

Amped Up!

What You Need to Know About EV Repair Safety



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1

Identify and Mitigate EV Hazards

2

Implement EV Repair Safety Specific Policies

3

Establish EV Emergency Response Protocols

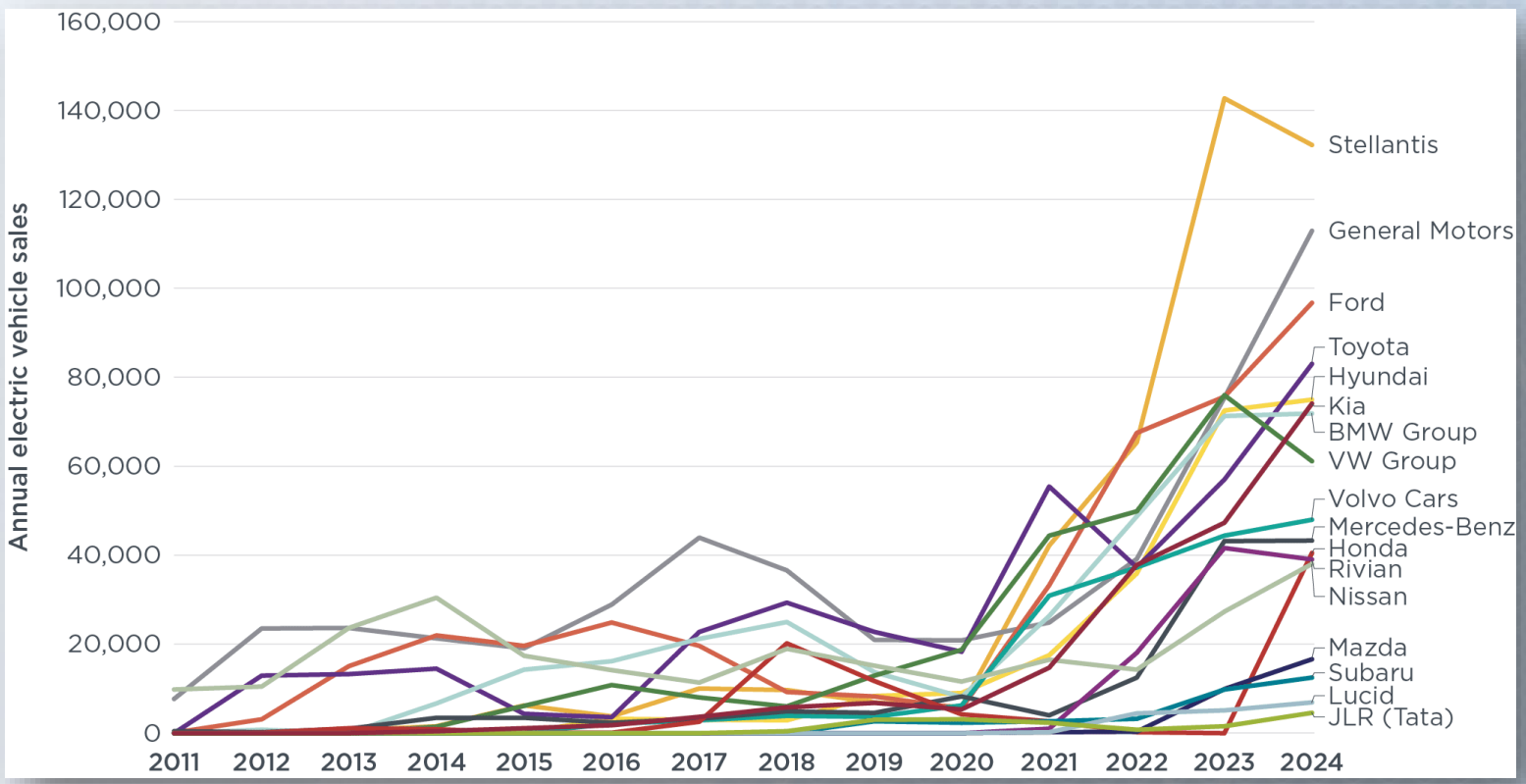
Agenda

- EV Market Trends and Stats
- Regulations Impacting Dealership Repair
- EV Hazards: Thermal Runaway & Shock Risks
- EV Repair & Storage Safety Tips
- Q&A



Current EV Statistics & Market Trends

- **EV Sales & Growth**
  - In 2024, EVs made up ~8–9% of U.S. new vehicle sales.
  - Over 3 million EVs now registered in the U.S.
  - Growth is steady but uneven across states (California, New York, Florida lead).



