



**MONTGOMERY COUNTY
FIRE AND RESCUE SERVICE**

(2022) – (SOG#)

**Hazardous Materials Team
Standard Operating Guidelines**

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**Battery, Electric Vehicle and Electrical
Storage System Response - **INTERIM****

(09/20/2022)

Purpose:

The purpose of this SOG is to provide a framework for Hazmat personnel responding to incidents involving batteries, electric vehicles and/or electrical storage systems.

Guideline:

Initial Operations

- Confer with Incident Commander**
- Immediate Rescue**
 - Determine if any individuals/occupants must be rescued or evacuated
 - Minimum PPE for rescue is structure fire PPE and SCBA
 - Any immediate rescue will require water decontamination
- ACRE: Assess, Control Hazards, Rescue, Evacuate**
- Assess**
 - **Coin Cell Ingestion**
 - Contact National Battery Ingestion Hotline (1-800-498-8666)
 - Try to obtain battery type and size
 - Transport to ED is always indicated
 - **Note hazards identified by first responders**
 - Components that have elevated temperatures
 - LEL readings
 - Carbon Monoxide (CO) readings
 - Oxygen (O₂) readings below 20.8%
 - Fumes
 - Odors
 - Leaking fluids
 - Types of batteries involved:
 - Primary (alkaline – not rechargeable)
 - Secondary (rechargeable)
 - Any technical specialists that are responding or have been requested
 - **Indications of high hazard operations**
 - Obvious fire involvement of any battery, battery pack or ESS
 - Visible or audible off-gassing by a battery, battery pack or ESS
 - Any LEL readings (that cannot be otherwise explained)
 - Any CO readings (that cannot be otherwise explained)
 - Any color change in wet Ph paper when exposed to air (that cannot be otherwise explained)
 - Elevated temperatures of battery, battery pack or ESS (that cannot be otherwise explained)
 - Fire impingement to exposure battery or in same compartment as fire
 - Physical damage to a battery, battery pack or ESS
 - Liquid leaks, pooling, etc.



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Control Hazards

- Isolate and deny entry
- Establish isolation and control zones based on hazards
- Ensure use of PPE and Respiratory Protection
- Ventilate to reduce build-up of explosive and toxic gases
- Reduce heat stress to additional batteries/cells
 - Water is most effective to reduce heat

Rescue

- Use appropriate methods and equipment to separate unprotected personnel and civilians from the current and potential hazards

Evacuate

- Remove any victim(s) to an area of safe refuge
- Provide appropriate decontamination to victims

Risk Assessment

- An effective risk assessment for battery emergencies must consider the following:
- Hazard(s) victims and personnel are exposed to
- Ability of the Hazardous Materials Team and Fire/Rescue personnel to control the hazard(s)
- Likelihood that hazard(s) will cause harm or death
- Expected benefit of intervention

Risk Mitigation

- Refer to Specific Battery Considerations and consult current technical guides and other appropriate reference material
- Consult technical specialist where available
- Develop and communicate Incident Objectives
- Receive approval from Incident Commander to implement incident objectives
- Consult and request outside agencies to assist (i.e. – MDE, County Agencies, etc.)
- Work with RP and MDE to establish and ensure a plan for disposing of damaged batteries



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Primary Battery Considerations

Disposable Alkaline

- Consider standard extinguishment techniques (water, dry chem, CO₂)
- Consider Alkaline (base) hazard from large quantities of these batteries
- Consider small Mercury (Hg) hazard in pre-1990 batteries

Disposable Lithium Metal

- Water may suppress small Lithium fires and lithium metal consumed in first few minutes
- Consider Class D Agent *if available* – Copper Preferred, Graphite is effective
 - **SODIUM CHLORIDE IS NOT EFFECTIVE**
- Identify battery electrolyte used for toxicity and environmental hazards that may need mitigated

Secondary Battery Considerations

Lead Acid Battery

- Meter for LEL and CO
- Consider dry chemical for fire suppression
- Consult SDS when possible
- Consider neutralization for spills

