



SAN DIEGO HAZARDOUS INCIDENT RESPONSE TEAM



STANDARD OPERATING GUIDELINES

Lithium Ion Battery Fire: Electric Vehicle Fire

	ITEM	DESCRIPTION
<input type="checkbox"/>	FIRST RESPONDER GUIDANCE	<p>All personnel working in proximity to the Electric Vehicle fire shall don turnouts and SCBAs. If vehicle is indoors, structures shall only be entered for life rescue. Reacting batteries produce hydrogen which may accumulate within the structure causing an explosive atmosphere. Secure all possible ignition sources and power. Ventilate structure if possible. Fire response should focus on protection of nearby exposures. A vehicle burning indoors may impact the integrity of the structure if allowed to burn to completion. Removing the vehicle from inside to outdoors may be considered.</p> <p>An Electric Vehicle fire may not involve the batteries. Fire should be treated as a standard vehicle fire until it is determined that the batteries are involved.</p>
<input type="checkbox"/>	INITIAL SIZE UP	<ul style="list-style-type: none">Identify if batteries are reacting or involved in a fireIf batteries are reacting but no fire is observed, explosive atmosphere is likely presentOnly approach building if explosive gases have been vented or mitigatedUse 4-gas or combustible gas indicators to percentage in air. CO sensor is cross sensitive to H₂Don proper PPE- Fire Turnouts with SCBA for suppression, overhaul, mitigationAvoid contact with gasses generated from reacting batteryAssess location to determine if vehicle needs to be relocated due to extended incident time that can affect densely populated areas.
<input type="checkbox"/>	CHEMICAL INFORMATION (if available)	<ul style="list-style-type: none">UN 3480 or 3481 DOT 9 Dangerous GoodsLithium Ferrous PhosphateLithium Nickel Manganese Cobalt Oxide or similarNon LIB- Lead Acid, Zinc Bromide, Other if present in addition to LIBs
<input type="checkbox"/>	PROTECTIVE MEASURES	<p>ERG Guide 147</p> <ul style="list-style-type: none">Initial 75' for fire at LIB with no LIB impact.Increase the immediate precautionary measure distance as necessary.LIB impact- ISOLATE for 500 meters (1/3 mile) in all directions; also, consider initial evacuations for 500 meters (1/3 mile).Consider wind direction changes
<input type="checkbox"/>	TACTICAL ACTIONS	<ul style="list-style-type: none">Don proper PPE- Fire Turnouts with SCBA for suppression, overhaul, mitigation. Other PPE to be considered as needed, such as high temperature gloves or gloves to shield from battery charges.Prepare monitoring equipment- TIC for reaction temps, 4-gas with CO and CGI for H₂/flamm, ExplorIR, pH paper, FI paper for HF. For smoke consider also RAE for Cl₂ vapors, RAE or Draeger for HCl vaporsIf vehicle is located in a densely populated area, Area Raes shall be set up to cover all sides of the incident. If all sides cannot be accessed, air monitors shall be staged to cover populated