*U.S. sales of electric vehicles by automaker, excluding Tesla, 2011–2024. *ICCT*

Current EV Statistics & Market Trends

Public Adoption Trends

- Consumer interest driven by fuel savings, incentives, and environmental benefits.
- Hesitation remains around charging infrastructure, repair costs, and battery life.

Dealership Impact

- EV sales drive changes in service operations, technician training, and facility readiness.

Regulations – EV Production

- 2024 Multi-Pollutant Emissions Standards for Model Years 2027 and Later for Light Duty and Medium Duty Vehicles
  - Stricter emissions limits each year
- Reversing of the Scientific Endangerment Finding
- Is the rule still in play?
  - Yes – It has not been officially nullified
  - No – Major parts are being challenged
- CA: Congressional Review Act blocked CA's ability to enforce stricter emissions standards repealing a waiver
  - 2035 Ban on ICE vehicles

Regulations – EV Production

Federal Comparison: Model Year (MY) 2026 vs MY 2032 [4]			
Vehicle Category	MY 2026 Target (or Existing Standard)	MY 2032 Target (Under New Rule)	% Reduction (MY 2026 → MY 2032)
Light-Duty Fleet (combined cars & trucks)	**~ 168 g CO_2/mile**	**~ 85 g CO_2/mile**	**~ 49-50%**
Passenger Cars	**~ 131 g CO_2/mile**	**73 g CO_2/mile**	**~ 44%**
Light Trucks	**~ 184 g CO_2/mile**	**90 g CO_2/mile**	**~ 51%**

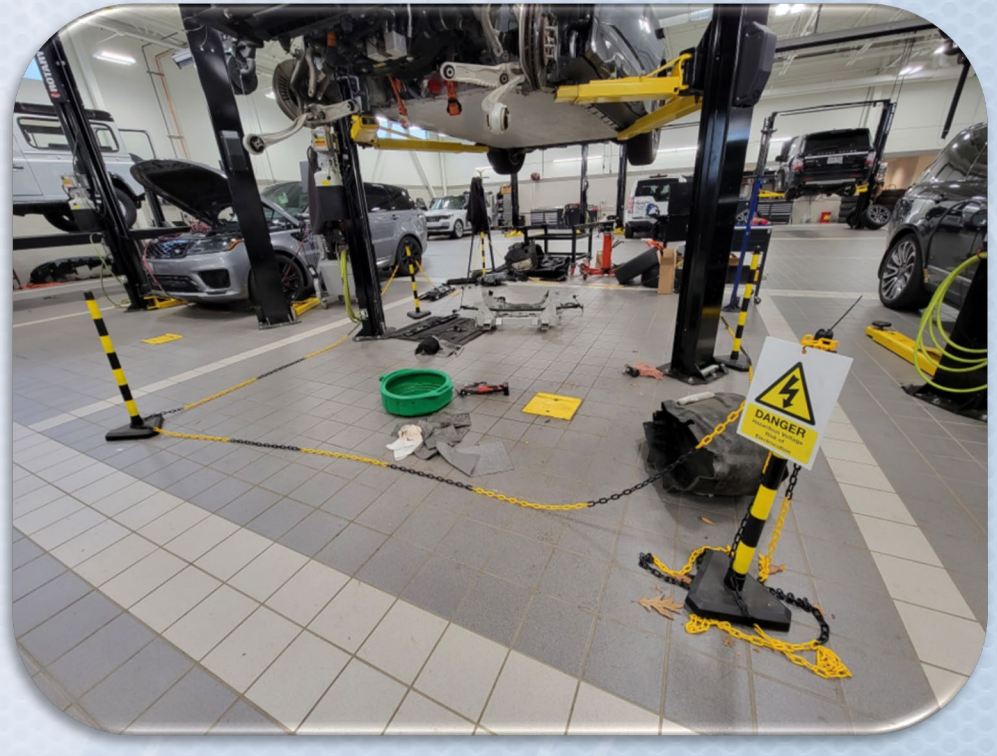
California

- Adopted the **Advanced Clean Cars II program (ACC II)** requiring increasing percentages of zero-emission vehicle (ZEV) sales — goal of **100 % by 2035**.
- U.S. Senate voted to block California's EV mandate and revoke three EPA waivers (including ACC II).

