In-Station Training

TM 24-25 Multiple Toxic Exposure

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Purpose

Some incidents turn out to be exactly what you are dispatched to, others do not. It is important to consider the fixed and variable factors available when dispatched, with continual review and revision of situation assessment as additional information becomes available.

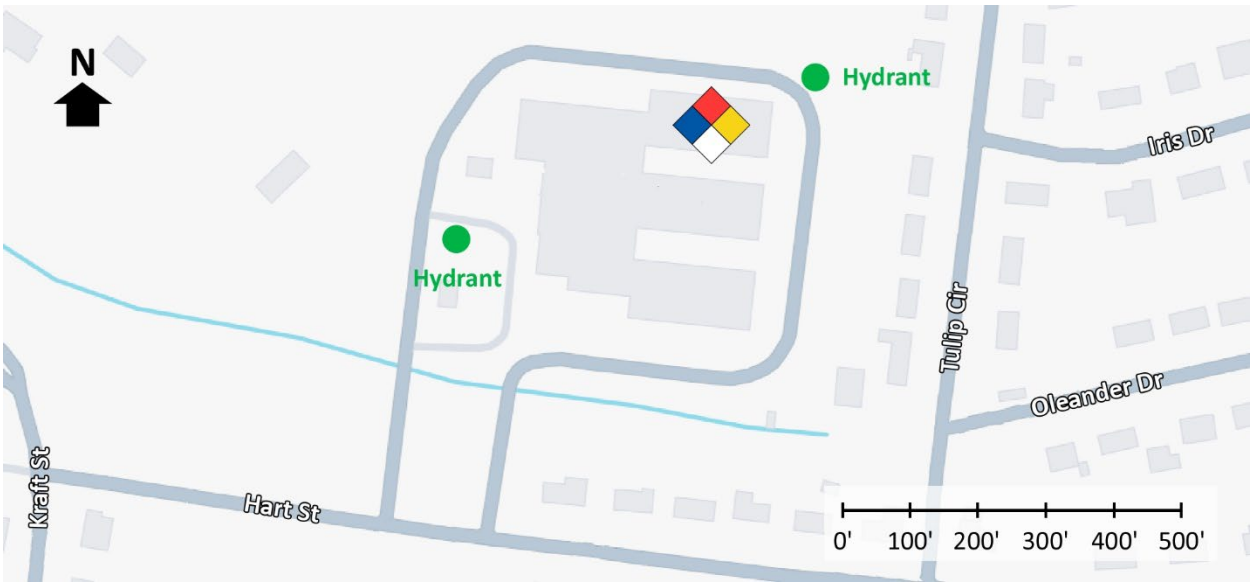
Learning Outcomes

Firefighters and officers perform an effective size-up, select an appropriate strategy, and implement tactics based on the strategic decision-making model.

Conducting the Drill

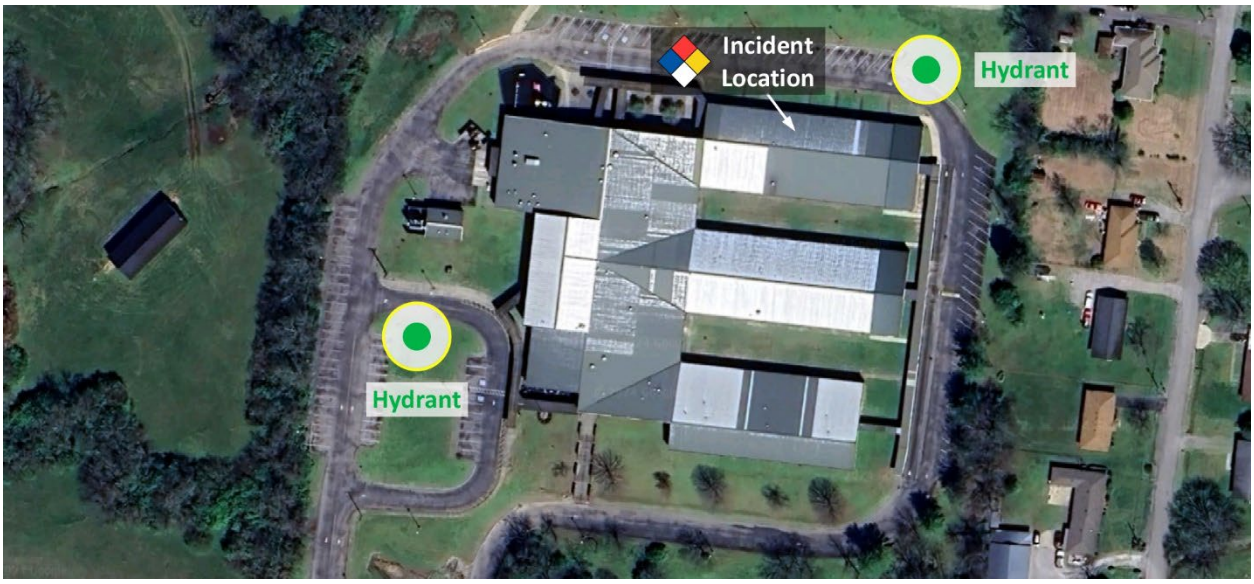
This incident involved an emergency medical response for elementary school students and a teacher exposed to carbon dioxide at Vena Stuart Elementary School, 780 Hart Street in Gallatin, Tennessee on February 16, 2024, at 09:30 (Wethington, 2024 & Guerry, Hargett, & Baird, 2024). Review the map and photos (Figures 1-5) to gain an understanding of the area and building involved.

