



**MONTGOMERY COUNTY  
FIRE AND RESCUE SERVICE**

2024–14

**Hazardous Materials Team  
Standard Operating Guidelines**

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

09/01/2024

**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.

**Applicability:**

All MCFRS Hazardous Materials Officers and Technicians

**Definitions:**

See Hazmat SOG - Definitions

**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 (O<sub>2</sub>) 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



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- **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 battery equipment
  - Physical damage to a battery, battery pack or ESS
  - Liquid leaks, pooling, etc.
- **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 application 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



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**Risk Mitigation**

- Refer to emergency response guides/plans for equipment or facility involved
- Refer to specific battery information considerations and consult Technical Guides or other appropriate reference material
- Consult technical specialist where available
- Develop and communicate Incident Objectives with Incident Commander
- 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

**Primary Battery Considerations**

***Disposable Alkaline***

- Consider standard extinguishment techniques (water, dry chem, CO<sub>2</sub>)
- Consider Alkaline (base) hazard from large quantities of these batteries
- Consider small Mercury (Hg) hazard in pre-1990 batteries

***Disposable Lithium Metal (not the same as Lithium-Ion)***

- 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



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***Lithium-Ion Batteries***

- Consider allowing batteries involved in fire to burn out in a safe area
- Structural PPE and SCBA **MUST** be worn when operating around Li-Ion batteries exposed to thermal, physical or electrical abuse
- Always ensure a charged handline or appropriate extinguishing mechanism in place when near a battery that was exposed to thermal, physical, or electrical abuse
- Extinguish visible fire with water or other appropriate extinguishing agent
- Ventilate area
- Cool adjacent battery cells with water
  - Consider placing battery cells/packs in a bathtub or sink filled with cool water as a temporary measure
  - Thermal runaway can still occur under water and proper precautions should still be in place
- Removal from inside an area to an outside space should be done with a full risk assessment.
  - Structural firefighting gloves are minimum hand PPE for moving battery cells/packs
  - Consider non-conductive buckets and tools (Plastic shovel, 5-gallon bucket, etc)
- Use a thermal imager to observe battery cells for heat
- Consider unplugging batteries that are connected to a charger
- 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
  - **DO NOT USE ELEVATORS**
  - 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.

***Other Batteries***

- Consult SDS or manufacturer



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***Electric Vehicles (EV)***

- Any incident involving an EV needs to evaluate the involvement of the battery pack that powers the vehicle
- Consult the emergency response 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 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
- 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 company 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 and MCFRS Post Incident Decontamination procedures 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 current technical guides where applicable
  - Hazard 3: [Battery Technical Guides 101-111.pdf](#)





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**BATTERY FIRE INITIAL RESPONSE**



**ASSESS**

- ☐ Identify Battery Involvement
  - o Primary (Non-rechargeable)
  - o Secondary (Re-chargeable)
  - o Coin Cell (1-800-498-8666)
- ☐ Request Hazmat Response
- ☐ High Hazard Operations
  - o Obvious fire involvement of any battery, battery pack or ESS
  - o Visible or audible off-gassing by a battery, battery pack or ESS
  - o Any LEL readings (that cannot be otherwise explained)
  - o Any CO readings (that cannot be otherwise explained)
  - o Any color change in wet Ph paper when exposed to air (that cannot be otherwise explained)
  - o Elevated temperatures of battery, battery pack or ESS (that cannot be otherwise explained)
  - o Fire impingement to exposure battery or battery equipment
  - o Physical damage to a battery, battery pack or ESS
  - o Liquid leaks, pooling, etc.

**CONTROL**

- ☐ Isolate and Deny Entry
- ☐ Establish Control Zones (Hot, Warm, Cold)
- ☐ PPE – Full Structural and SCBA
- ☐ Ventilate
- ☐ Extinguish visible fire with water and keep batteries/battery packs cool
- ☐ Identify ejected battery cells

**RESCUE**

- ☐ **Immediate Rescue**
  - o Full Structural PPE and SCBA
  - o Water Decontamination
- ☐ Separate civilians from hazards

**EVACUATION**

- ☐ Remove victims to safe area
- ☐ Decontaminate victims

**REQUEST HAZMAT RESPONSE**





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**BATTERY FIRE INITIAL RESPONSE**



**Electric Vehicle Tactical Considerations**

- ☐ Consider non-intervention after risk assessment
- ☐ Consult manufacturer emergency response information where available
- ☐ Utilize full firefighting PPE and especially SCBA
  - o Structural firefighting gloves should be used to provide some additional insulation over extrication or utility gloves
- ☐ Establish water supply for extended operation
  - o 500gpm flow capability on battery pack
  - o 3000 to 8000 gallons of water for light duty EV
  - o Over 100,000 gallons for commercial EV
- ☐ Remove key fob at least 25 feet away from vehicle
- ☐ Do not force access into the battery compartment
- ☐ Utilize a fog nozzle for applying water
- ☐ Do not use foam
- ☐ Fire involving Commercial EV (Ride On, Metro Transit, etc)
  - o Contact dispatch or emergency contact number
  - o Obtain vehicle manufacturer & battery location information
- ☐ Work with Hazmat for mitigation

**Electrical Storage System (ESS) Tactical Considerations**

- ☐ Isolate, deny entry, set-up control zones
- ☐ Non-intervention unless life safety issue
- ☐ Contact ESS responsible party for additional information
- ☐ Work with Hazmat for mitigation

**REQUEST HAZMAT RESPONSE**