Lithium-Ion Batteries

- Consider allowing batteries involved in fire to burn out in a safe area
- Extinguish visible fire with water or other appropriate extinguishing agent
- Always ensure a charged handline or appropriate extinguishing mechanism in place when near a battery that was exposed to thermal, physical, or electrical abuse
- Ventilate area
- Cool adjacent battery cells with water
- Use a thermal imager to observe battery cells
- Consider unplugging batteries that are connected to a charger
- Removal from inside an area to an outside space should be done with a full risk assessment.
- Consider overpack of batteries involved prior to moving outside to a safe area
- Consider removing battery pack with proper cutting tools/equipment
- Consider using appropriate fire blanket/cover over batteries during removal
- If unable to overpack safely inside a structure or confined area:
 - Establish path of travel to remove batteries
 - Suppression capability in place through entire path of travel



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- **NEVER ALLOW PERSONS IN AN ELEVATOR WITH A BATTERY OF CONCERN**
- Cover battery or batteries with fire blanket or use a specialty fire bag if possible, during movement to outside
- Damaged battery cells should be placed into a battery containment device/overpack when possible
- Check the area of involvement for battery cells that may have been ejected from a battery pack. These should be considered DDR.

Electric Vehicles (EV)

- Any incident involving an EV needs to evaluate the involvement of the battery pack that powers the vehicle
- Consult the manufacturer guide for the type of vehicle involved when available
- Consider non-intervention for fire involvement after appropriate risk assessment
- In the event of fire, thermal runaway, or battery pack involvement where non-intervention is not feasible:
 - Protect exposures and control any visible EV fire with water
 - Consider deploying EV fire blanket to suppress flames and reduce smoke production
 - Continuously to cool battery cells involved in fire and prepare for extended water supply operation
 - Use Thermal Imager to check additional battery cells for propagation
 - Consider lifting/titling vehicle if safe to do so for direct access to battery modules for cooling
 - Consider water supply requirements
- Perform air monitoring for flammable vapors in enclosed or partially enclosed areas
- For vehicles in a garage or other enclosed area, work with rescue squad, towing or in some cases TRT personnel to establish a plan for removing the EV to a safe area outside
- Consider a plan to move vehicle to a safe area with no exposures when possible.
 - This may require mobile suppression capability.
- Work with police and towing personnel to establish a plan to safely remove vehicle from incident scene
- Ensure no fire or signs of thermal runaway/heating are present for at least 45 minutes before releasing vehicle for towing, investigation, etc.
- Advise that vehicle should be placed in an area at least 50' from exposures on all sides in the event of re-ignition



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Interior Energy Storage Systems (ESS)

- Work with Incident Commander to ensure:
 - Appropriate fire suppression tactics for building involved
 - Size, number, and locations of interior ESS's involved
 - Deny Entry and Establish Control Zones that account for the ESS
 - Accounting for explosion or additional fire hazards
- Establish air monitoring for flammable and toxic gas build-up with-in the area of involvement and structure
 - Pay special attention to LEL and CO
- Ventilate area of involvement
- Restrict operations in an ESS hot zone to immediate life safety needs with full structural PPE and SCBA with handline protection
- Immediately contact the RP or any emergency numbers listed for the ESS facility and ensure ESS technical specialists are enroute to the scene
- Consider setting-up to provide exposure protection
- Work with Incident Commander, RP, and Technical Specialists for a mitigation plan

Exterior Energy Storage Systems (ESS)

- Isolate, Deny Entry and Establish Control Zones that account for the size of the ESS and any explosion or fire hazards
- Restrict operations in an ESS hot zone to immediate life safety needs and completed in full structural PPE and SCBA with handline protection
- Immediately contact the RP or any emergency numbers listed for the ESS facility and ensure ESS technical specialists are enroute to the scene
- Protect exposures and control any visible fire with water if appropriate
- Work with the Incident Commander, RP and Technical Specialists for a mitigation plan
 - Consider contacting DPS/DGS for electrical engineer or other technical specialist assistance



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Exposure Medical Care

- Patient exposed to the inhalation of smoke from a battery fire should be evaluated by the appropriate emergency medical personnel and transported to the appropriate facility
- Consult SDS when available for health information and provided to medical and hospital personnel
- In the absence of specific information for the battery involved, consult current reference material and air monitoring tables to help identify specific inhalation hazards

Decontamination

- When available, consult the SDS or a technical expert provided for each battery hazard
- Follow MCFRS Hazmat SOG – Decontamination as necessary
- At a minimum for a battery fire event, standard structural fire decontamination procedures should occur for any personnel that engage in firefighting or entry operations into a designated hot zone
- Consider technical decontamination for incidents involving corrosive contamination

Appendices:

*****See most current technical guides*****