In-Station Training

TM 24-08 Residential Fire Involving EV

Author

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Purpose

Lithium Ion (Li-ion) batteries can be encountered during residential firefighting operations in multiple contexts. Smaller batteries can be in power tools or e-mobility devices while larger batteries can be found in energy storage systems and vehicles. In each of these contexts, Li batteries present significant but varied hazards and challenges during firefighting operations.

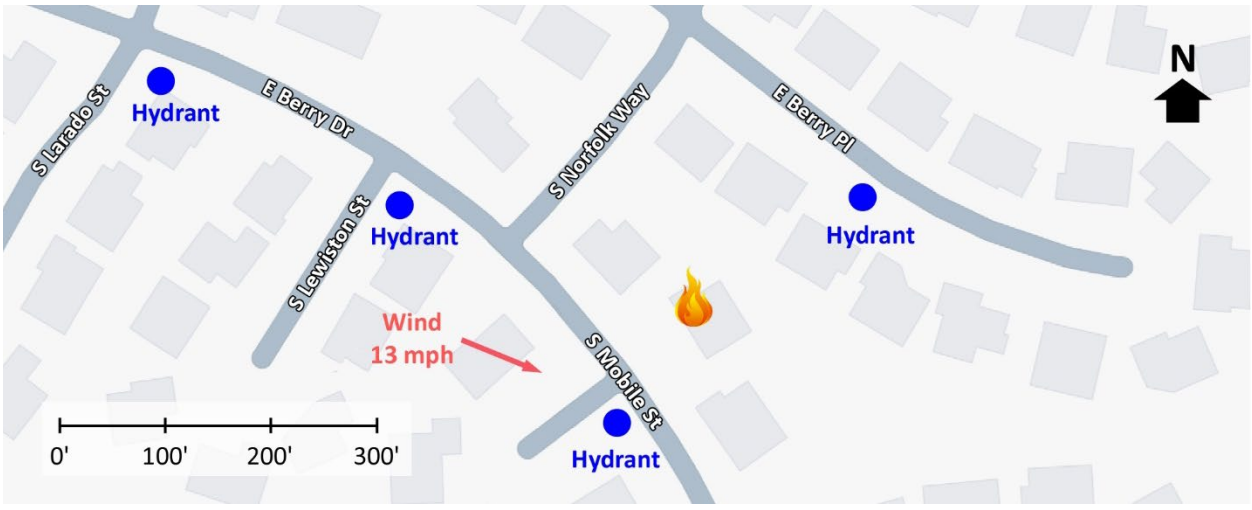
Learning Outcomes

Firefighters and officers perform an effective size-up, select an appropriate strategy, and implement tactics based on the strategic decision-making model when confronted with an incident involving Li-ion batteries.

Conducting the Drill

This incident involved a residential fire at 5538 S Mobile Street, Centennial, Colorado on January 10, 2023, at 07:40 (SMFR, 2024a & 2024b). 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. (2024a). [Map, 5538 S Mobile Street, Centennial, CO]. https://bit.ly/3Oie1rS.

Figure 2. Aerial View

Note: Adapted from Google. (2024b). [Aerial view 5538 S Mobile Street, Centennial, CO]. https://bit.ly/3S8W6VE.

The closest hydrant are is across the street from the Main Fire Occupancy. Additional hydrants are in the area as illustrated in Figure 1.

Figure 3. Side Alpha

Note: Adapted from Google. (2023a). [Street view, 5538 S Mobile Street, Centennial, CO]. https://bit.ly/3SvEGUD.

Figure 4. Alpha/Delta Corner

Note: Adapted from Google. (2023b). [3d aerial view, 5538 S Mobile Street, Centennial, CO]. https://bit.ly/3SePrtd.

Figure 5. Charlie/Delta Corner

Note: Adapted from Google. (2024c). [3d aerial view, 5538 S Mobile Street, Centennial, CO]. https://bit.ly/3SePxB5.

Figure 6. Bravo/Charlie Corner

Note: Adapted from Google. (2024d). [3d aerial view, 5538 S Mobile Street, Centennial, CO]. https://bit.ly/3Ulx4Wd.

The temperature is currently 30° F with wind from the west northwest at 13 mph (Weather Underground, 2024). You have been dispatched to 5538 S Mobile Street for a report of a residential fire at 07:40. 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?

Dispatch provides an update indicating that the resident reports an electric vehicle on fire in the attached garage. You hear a command officer and two other engines with typical staffing for your agency go enroute. You will arrive from the west on South Mobile Street. The second engine will arrive from the same direction four minutes after you. The third engine will arrive six minutes after you from the opposite direction on South Mobile Street. The command officer will arrive shortly after the third engine. All other units dispatched on the first alarm will arrive after the command officer.

Examine Figure 7 illustrating conditions on arrival.

Figure 7. Conditions on Arrival

Note: Adapted from South Metro Fire Rescue (SMFR). (2024a). *Electric vehicle fire* [video]. https://bit.ly/3ScMDwr

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

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

Conditions on Sides Bravo, Charlie, and Delta are consistent with those observed on Side Alpha with a small to moderate amount of smoke issuing from the building. Occupants report that everyone has evacuated from the home and that there are two vehicles in the garage, one of them being an EV.

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. Engine 2 arrives and reports that they are Level 1 on a hydrant on East Berry Drive at South Lewiston Street, west of the incident. State the tactical assignment you would give them exactly as you would transmit it.

7. Engine 3 arrives and reports they are Level 1 south of the incident. State the tactical assignment you would give them 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.

Watch the first three minutes of the incident video (SMFR, 2024a) illustrating the conditions encountered and tactical operations conducted by the South Metro Fire Department companies that were on-scene.

9. Did your resource determination include request for the hazardous materials team? What factors influenced your decision to request hazmat response (or not)?

10. How did you approach initial water application to the fire in the garage? Did you apply water from the exterior or access the garage via the door between the garage and interior of the house? Why did you select the attack position that you used?

11. Did the initial water application maintain anti-ventilation (e.g., use of a piercing nozzle or small opening)? Why or why not?

12. If your company was tasked with accessing the garage through the overhead door, how would you approach this task? Why?

13. The EV in this incident appears to have been a Tesla Model S. What resources could you use to gain emergency response information for this type of vehicle? How would you access these resources?

Additional Learning: Watch Test shows explosive power of a lithium-ion battery thermal runaway (CBS News, 2023) for a graphic illustration of the potential hazards presented by a Li-ion battery energy storage system in a garage (the potential risk from a electric vehicle battery in thermal runaway inside a garage would likely be similar).

Watch *High Voltage Vehicle Firefighting* (Archer, 2020) and review the Emergency Response Guide Tesla Model S (Tesla, 2024a). Information on other Tesla models (and energy storage systems) is available on the *Tesla First Responder Information* webpage (2024b). Information on other electric vehicles is available on the *National Fire Protection Association (NFPA) Emergency Response Guides* webpage (2024).

Shelby Township fire department using giant blanket to fight electric vehicle fires provides a demonstration of how a fire blanket such as used in the Centennial Colorado incident is deployed for control of an electric vehicle fire.

Watch *Attack EV Fires Fast with the Transformer EV Nozzle System* (Task Force Tips, 2023) discuss the advantages and disadvantages of this type of device for battery cooling, particularly in comparison to use of the Rescue 42 struts to lift one side of the vehicle as illustrated in the High Voltage Firefighting video.

References

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