		<p>areas, the Incident Command Post and any other vulnerable areas. Note: Monitors do not have sensors for all possible gases emitted during a battery fire. If monitors alarm or detect any gases, it should be assumed that other gases are present.</p> <ul style="list-style-type: none"> ▪ USE ERG or EV app to determine high voltage and low voltage shut offs. Ensure all required systems are maintained operational. ▪ Use ERG, ALOHA or PEAK to model smoke plume. Provide model to IC and LE for possible evacuations or shelter in place guidance. Larger or more detailed Plume Modeling can be requested from IMAAC. Note: Sheltering in place with closed windows should be the recommendation for all impacted individuals not at risk of fire. ▪ If water is being used on burning batteries, attempts should be made to maintain water on site and not allow it to enter storm drains or waterways. Collect a sample for testing. Conduct field test for VOCs and pH. Heavy metal testing will be conducted by a laboratory if needed. Complete chain of custody. ▪ Fire fighting water shall be directed to provide maximum contact with underside of vehicle to assist with cooling. If access to battery compartment can be made, water shall be directed into battery compartment to flood and cool batteries. Avoid cutting into compartment to damage batteries. ▪ If suitable area is located, allow vehicle to burn to completion. If vehicle is fully involved, incident can last several hours. Thermal runaway involving only the batteries without additional combustible materials may last up to 12 hours. ▪ If batteries can be stabilized for 45 minutes, without showing signs of reaction, consider a flat bed tow to an open space for vehicle to sit. Follow tow with Fire Engine in case the reaction resumes. 50 feet of clearance from all combustible materials is required for vehicle storage.
<input type="checkbox"/>	MITIGATION AND CONTAINMENT	<ul style="list-style-type: none"> ▪ Protect exposures ▪ Slow or prevent propagation ▪ Control runoff from entering storm drains if possible ▪ Relocate vehicle to open area to allow to burn
<input type="checkbox"/>	TECHNICAL REFERENCES	<ul style="list-style-type: none"> ▪ ERG Book or App ▪ CAMEO/ALOHA/Marplot & EPA AEGLs ▪ PEAC ▪ NIOSH/CalOSHA – for IDLH and/or PELs ▪ Safer Mobile ▪ CERES ▪ WISER
<input type="checkbox"/>	ADDITIONAL RESOURCES	<ul style="list-style-type: none"> ▪ Fire ▪ EMS ▪ SDGE ▪ EPA
<input type="checkbox"/>	NOTIFICATIONS	<ul style="list-style-type: none"> ▪ CAL OES, County OES, City OES as needed ▪ CUPA ▪ Fire Prevention ▪ Code Enforcement- Building ▪ Stormwater Agency ▪ Fish and Wildlife ▪ National Response Center if EPA resources are going to be requested. ▪ APCD ▪ Health Officer- if impacts to populations
<input type="checkbox"/>	USEFUL CONTACTS	<p>EPA- additional monitoring equipment, oversight, communication equipment, aerial resources</p> <p>Private Resources- Firewatch and Energy Support Specialists</p> <p>See EPA list of companies that provide remote air monitoring below</p>
<input type="checkbox"/>	PERSONAL PROTECTIVE EQUIPMENT	<ul style="list-style-type: none"> ▪ Turnouts with SCBA

<input type="checkbox"/>	MONITORING & DETECTION	<ul style="list-style-type: none"> CGI – LEL can be compared to CO sensor. CO not maxing with LEL indicates non H2 flams Thermal Imaging Camera – above 250F may indicate thermal runaway/propagation potential Explor IR – carbonates/carbonic esters indicate battery electrolyte vapors. PID – An air sample can be captured for later use on GasMet to assist decon/exposures Area Raes – Remove H2S sensor if HCN used. VOC an indicator of failing batteries. pH paper – Acid or Base can indicate failed batteries HF paper – Instructions say to use HCl, however these can be wetted with water if worn on PPE
<input type="checkbox"/>	Plume Modeling	<ul style="list-style-type: none"> For a large scale or ongoing incident, plume model will be required to determined impacted populated areas. Evacuation or shelter in place orders may need to be issued by IC. Refer to Plume Modeling SOG for options on resources. https://sdcountycagov.sharepoint.com/:w:/r/sites/DEH_MARS/HMD/HIRT/ERDocs/0.%20Guidance.After%20Hours/Tab%2014%20SOG%27s,%20PPE/Plume%20Modeling%20SOG.docx?d=wbc2380120e6a45d4a557bade711df65&csf=1&web=1
<input type="checkbox"/>	DECONTAMINATION	<ul style="list-style-type: none"> Launder turnouts following NFPA 1851 Standards Liquid CO2 for heavily soiled turnouts (inside structure or in smoke plume) Disposal at expense of Responsible Party should be considered.
<input type="checkbox"/>	CLEAN UP & DISPOSAL	<ul style="list-style-type: none"> Responsible Party expense Work with DTSC ER and/or EPA as needed Trained and Licensed/Registered clean up contractors https://hwts.dtsc.ca.gov/transporters/ Properly Managed Waste- manifests/ Receipts Photographs / Sampling Monitoring Develop Unified Command structure for cleanup- Fire, Building Dept, EPA/State/Local OSC, HIRT
<input type="checkbox"/>	INCIDENT TERMINATION	<ul style="list-style-type: none"> Batteries are no longer reacting. TIC shows stable or decreasing temperatures. Vehicle relocated to suitable location for storage up to 30 days.



Remote Area Air
Monitoring Capabilitie