In-Station Training

TM 23-47 Propane Facility Leak and Fire

Author

Chief Ed Hartin

Purpose

Hazardous materials response often involves gasoline, diesel fuel, propane, or natural gas. Incidents may occur during storage, transportation, or during their end use. Firefighters and officers must be familiar with these products, how they are transported, typical uses, the hazards they present, and risks encountered during incident operations.

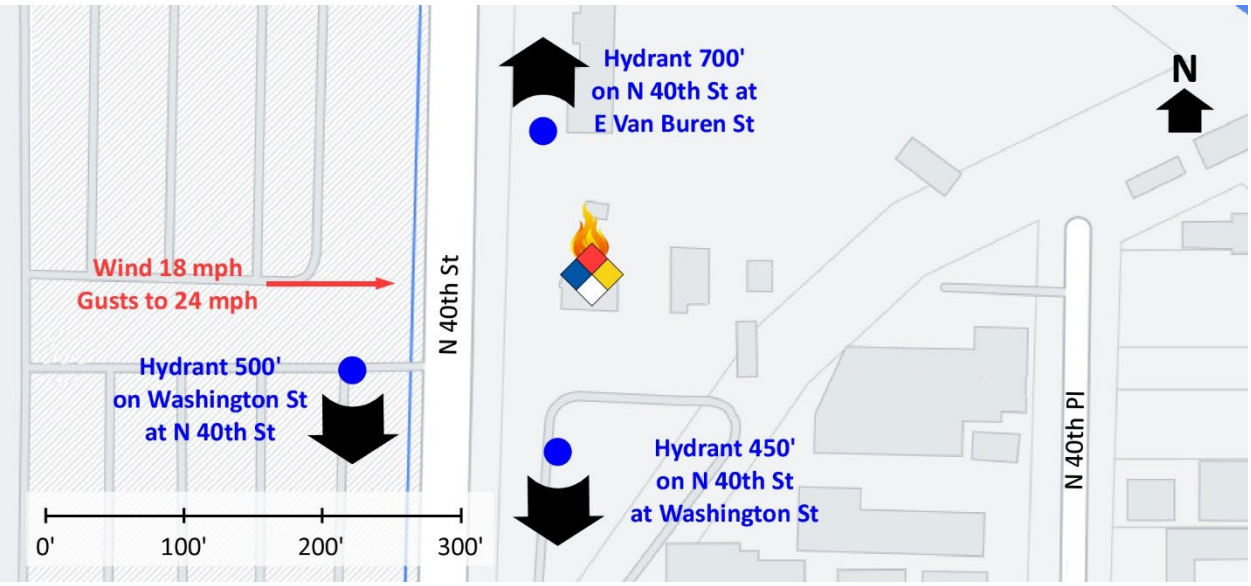
Learning Outcomes

Firefighters and officers perform an effective size-up; select an appropriate strategy, and implement tactics based on the strategic decision-making model when dealing with hazardous materials incidents.

Conducting the Drill

This incident involved a report of a leak and fire at Bill's Propane Service (a propane retailer) located at 109 N 40th Street in Phoenix, Arizona on July 20, 2023, at 17:00 (12 News, 2023; DeWitt, 2023, Arizona Republic, 2023, On-Scene TV, 2023; & Deusterman, 2023). Review the map and photos (Figures 1-6) to gain an understanding of the area and building involved.

Figure 1. Map of the Incident Area



Note: Adapted from Google. (2023a). [map, at 820 Industrial Parkway, Phoenix, AZ]. https://bit.ly/46ZH62d.

The closest hydrants are located on N 40th Street at Washington Street with an additional hydrant at N 40th Street and E Van Buren Street as illustrated in Figure 1.

Figure 2. Aerial View

Note: Adapted from Google. (2023b). [aerial view, 109 N 40th Street, Phoenix, AZ]. https://bit.ly/3Mbv5P6.

Figure 3. Alpha/Delta Corner

Note: Adapted from Google. (2023c). [street view, 109 N 40th Street, Phoenix, AZ]. https://bit.ly/470Vgjz.