Figure 1. Map of the Incident Area



Note: Adapted from Google. (2024a). [Map, 780 Hart Street, Gallatin, TN]. https://bit.ly/4bxiccC.

Figure 2. Aerial View



Note: Adapted from Google. (2024b). [Aerial view 780 Hart Street, Gallatin, TN]. https://bit.ly/3JVDuoj.

Ther are multiple hydrants in the school complex as illustrated in Figures 1 and 2.

Figure 3. Entrance to the School Complex

Note: Adapted from Google. (2023a). [Street view, 780 Hart Street, Gallatin, TN]. https://bit.ly/4bvDSpq.

Figure 4. Side Alpha

Note: Adapted from Homes.com. (2024). Vena Stuart Elementary School. Retrieved May 11, 2024, from https://bit.ly/4bbNTrT.

Figure 5. Alpha/Bravo Corner

Note: Adapted from Homes.com. (2024). Vena Stuart Elementary School. Retrieved May 11, 2024, from https://bit.ly/4bbNTrT.

The temperature is currently 45° F with wind from the east northeast at 3 mph (Weather Underground, 2024). You have been dispatched along with a paramedic unit to Vena Stuart Elementary School, 780 Hart Street for a report of several elementary school students experiencing nausea. You are the company officer or AIC of the first arriving engine and have your company's typical staffing.

1. What critical factors would you consider when dispatched and during response and what conversations would you have with your crew while responding?

You hear a paramedic unit with a staffing level of two go enroute. You will arrive from the east on Hart Street and the paramedic unit will arrive approximately five minutes after you from the same direction. Dispatch provides an update that three patients are in the school nurse's office and that they had been in a science class doing an experiment with dry ice. Examine Figure 6 illustrating conditions on arrival.

Figure 6. Conditions on Arrival

Note: Adapted from Homes.com. (2024). Vena Steward Elementary School. Retrieved May 11, 2024, from https://bit.ly/4bbNTrT.

2. State your initial radio report (IRR) exactly as you would transmit it to dispatch (this is likely a mobile data computer command-arrived or a short radio communication that you are on-scene).

3. What specific actions would you take (as the company officer) immediately upon arrival and exiting the apparatus and what task orders you would give your crew?

Arriving at the nurse's office you find there are now four patients exhibiting the same signs and symptoms. All the children are complaining of nausea and have elevated respiratory rate and pulse. The

nurse reports that all the children were from the same class. The children report that they had been doing science experiments using dry ice.

4. Would you change the action you are taking or modify the assignments given to your crew? If so, what task orders would you provide?

5. State your update report exactly as you would transmit it to dispatch.

6. What action will you take at this point?

7. Medic 1 arrives what information do you provide them regarding status of the patients.

As you conduct patient assessment on the children in the nurse's office, the nurse receives a report that other children and the teacher in the science classroom where the experiments were conducted are also symptomatic.

