­­Dozens of electric vehicle emergency response guides and sheets from various manufacturers were reviewed which pertain to firefighter safety and protection. The review found a lack of commonality in standards, personal protection equipment (PPE), and call-outs for tools. The following is a list of observations, followed by suggested recommendations for change.[[1]](#footnote-1)

OBSERVATIONS:

1. Vehicle manufacturers in the United States are not required to provide emergency response guides, beyond general requirements of the New Car Assessment Program (NCAP) program sub-parts (49 CFR Part 575.301, Part 575.302, Part 575.401, USC 1232, etc.)

1A. Pertaining to emergency information, NTSB Safety Recommendation H-20-30 was issued January 13, 2021 to the National Highway Traffic Safety Administration and stated:

When determining a vehicle’s US New Car Assessment Program score, factor in the availability of a manufacturer’s emergency response guide and its adherence to International Organization for Standardization standard 17840 and SAE International recommended practice J2990. (H-20-30)

The Safety Board classified the NHTSA response as unsatisfactory on October 18, 2021.[[2]](#footnote-2) This followed NHTSA stating in a response of April 2, 2021 that rather than have manufacturers provide emergency response information, the agency “*believes it is more effective to address risks to emergency responders by working directly with the emergency response community.*” The agency added that “*­­NHTSA also makes available manufacturers supplied emergency response guides for various alternative fuel vehicles make and models. We will partner with the NFPA and advocate for an immediate update to their 2018 Emergency Field Guide to incorporate recently manufactured EVs and underscore the need for a recurring, biennial update to this publication.*”

1B. Emergency response information continues to be very difficult to find, especially for first and second responders on scene when time is critical.

1C. The Tesla and Ford websites demonstrate that providing easily accessible links to emergency information is possible.

1. The NFPA provides a common location for collecting emergency response information and this collection is cited by FEMA and other organizations.

2A. While an excellent resource, the web page is outdated due to the volume of, and continual change in, new vehicles. Many new vehicles are not included in the NFPA list.

EXAMPLE: The most recent BMW links are from 2018.

1. Basic approaches regarding how to show emergency response information vary widely between manufacturers, and even large changes in approach exist within a manufacturer between years.

EXAMPLE 1: The 2021 Ford Mach-E ERG is a deviates from the ISA 17840 standard by dividing the typical one or two page ISO-17840 rescue sheet illustration across topics on 34 pages.

EXAMPLE 2: The 2022 Ford F150 Lightning has a single page ISO 17840 rescue sheet illustration at the beginning of a similarly comprehensive 20 page guide.

EXAMPLE 3: The 2022 Honda CR-V has a single page ISO17840 rescue sheet illustration located on page 42 of 44, not the beginning of the document.

EXAMPLE 4: Unique from other manufacturers and all previous GM models, the Lyriq guide states that the 12V cables should not be cut unless needed for extrication.

NOTE: Basic firefighter training based in decades of internal combustion engine (ICE) experience is to double cut the negative battery cable.

1. Some manufacturers continue to have unique documents which are not ISO 17840 compliant.

EXAMPLE: While the Nissan Leaf was originally introduced in 2010, emergency information for the 2022 continues to spread illustrations across a larger document, similar to the 2021 Ford Mach-E previously mentioned.

5. Some European manufacturers have a single or double page rescue sheet with a separate large document for instructions, warnings, and cautions.

5A. Beyond the difficulty of finding rescue sheets from some manufacturers, up to date versions of the separate documents can be very difficult to search for and find quickly and broken hyperlinks exist. Searching through separate documents of up to 161 pages can be cumbersome and time consuming.

5B. Emergency response information is typically not found on the more accessible manufacturer web pages.

EXAMPLE: BMW i4 emergency response information is on the BMW Aftersales Online System

5B2. Once found, the separate documents may include info for ALL models and be vague, making them all but unusable in a crisis.

EXAMPLE 1: The Mercedes document is 161 pages long.

EXAMPLE 2: VW States: "Due to the large number of different battery types with their different accumulator technology, this guide cannot address the specific chemical components, and due to continuous improvement in hazards and possible behavior of all these batteries."