Regulations - Electrical

- Work Area
  - 29 CFR 1910.303
    - Live parts (50+ volts) must be guarded against accidental contact
    - Barriers, partitions, or screens required
    - Only qualified persons may access live parts
  - 29 CFR 1910.335
    - Use safety signs, symbols, or tags to warn employees of electrical hazards
    - Barricades must prevent access to energized parts
    - Conductive barricades may not be used near energized conductors

Minimum Clear Distance – Condition A	
Nominal Voltage to Ground	**Feet (ft)**
601 – 2500 V	3.0
2501 – 9000 V	4.0



Regulations– Electrical LO/TO

- 1910.333(b)/(c) Compliance
  - Develop and maintain written procedures
    - De-energizing
    - Verification
    - Re-energizing
  - Stored energy must be released (if possible)
  - A lock and tag must be used
  - Guarding the “Start” button may not be solely used



- 1910.147 Compliance
  - Training
    - Authorized/Qualified Employees (OEM training)
    - Affected/Unqualified Employees
  - Conduct annual verification

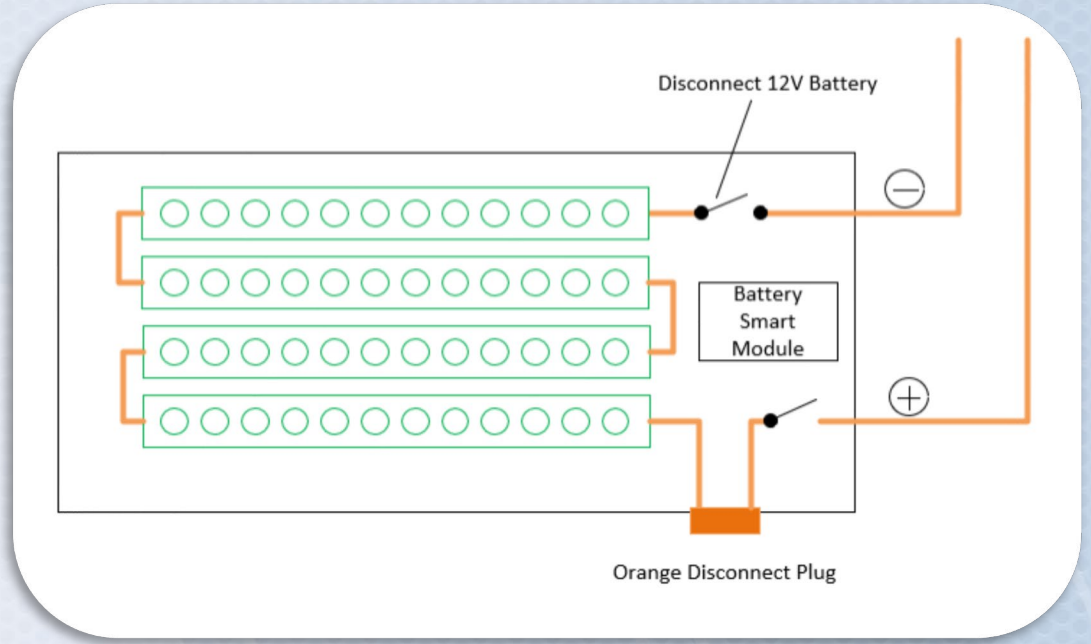




Regulations – Electrical LO/TO

- Procedures following 1910.333(b)/(c)
  - Review OEM procedures
  - Prepare work area
  - Disconnect from all energy sources
    - Ignition key
    - Chargers
    - 12V Battery
  - Don PPE
  - Disconnect orange safety plug
  - Lockout disconnects & key fob
  - Release all stored energy (OEM Procedures)
  - Wait 10-15 min
  - Test inverter with voltage meter
    - Live – Dead – Live