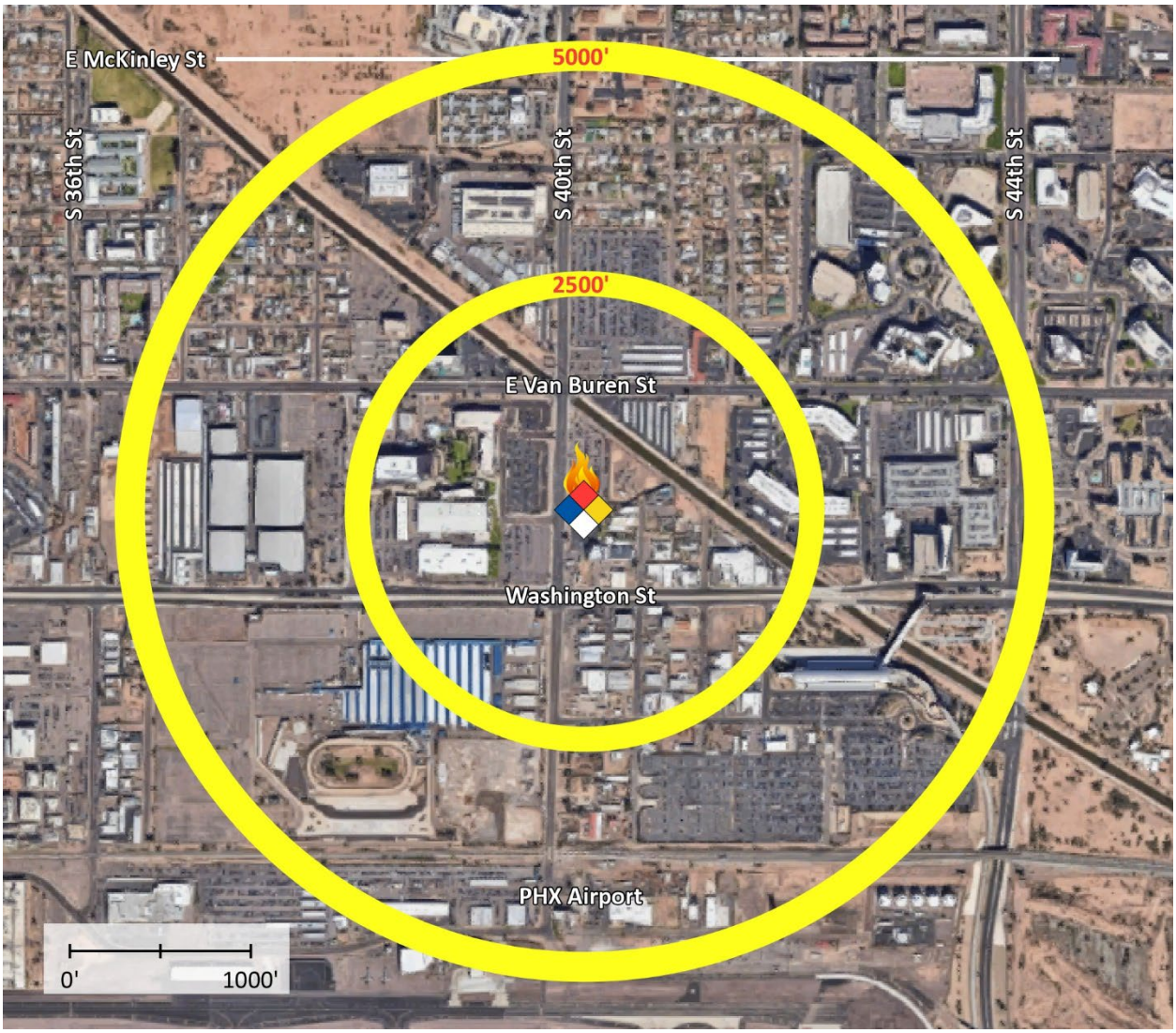
Figure 4. Side Alpha

Note: Adapted from Google. (2023d). [street view, at 109 N 40th Street, Phoenix, AZ]. https://bit.ly/3sb0LNL.

Figure 5 Alpha/Bravo

Note: Adapted from Google. (2023e). [street view, at 109 N 40th Street, Phoenix, AZ]. https://bit.ly/3S6pBsH.

Figure 6. Aerial View of the Incident Location



Note: Adapted from Google. (2023g). [aerial view, 109 N 40th Street, Phoenix, AZ]. https://bit.ly/49iYbpH.

You have been dispatched for a fire at Bill's Propane Service located at 109 N 40th Street at 17:00. You are the company officer or AIC of the first arriving engine and have your company's typical staffing. The temperature is 116° F with wind from the west at 18 mph with gusts to 24 mph (Weather Underground, 2023).

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

While responding you hear a command officer and another engine with typical staffing for your agency go enroute. Dispatch provides an update reporting multiple calls for a fire at the incident location. The second engine will arrive approximately 4 minutes after you, followed by the command officer. You will be approaching from the west on Washington Street.

Use the *2020 Emergency Response Guidebook* (DOT, 2020) and *Pocket Guide to Chemical Hazards* (NIOSH, 2020) to inform your strategic and tactical decision-making.

2. How will you define the initial isolation area (hot zone)?

Watch the incident video (Deusterman, 2023) and examine Figure 7 illustrating conditions on arrival. The video and photo illustrate conditions from Washington Street (Side Bravo) and then from the intersection of North 40th Street and Washington Street.

Figure 7. Conditions on Arrival

Note: Adapted from Deusterman, R. (2023). Intense flames, propane business fire prompts evacuations in Phoenix. [video]. Retrieved November 4, 2023, from https://bit.ly/472Gjxh,

3. State your initial radio report (IRR) exactly as you would transmit it to dispatch.

4. 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?

You are unable to perform 360-degree reconnaissance, but initial observations indicate fire involving a bobtail propane delivery truck and multiple propane tanks ranging in size from 20-pound to 1000 gallon. Several 20-pound tanks experience a boiling liquid expanding vapor explosion (BLEVE) as you are conducting reconnaissance.