5B3. The search function on manufacturer websites generally do not provide rescue sheet links when responding to queries such as “Emergency response information”

6. Some manufacturers provide a QR code or other link to emergency response information. This is an excellent practice only used by a limited number.

EXAMPLE 1: Mercedes provides a QR code in the fuel filler or charging port door.

EXAMPLE 2: Iveco provides a QR code and telephone numbers on the most recent emergency response sheets.

7. Non-standardized use of descriptions, pictograms, and icons results in conflicts of key information.

EXAMPLE: The variation in PPE call-outs range from none, to generically stating *"Wear appropriate protective equipment!," to "...use appropriate PPE,*" to "*SCBA required,*" to only posting an Injury Risk icon, to posting the Injury Risk icon plus a definition.

NOTE: Even the Injury Risk definition has variations.

EXAMPLE: The VW ID.4 rescue sheet states "*Hazards to the human health*" while the Cadillac Lyriq defines the symbol with "*Potential for eye, nose, and throat irritation with prolonged exposure.*" Neither call for SCBA.

8. Ford and Hyundai/Kia call for removal of jewelry and other worn metal items. These instructions regarding potential personal short circuit hazards are not in the rescue guidance of most manufacturers.

TOOLS AND EQUIPMENT

9. Some manufacturer emergency guidance regarding potentially needed equipment and tools is quite comprehensive while others are conspicuously absent.

9A. The ISO 17840 standard does not require listing tools on emergency response sheets and most manufacturers do not or are minimal in content. A minority of manufacturers provide tool information separately, such as the separate and comprehensive 161 page document by Mercedes which even lists minor items such as tape.

9B. Chains have proven to be an effective tool to pull a burning vehicle away from adjacent vehicles to prevent fire spreading to those vehicles. However, none of the emergency response guidance mentions having chain available.

9C. A minority of guidance information specifically cites the need to cool the battery, typically located on the bottom of the vehicle. Some guidance notes that vehicles should be lifted at specific jack points, typically in the tow section, but does not relate this to being able to cool an overheating battery. By contrast, the separate comprehensive Mercedes emergency document shows how to lift the side of a vehicle to access the bottom for cooling the battery.

9D. The need for blocking wheels to prevent unintended and unanticipated movement cited in about half of the emergency guidance should be in all.

9E. Manufacturers with an integrated emergency response sheet and guide tend to provide a result, such as "always double cut negative cable" frequently with a tool description such as “hydraulic cutter.” This is not standardized and may need to be found in a separate document. Emergency response sheets typically just show the "FF Cut" icon. (Tesla has both on the emergency response sheet)

9F. The lack of standardization for high voltage (HV) emergency disconnects requires tools in some vehicles and not others. The HV disconnects typically can not be found without the aid of emergency response information.

EXAMPLES FOR THE VARIOUS TYPES OF HV DISCONNECTS:

1. CUT LOOPS REQUIRING CABLE CUTTERS:

1A. In the front “frunk” compartment are cut loops in Tesla vehicles, Chevrolet Bolt, and others.

1B. The Chevrolet Volt hybrid has a firefighter loop in a trunk side panel.

1C. Some Mercedes sedans have a cut loop inside a removable panel in the left end of the instrument panel, concealed with fuses.

1. MANUAL TOGGLES TO PULL:

2A. Chevrolet Tahoe hybrid requires removal of a panel in the right rear door, then pulling a toggle.

2B. The Toyota Highlander hybrid is similar but inside the left rear door.

2C. The Toyota Prius hybrid requires removal of an unmarked panel in the trunk to access a similar toggle.

1. ROTATING DEVICES TO MANUALLY TURN:

Ford Focus and Escapes required rear seat removal to access a rotating orange knob.

1. FLAGGED FUSES TO REMOVE:

Early SmartCar EVs were an example of an orange tape marker on removable fuse under the left instrument panel to disable the HV circuit. The location is not marked on the emergency response sheet.

1. UNMARKED HV DISCONNECTS:

Ford and Polestar have no firefighter cut-loops marked with the helmet emblem. Instead, each has inconspicuous sliding plastic "maintenance disconnects" under a plastic front cowl panel.

NOTE: In commercial vehicles, most but not all bus and truck HV disconnects are well marked both in documentation and on the vehicles.