- 1910.333(a)(2)
  - Infeasible to de-energize?
  - Employ other safety work practices



Regulations – Electrical PPE

- NFPA 70E Table 130.7(C)(15)(b) Arc Flash PPE Categories for DC Systems
  - Batteries >150 V and <600 V
  - Fault Current <3kA = Arc Flash PPE Category 2
  - Fault Current = Max current that flows in a short circuit

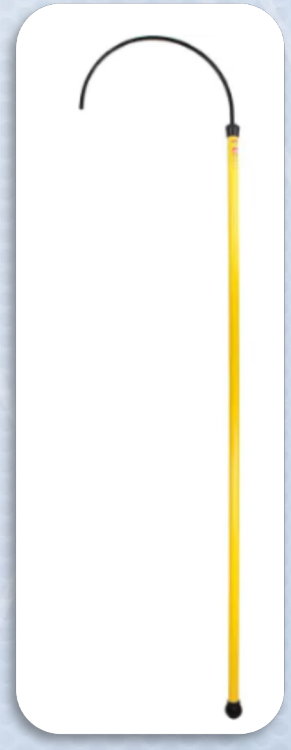
- Arc Flash Category 2
  - Arc-Rated Clothing, Minimum Arc Rating of 8 cal/cm2 Arc-rated long-sleeve shirt and pants or arc-rated coverall
    - Arc-rated flash suit hood or arc-rated face shield and arc-rated balaclava
    - Arc-rated jacket, parka, high-visibility apparel, rainwear, or hard hat liner
  - Protective Equipment
    - Hard hat
    - Safety glasses or safety goggles
    - Hearing protection (ear canal inserts)
    - Heavy-duty leather gloves, arc-rated gloves, or rubber insulating gloves with protectors
    - Leather footwear



Regulations – Electrical PPE

NFPA Table 130.7 (C)(7)(b) Rubber Insulating Equipment Test Intervals [5]	
Rubber Insulating Equipment	**When to Test**
Blankets	Before first issue, every 12 months after*
Covers	If insulating value is suspect
Gloves	Before first issue, every 6 months after* (Class 1 or above for EV work)
Line Hose	If insulating value is suspect
Sleeves	Before first issue, every 12 months after*
*New insulating equipment is not permitted to be placed into service unless it has been electrically tested within the previous 12 months.	

Equipment must be tested by a North American Independent Laboratory for Protective Equipment Testing: https://nail4pet.org/





1910.269(j)(2)(iii)
Live-line tools used for primary employee protection shall be removed from service every 2 years for examination, cleaning, repair, and testing

Regulations – Electrical PPE

- Electrical Gloves
  - Electrician gloves require regular electrostatic testing to ensure they are insulating
  - Gloves do not need testing if they are used for the first time within 12 months of initial testing
  - Gloves must be tested every 6-months after initial use, generally $15 - $50
  - Multiple pairs can reduce downtime
  - Electrician gloves should be visually inspected for damage; cuts, scrapes, punctures, warping, discoloration, or creasing
  - Technicians can use an inflatable base (pictured & recommended) or manually inflate to test for air leaks





Regulations Affecting EV Repair – Emergency Preparedness

- 29 CFR 1910.269(b)
  - ***First Aid Training***
    - 50 volts or more
    - Each employee exposed to electric shock can be reached within 4 minutes by a trained person
- 29 CFR 1910.151(b)
  - In the absence of an infirmary, clinic, or hospital in near proximity to the workplace which is used for the treatment of all injured employees, a person or persons shall be adequately trained to render first aid.
  - Adequate first aid supplies shall be readily available.
  - **Near Proximity ≈ 3-4 minutes**





Regulations Affecting EV Repair – Positioning/Storage

- Using a Forklift? 29 CFR 1910.178
  - Certified drivers

- NFPA 855 – Standard for the Installation of Stationary Energy Storage Systems
  - Dedicated, fire-rated storage space (indoor or outdoor)
  - Automatic fire suppression and detection
  - Proper ventilation and explosion control
  - Separation distances from occupied areas (3ft)
  - Hazard signage and emergency response planning

- NFPA 800 – Battery Safety Code
  - Coming in the near future

- State Rules Emerging
  - California
    - Stricter battery recycling mandates
    - Storage fire codes
    - Technician certification requirements are under discussion.



