Safety Risks in Electric Vehicle Crashes

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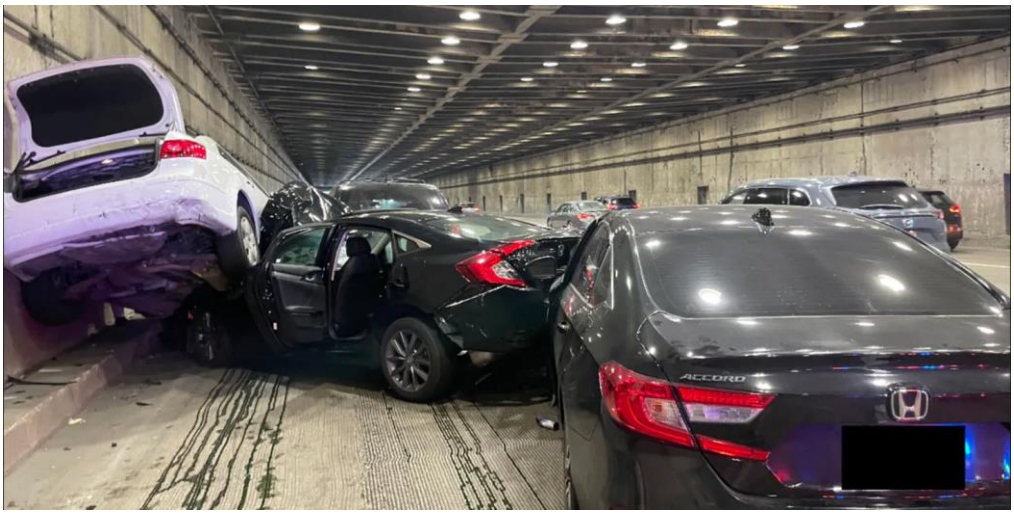
A Guide for First Responders

By Dave Brown

Electric vehicles pose unique challenges for First Responders



Tesla Crash San Francisco Bay Bridge, Nov 24, 2022 Photo: California Highway Patrol Footage

You are the first responder at the scene of a serious vehicle crash and you suspect one of the damaged vehicles is a hybrid or full electric vehicle. There may be people still inside and bystanders milling about. What is the first thing you do?

Answer. Chock the wheels.

Unlike internal combustion engines, there are few signs that an electric vehicle is still running. If the battery pack is still energized and the ignition system is still on, one touch of an accelerator pedal or a shorted wire may cause it to move without warning.

There are multiple risks inherent with vehicles equipped with high-voltage lithium-ion battery packs, as found on most hybrid and plug-in (EV) electric vehicles. We checked with a few experts to give a quick summary on suggestions for the firefighters or police officers on the scene of a serious wreck or a disabled electric vehicle.

Firstly, the high-voltage lithium-ion (Li-ion) batteries in hybrid, plug-in hybrid and battery electric vehicles do pose a danger to first responders in crashes where the vehicle may be severely damaged. There is risk of electrocution if the battery pack or any of the high-voltage cables or connectors have been compromised. There is also a risk of thermal runaway if the battery pack catches fire. But in spite of widely-distributed stories of electric vehicles burning for days, it is rare for a battery pack to be compromised and ignite on fire.

"There are few signs that an electric vehicle is still running. Immobilize the vehicle first, then extricate the occupants."

First responders at a wreck or a disabled vehicle should first identify the presence of a vehicle containing a battery pack, immobilize the vehicle with wheel chocks and an EV safety plug if equipped, and then extract the occupants and remove any bystanders.

1. Identify

Look for indications the vehicle may contain a high-voltage battery pack. Labels, brand names and even the lack of tail pipes might be an indication. Do not use the lack of sound as an indicator that the vehicle is off. Look instead for lights on the dash or instrument panel that may indicate the ignition is still on and the powertrain is still energized.

Attempt to identify the make, model and year of the vehicle to help select an appropriate Emergency Response Guide as published by the vehicle manufacturers and the National Fire Protection Association (NFPA.) Nearly every electric and hybrid vehicle has an emergency response guide for first responders at NFPA - Emergency Response Guides for Alternative Fuel Vehicles.

2. Approach

Approach the vehicle at a 45-degree angle and expect that the vehicle may start moving without warning at any time until it is immobilized.

3. Immobilize

Chock the wheels to prevent it from moving before trying to extricate any passengers or disable the high-voltage battery pack. If you can safely access the passenger compartment, set the parking brake, place the vehicle in Park and look for any "ready" indicator lights. If any lights are visible, push the ignition button to OFF. Once occupants are safely extracted, remove any key fobs and keep the fobs at least ten meters away. If occupants are conscious, tell them to not use any vehicle apps on their smart phones.

If first responders are equipped with an emergency EV safety plug, locate the charging door and open the door manually or with a pry bar, activate the plug, determine which type of charger socket it uses and insert the appropriate end of the safety plug into the charging port. It activates most vehicles safety protocols that will temporarily prevent the vehicle from running and disable the vehicle. Note that some newer vehicles use different protocols that may not be disabled by a safety plug. Also remember that the vehicle can still roll away and it is important to always chock the wheels first.