9G. Access to secondary disconnects may be required when an accident prevents access to the initial or forward locations. Secondary HV disconnects may be even more difficult to find without the aid of emergency response sheets. Examples of secondary HV disconnect designs include:

EXAMPLE 1: Some Tesla Model S cars require cutting a rear door frame with a circular saw to a specified depth.

EXAMPLE 2: The Rivian pickup truck calls for cutting the roof column to the right side of the rear window with a hydraulic cutter.

EXAMPLE 3: The VW ID.4 secondary cut loop access requires removal of a tail light.

EXAMPLE 4: The Polestar has a second removable “maintenance” fuse plug in the right rear floor panel. The Chevrolet Volt has a similar second removable “maintenance” fuse plug to remove which is concealed within the center arm rest. The Chevrolet Bolt also has a second removable “maintenance” fuse plug which is located beneath the rear seat.

10. All manufacturers provide guidance on recovery of vehicles from water if submerged. However, most manufacturers provide no guidance about the suitability of placing vehicles in water for firefighting. Tesla instructs to never intentionally submerge a vehicle, Others (ex: Honda, Kia, Hyundai) provide instructions on how to submerge either for extinguishing &/or de-energizing. All manufacturers provide guidance on recovery of vehicles from water if submerged.

11. The majority of emergency information explicitly states not to puncture the battery case or cut HV (orange) components. The following Tesla statement is typical: “At no time should the high voltage battery pack be compromised with rescue tools.” This is contrary to the intent of the penetrating tools, such as marketed to fire departments by Rosenbauer, MURER, and Cobra Cold Cut.

11A. A minority cite the reason being risk of electrocution. Because arc flash events are explosive and have occurred when HV batteries have had internal short circuit protection compromised, emergency response sheets and guides should add this reason to prevent damage to damage the battery case.[[3]](#footnote-3)

12. Whole vehicle bags and blankets are being marketed to fire departments for containment of flames to prevent fire spreading to adjacent vehicles and also to move a burning vehicle. These are not mentioned in the emergency response guidance from any vehicle manufacturers.

13. Secondary fires have occurred on tow vehicles and operators have been injured. The potential for this is not included in emergency guidance information, nor the need for operator PPE and precautions.

SUGGESTED RECOMMENDATIONS:

1. Manufacturers should be asked for commitments to use ISO 17840 as the recognized format for emergency response information. This may be most effective through UNECE Global Technical Regulation (GTR) Number 20.
2. The ISO 17840 guidance committee should be encouraged to use the results of this review to better standardize the format of emergency response information.
3. A Government web page should be established to host emergency response information, similar to finding recall information through NHTSA SAFERCAR.GOV. Unless or until the Government provides such a collective web page, an industry webpage should be established and funded.
4. Emergency response information for each make and model should be self-contained in a single short document rather than in a collection of data containing multiple vehicles.
5. Emergency response guidance should include suggested basic tools and equipment to have available. This includes blocks to prevent movement of a vehicle, chain to move a vehicle if needed for separation from others, and the potential need to lift a vehicle if a battery on the bottom needs to be cooled.
6. All emergency information should warn of the reasons to not damage the HV battery, including the threats of electrocution and arc flash.
7. All vehicle manufacturer websites should make emergency response information accessible from the search function.
8. A QR Code or other link to emergency response information should be on each vehicle in a standardized location, such as corner of a window or in fuel/charge port door.
9. Vehicle fuel type should be in a standardized location on each vehicle, possibly co-located with the emergency QR code, such as corner of a window or in the fuel/charge port door.
10. Tow instructions should warn of the possibility of secondary fires on tow vehicles, call for operator protective equipment, and provide guidance should an event occur.

1. First release and revision of November 16, 2022 by R. Swaim, HowItBroke.com. Permission is given for public use or distribution. This is a continuously changing document. [↑](#footnote-ref-1)
2. NTSB Record of correspondence may be found at https://data.ntsb.gov/carol-main-public/sr-details/H-20-030 [↑](#footnote-ref-2)
3. Example: Fort Lauderdale, FL, May 8, 2018, NTSB HWY18FH013 [↑](#footnote-ref-3)