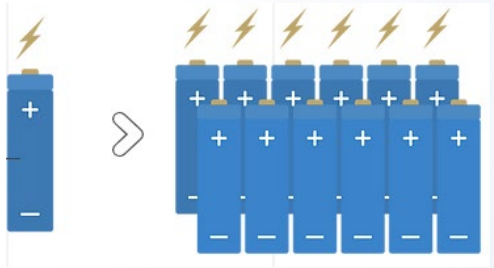
https://www.milesgroup.co.nz/news/electric-vehicle-news/behind-the-scenes-of-a-ev-vehicle-battery-repair/

Regulations Affecting EV Repair – Battery Shipping/Disposal

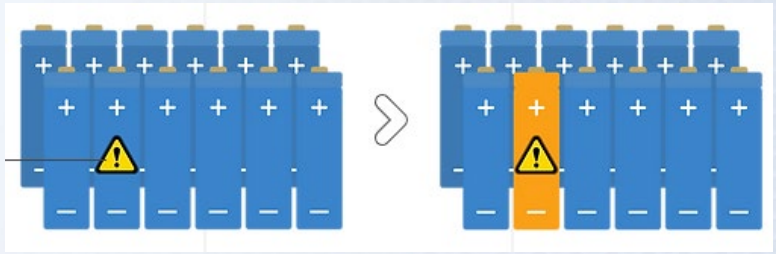
- Lithium Ion Batteries are regulated as Hazmat
  - UN ID #: UN3171
  - Proper Shipping Name: Battery-powered vehicle
  - Hazard Class Label: Class 9 Miscellaneous
- Follow the US DOT Lithium Ion Battery Guide for Shippers and OEM instruction[9]
- Disposal: Must be recycled via a lithium ion battery recycler or as hazardous waste



EV Fires and Thermal Runaway

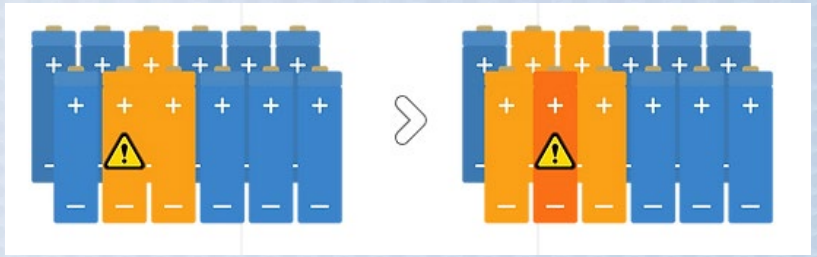


Multiple Battery Cells Make a Module



When a cell short circuits the cells heat up

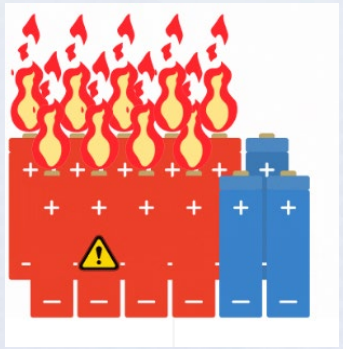
- Temperature
- Crushing
- Short circuit