4. Watch, Smell, Listen

Look for lights on the dash or instrument panel that indicate the powertrain is still energized. Look for any damaged high-voltage components or cables. (High-voltage cables and connectors will be colored orange. If the scene is at night, try to light the scene with white light instead of relying on red strobes to determine the color of the cables.)

If any orange cables or connectors are visibly cut or broken, move away from the vehicle and keep bystanders away due to a possible electrocution hazard. Listen for the sounds of bubbling or hissing that may indicate the high-voltage battery pack case may be compromised. If you smell toxic chemicals, move everyone away and do not approach unless equipped with full PPE.

5. Disable

In a serious crash, the vehicle may need to be completely disabled, which means isolating the battery pack completely from the chassis. Depending on the design, the battery pack is usually disconnected by pushing the ignition OFF. On some makes, it is automatically disconnected in a crash where the air bags are deployed. Most hybrid and electric vehicles are also equipped with special cable cut points, where a low-voltage cable can be cut, thus disconnecting the high-voltage battery pack from the vehicle. These are often marked as "First Responder Cut Loop."

Cutting or disconnecting the 12-volt battery also disconnects the high-voltage battery pack and isolates it from the chassis. Do not cut or attempt to disconnect any orange-colored cables or connectors. Orange is the universal designator across the industry for high-voltage components. Unless stated otherwise in the manufacturer's Emergency Response Guide, cut the negative cable of the 12-volt battery to prevent a possible spark if the positive cable is cut while the tool is making contact with a metal part of the vehicle.

Submerged Vehicles

If the vehicle is still mostly intact, hybrid and electric vehicles are designed to be safe even when fully submerged in water. Once the high-voltage system is isolated from the chassis, it will pose little danger of shock or energizing surrounding water.

Attempt to turn the ignition off but do not attempt any other measures while it is still submerged. Do not touch, cut or disconnect any orange high-voltage cables. If the ignition cannot be turned off, first responders should wait until the vehicle is recovered and full drained before attempting other methods of disabling it such as removing the 12-volt negative battery cable or cutting the First Responder Cut Loop.

If responders see evidence that the high-voltage battery pack has been compromised and the vehicle is submerged or partially submerged in salt water, no attempt should be made to turn the vehicle off. It should be treated like an energized high-voltage hazard while being recovered and drained.

Bubbling and hissing may be signs the high-voltage batteries are discharging. Toxic fumes or potentially explosive hydrogen gases may be emitted until the battery pack is fully discharged.

Once a previously submerged vehicle is recovered and stable, the wheels should first be chocked and the vehicle placed into Park. When safe, the vehicle should be moved to a secure and non-flammable area where it can be monitored for smoke or fire for a minimum of 4 days.

Electric Vehicle Fires

Firefighters should extinguish hybrid and electric vehicle fires using proper vehicle firefighting practices in accordance with departmental training and standards. In serious crashes, there may be non-electric vehicles involved, with a variety of possible flammable fluids and materials. Firefighters should wear all Personal Protective Equipment and Self-Contained Breathing Apparatus as required for vehicle fires.

If the battery pack is not compromised, a standard attack using typical vehicle fire extinguishing agents is appropriate.

If the pack has been compromised and a cell has caught fire, there are a whole new set of challenges for firefighters on the scene. A defensive attack with copious amounts of water may be necessary. High-voltage battery pack cells continue to burn until expended, so the purpose of the water is to attempt to cool adjacent battery cells.



In many cases, there is almost nothing firefighters can do to put a cell fire out, and efforts will be focused on cooling adjacent cells to prevent the spread of fire. In extreme cases, this may involve simply dragging the vehicle away from combustible materials and letting the vehicle burn out.

Once the fire appears out, latent heat may still spread within the battery pack, causing reignition hours and even days later.

There is some promise in the technology of extinguishers. A 2% solution of an encapsulator agent such as the F-500 EA manufactured by Hazard Control Technologies or the EFireX portable fire extinguishers containing their TRPL-E™ encapsulator agent have both proven effective in controlling and extinguishing lithium-ion battery fires.

Encapsulator agent fire extinguishers are currently unable to be listed by the NFPA as an extinguishing agent. While the NFPA is looking at revising fire classifications, extinguishers such as the Element, F-500 and EFireX are not currently rated by Underwriters Laboratory (UL) or Underwriters Laboratory Canada (ULC) and cannot substitute for ULC-rated extinguishers where required by regulation. They can only act as additional extinguishers.

Without an appropriate encapsulator agent added to water hoses or contained in an extinguisher, allowing a cell to burn itself out and control the spread to adjacent cells is about the only course of action should a high-voltage pack catch fire.

“Sometimes, the best way is to simply drag the vehicle away from combustible materials and let it burn itself out.”

If a vehicle is connected to a charging station, treat the scene as an energized electrical fire. Once the vehicle is immobilized, shut down the electrical current supplying the charging station before applying water to a fire. Do not attempt to cut or disconnect any charging cables and do not cut or disconnect any high-voltage cables on the vehicle even if the power has been cut to the charging station.

Emergency Response Guides for Alternative Fuel Vehicles

The National Fire Protection Association (NFPA) has complied a free database of Emergency Response Guides for many makes and models of hybrid and electric vehicles. These can be found at:

NFPA - Emergency Response Guides for Alternative Fuel Vehicles