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

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

7. State the tactical assignment you would give the next arriving engine exactly as you would transmit it.

8. 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?

Answer the following questions to examine how you used the resources available to aid in development of the initial incident action plan as well as your choice of strategy and tactics for this incident.

9. What guide number did you reference in the *2020 Emergency Response Guidebook* (ERG) (DOT, 2020)? Was the information useful and how did it inform your decision-making in this incident?

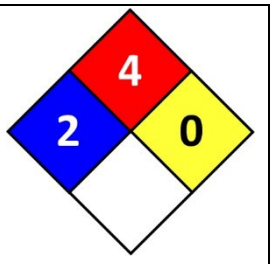
10. Did you use the BLEVE data provided on pages 365 through 367 of the *2020 Emergency Response Guidebook* (ERG) (DOT, 2020)? How is this data different from the generic information provided on the guide page specified for propane?

11. Was the *NIOSH Pocket Guide to Chemical Hazards* (NIOSH, 2020) useful and if so, how did it inform your decision-making in this incident?

12. What additional resources did you request (if any) and why did you request these specific resources?

Additional Learning: The additional learning in this 10-Minute Training provides an opportunity to review the characteristics of propane, the sizes of propane containers encountered in the Phoenix propane incident (subsequent training will look at rail tank cars and larger MC 331 cargo tanks) and boiling liquid expanding vapor explosion (BLEVE) hazards. After reviewing propane and typical containers, get out into your response area, identify where you may encounter an incident at a propane wholesale or retail facility, and conduct a walk around, discussing strategic and tactical operations with the members of your crew.

Table 1. Characteristics & Physiological Effects of Propane

<table>
<tr><td colspan="3">Product Name (UN/NA ID)
Propane (1075)</td><td>Formula
C_3H_8</td><td>NAERG
Guide 115</td><td rowspan="2"> 
</td></tr>
<tr><td colspan="5">Description
Colorless, tasteless, odorless, heavier than air, flammable gas. As propane is odorless, ethyl mercaptan is added to provide a distinctive “gas” odor.</td></tr>
<tr><td>Molecular Weight
44.09</td><td>Vapor Density
1.5</td><td>Specific Gravity
0.59 @ 60° F</td><td>Vapor Pressure
124.9 @70° F</td><td colspan="2">Ionization Potential
14.01 eV</td></tr>
<tr><td>Solubility
Not Soluble</td><td>Flash Point
n/a (gas)</td><td>LFL
2.1 %</td><td>UFL
9.5 %</td><td colspan="2">Ignition Temperature
920° F (493° C)</td></tr>
<tr><td>TLV-TWA (ACGIH)
1000 ppm (5% LEL)</td><td>STEL (15 min)
n/a</td><td>IDLH
2100 ppm (10% LEL)</td><td colspan="3">Routes of Entry
Inhalation, Contact (Liquid)</td></tr>
<tr><td colspan="6">Physiological Effects
Propane is a simple asphyxiant and rapid evaporation of propane liquid on the skin will result in rapid cooling.</td></tr>
<tr><td colspan="6">Symptoms of Exposure
Inhalation of propane may result in dizziness, confusion, excitation, or asphyxia; Contact with propane liquid may result in frostbite</td></tr>
<tr><td colspan="6">Other
Propane containers may present risk of a boiling liquid expanding vapor explosion (BLEVE) if the container is damaged (typically due to mechanical harm) or thermally stressed (due to flame contact above the vapor space). Note that a BLEVE does not require a fire or flame impingement prior to container failure (mechanical damage and an increase in ambient temperature may result in a BLEVE).</td></tr>
</table>

Note: Adapted from National Institute for Occupational Safety and Health (NIOSH). (2020). *Pocket guide to chemical hazards* and US Department of Transportation (US DOT). (2020). *Emergency response guidebook*.

Watch The *Complete Guide to Propane Tank Sizes* (Great Valley Propane, 2021) to gain an understanding of typical sizes of propane tanks. Despite the title of this video, there are other sizes of propane tanks such as 30, 33, and 40-pound tanks (these smaller tanks have characteristics like 20-pound tanks but are slightly larger). Then watch the *Propane Truck Overview* (IAFC, 2023) to develop an understanding of the characteristics of a propane bobtail delivery truck.

What is a BLEVE? This acronym stands for boiling liquid expanding vapor explosion. A BLEVE occurs when a liquid container fails into two or more pieces when the liquid contained is above its boiling point at normal temperature and pressure.

Pages 365 through 367 of the *2020 Emergency Response Guidebook* (ERG) (DOT, 2020) provides additional data on BLEVEs. Review this information, discuss it with your crew and consider how it may be applied to incidents such as the one used in this 10-Minute Training.

References

12 News. (2023). Crews gain control of propane facility fire in Phoenix. Retrieved November 4, 2023, from https://bit.ly/49p2vUk.

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Google. (2023e). [street view, at 109 N 40th Street, Phoenix, AZ]. Retrieved November 4, 2023, from https://bit.ly/3S6pBsH.

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