Heating starts to affect other cells



The cell goes into thermal runaway



Ignition may occur

- Suppression needs to get through the protected battery compartment



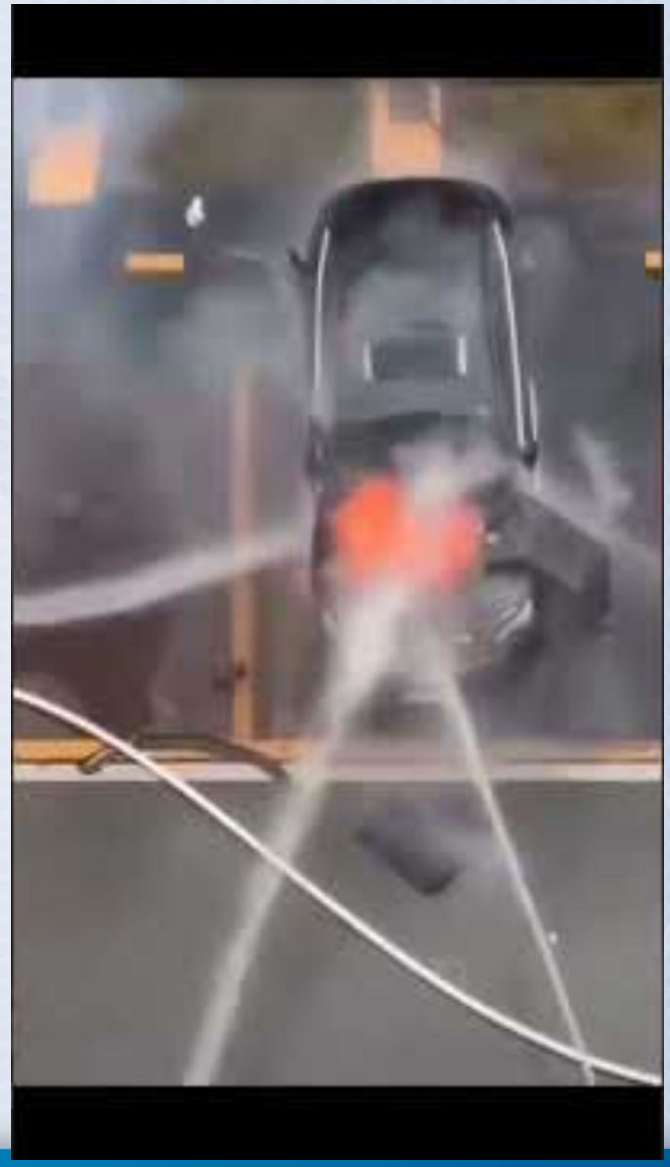
Toxic vapor cloud explosion is a risk

- Dark cloud = Heavy metal particles
- White cloud = Vapor of toxic flammable gas


FIRE TEST TIME
00:02:30

EV Fires & Thermal Runaway

- Fire Statistics
  - EV fires are less frequent per vehicle than ICE vehicles, but when they occur, they are more severe and harder to extinguish
  - Current data is not available or is misleading
    - Studies are inconclusive
  - High-profile incidents often dominate headlines (Tesla, Chevy Bolt recalls, NYC e-bike fires).



EV Fires and Thermal Runaway

- Where are we on fire suppression?