8. What action will you take based on this additional information.

The following questions are based on IC #1 having ordered additional resources when transmitting the update report and/or when receiving information regarding additional patients in the science classroom. Engine 2 and Medic 2 will arrive approximately five minutes after your request for additional resources. Engine 2 has your agency's typical staffing and Medic 2 has two-person staffing. Chief 1 will arrive six minutes after your request for additional resources (all other requested resources will arrive after Chief 1).

9. Engine 2 arrives and reports they are Level 1 on Hart Street. State the tactical assignment you would give them exactly as you would transmit it.

You determine that there are 19 patients, 18 children and one adult. All patients are conscious and alert and report nausea, elevated respiratory rates, and elevated pulse rates. All patients have been moved out of the science classroom and into the auditorium.

10. Based on the anticipated effectiveness of your tactical operations, state your conditions, actions, and needs (CAN) report that you would provide to the first arriving command officer as part of command transfer to IC #2.

Reflect on your strategic decision-making and responses to questions 1 through 10 before answering the next six questions (these questions usually apply to structure fires but consider how they apply to a hazmat incident such as encountered in this 10-Minute Training).

11. What was the problem?

12. What was getting in the way of achieving your tactical priorities?

13. Was there anything in this incident that could have hurt or killed you (right now)?

14. Was it reasonable to believe that the building was occupied?

15. Was there searchable space?

16. If you believed it was reasonable that the building was occupied and there was searchable space, what could you do about it?

17. Would you expect that the company tasked with checking on the patients and conditions in the science classroom would have been wearing self-contained breathing apparatus and used atmospheric monitoring equipment? Why or why not?

18. Would the atmospheric monitoring instruments carried on your apparatus be useful in determining if hazardous concentrations of carbon dioxide were present in the classroom and adjacent areas of the school? Identify what readings you would be looking for, how you would monitor and why?

Additional Learning: There are several interesting avenues for additional learning based on this incident.

Properties of Carbon Dioxide: Review the properties of carbon dioxide in the *National Institute for Occupational Safety and Health Pocket Guide to Chemical Hazards* (NIOSH, 2019), the *Dry Ice Safety Data Sheet* (Airgas, 2022), and the *Carbon Dioxide Health Hazard Information Sheet* (USDA, n.d.).

Likelihood of Significant Exposure: When dry ice (solid carbon dioxide) completely sublimes into carbon dioxide in the gaseous state, one pound of dry ice releases 8.5 (US DOT, 2004) cubic feet (ft^3) of gas. A typical elementary school classroom is approximately 900 square feet (ft^2). Consider a 900 ft^2 classroom with a nine-foot ceiling height. How much dry ice (in pounds) would be needed to achieve a concentration of 1% by volume within the classroom? Consider the properties of carbon dioxide. How might concentration vary throughout the classroom as the dry ice sublimes? Where and how would occupants of the classroom be at highest risk?

Mass Psychogenic Illness: Mass psychogenic illness is when people in a group start feeling sick at the same time even though there is no physical or environmental reason for them to be sick (Jones, 2024). Indicators of potential for mass psychogenic illness include:

- Many people get sick at the same time.
- Physical exams and tests show normal results.
- No apparent environmental cause.

Symptoms of mass psychogenic illness may be like those resulting from carbon dioxide exposure. In this case, it is possible that students and the teacher were exposed to some elevated level of carbon dioxide. How might potential for mass psychogenic illness be a critical factor in this type of incident? Read *Mass Psychogenic Illness Attributed to Toxic Exposure at a High School* (Jones et. al., 2000).

Another Carbon Dioxide Incident: Carbon dioxide incidents can occur in a variety of contexts and may involve dry ice (solid carbon dioxide), compressed or cryogenic liquid carbon dioxide, or carbon dioxide in the gaseous form. Watch *McDonalds Hazmat, Deadly Carbon Dioxide* and *E61 CO2 Incident* for additional perspective on the hazards presented by carbon dioxide.

Clark County Mass Casualty Protocol: Review the *SW Region EMS Protocols* (Wittwer, 2023) related to mass casualty incidents (see COPS Mass Casualty Incident (MCI) on page 117 and Reference Mass Casualty Protocol Detailed Operations on pages 196-206).

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