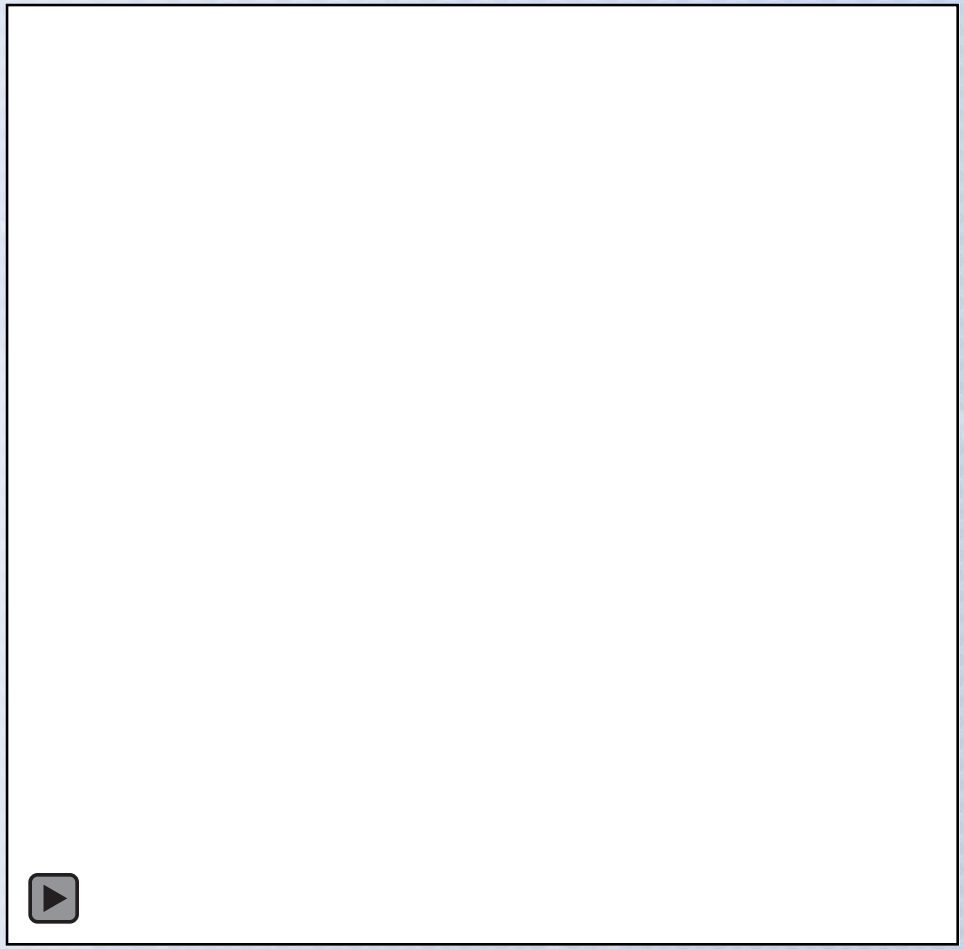






EV Fires and Thermal Runaway

- NFPA and partners warn of risks with fire blankets on EV battery fires[8]
  - Blankets can trap heat and gases, worsening thermal runaway or explosions
  - Use only with extreme caution, limited time, and continuous monitoring
  - Fire agencies should reevaluate SOPs for EV fire suppression
  - EV battery fires present unique hazards: re-ignition, rapid heat buildup, toxic gas release



EV Repair Safety & Dealership Storage Tips

- Vehicle Storage
  - Designate a clearly marked, isolated area for EV parking
  - Keep EVs at least 50 feet from buildings, other vehicles, and combustibles when practical
  - Maintain fire department access lanes and clear signage for first responders
  - Avoid storage in underground or poorly ventilated garages when possible
  - Monitor state of charge (SOC); many OEMs recommend 30–50% SOC for storage



EV Repair Safety & Dealership Storage Tips

- EV Battery Storage (Removed Packs)
  - Store in a cool, dry, well-ventilated space, away from flammables
  - Place batteries on non-conductive, fire-resistant surfaces (e.g., concrete)
  - Maintain separation: ideally 3–5 feet clearance between packs
  - Follow OEM and DOT requirements for SOC during storage (commonly 30%)
  - Use specialized containers or racks designed for lithium battery storage
  - Have an emergency plan: spill kits, extinguishers, and clear reporting procedures



EV Repair Safety & Dealership Storage Tips

- Responding to a Fire
  - Call 911 immediately – do not attempt full suppression without fire department
  - Prioritize life safety and evacuation over saving property
  - If safe, use large amounts of water for cooling (per NFPA and OEM guidance)
  - Expect possible re-ignition hours or days later — coordinate with fire department for post-fire monitoring
  - Provide first responders with vehicle information (battery type, location, disconnect points)



EV Repair Safety & Dealership Storage Tips

- Repair
  - De-energize high-voltage system before service (use OEM service disconnects)
  - Post “High Voltage Work in Progress” signage in the bay
  - Use only insulated tools and properly rated test equipment. Wear required arc-rated PPE, gloves, and face protection (per NFPA 70E / OEM guidance)
  - Train techs in hazard recognition (thermal runaway signs, orange cable ID, lockout/tagout)
  - Train other personnel as “affected users” on LOTO EV repair awareness
  - Follow standard LOTO procedures
  - Designate a bay as an EV repair bay and ensure a form of fire suppression
  - Develop and implement an EV repair, response, and storage plan

Summary

- EVs are growing in market share and dealerships need to prepare.
- Fires are rare but dangerous—thermal runaway is the main hazard.
- Regulations are developing; dealerships must stay proactive.
- Safety starts with training, equipment, and clear storage protocols.

Sources

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QUESTIONS?

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