Global **EV-Fire HSE Notice**

Key takeaways from report *"A Technical HSE Assessment of Water Risks and Enclosed Containment Solutions for EV Fire Suppression"*

This report provides scientific evidence that an EV fire blanket is one of the most effective tools for reducing environmental impact and improving firefighter safety.

Although water-based suppression is essential in many fire scenarios, applying water to EV fires increases contamination risks through airborne pollutants, runoff, and firefighter exposure to hydrogen fluoride (HF). When properly deployed, a fire blanket contains gases, aerosols, and contaminated water, significantly limiting their spread into the environment. As with any technical tool, correct handling is critical, improper deployment can reduce its effectiveness or introduce operational challenges. Following recommended procedures ensures reliable performance that protects both the environment and emergency responders.

The importance of isolation prior to water application in EV fires

Early isolation is the most effective method to reduce firefighter exposure and environmental impact during EV fires. Uncontained fires release HF, soot, VOCs and metal aerosols into air and water pathways within seconds. Without a physical barrier, these contaminants disperse freely through smoke, steam, wind, and firefighting water. For firefighters, this increases exposure risk, as HF and fine aerosols can enter the breathing zone even when full PPE and SCBA are used. The result is a larger contamination footprint, higher health risk, and a far more complex cleanup effort. A fire blanket helps prevent this by trapping pollutants at the source, reducing steam formation, limiting water use, and creating a safer and more controlled working environment.

Steam-driven spread of HF and toxic aerosols

HF binds readily to moisture, steam, and microdroplets in smoke.
During suppression, any steam generated by water contacting hot surfaces can carry HF much farther than smoke alone. When water contacts burning cells and flashes to steam or when water mist is applied, HF dissolves into these droplets and remains airborne for a longer period.

Studies from RISE in Sweden show that this can temporarily increase measured HF concentrations. The battery is not producing more HF; the existing HF simply becomes more mobile once attached to airborne moisture. Steam and fine mist therefore act as effective transport mechanisms, distributing HF farther through the plume before it eventually deposits onto soil, buildings, vehicles, vegetation, and other surfaces.

Runoff water as a source of environmental pollution

Water also creates a second contamination pathway: runoff. As water flows over a burning EV, it dissolves and carries metals such as nickel, cobalt, manganese, aluminum and lithium, along with electrolyte residues, fluorides, acids, soot and corrosion products. This contaminated water can enter storm drains, soil, drainage systems, and even groundwater. Research shows that water contacting damaged lithium-ion cells accelerates corrosion and chemical breakdown inside the battery, releasing even more metals and electrolyte compounds. Runoff therefore becomes a concentrated chemical mixture that spreads far beyond the fire scene and is significantly harder to clean up than simple surface deposits.

Stopping airborne and waterborne spread

A fire blanket reduces environmental contamination by cutting off both major water-driven pathways. By covering the vehicle, it suppresses airflow and reduces the intensity of the fire, which limits steam formation and prevents HF from attaching to moisture and becoming airborne. The blanket also traps HF, soot and metal particles beneath the cover instead of allowing them to escape into the surroundings. Because encapsulation reduces the amount of water needed during suppression, far less contaminated runoff is produced. With minimal steam in the air and far less polluted water on the ground, the environmental footprint of an EV fire becomes much smaller, and the contamination stays local and manageable.

Warning against intentional misuse of the fire blanket

A recent third-party demonstration resulted in a deflagration after intentional deviations from established operating procedures. During the test, the blanket was repeatedly lifted after deployment, and a substantial amount of water was introduced beneath it. Lifting the blanket allowed oxygen to re-enter the compartment, while the water created direct water-to-cell contact with a heating and damaged battery pack. These conditions are well known to accelerate hydrogen generation through reactions between overheated cell materials and moisture.

Hydrogen produced under these circumstances can accumulate beneath the blanket if the seal is repeatedly broken. When oxygen is reintroduced, for example, by lifting the blanket, ignition source within the battery pack can trigger a deflagration. This sequence is not unique to blanket-covered vehicles; it reflects fundamental lithium-ion battery chemistry and is the same mechanism that can occur in any confined EV fire scenario where water interacts with compromised cells such as garages, ferries, etc.

This incident illustrates the critical importance of maintaining a continuous seal once the blanket is deployed and ensuring that no water is introduced beneath it. A fire blanket performs safely and predictably when used according to procedure. Proper handling prevents gas accumulation, avoids water-driven hydrogen generation, and preserves the intended protective effect for both firefighters and the surrounding environment.

Key Clarifications

Proven operational safety

Fire blankets have been used for more than 11 years, in over 50 countries, across hundreds of EV fire incidents, with no known deflagrations when used according to procedure.

At the same time, there are documented cases globally of firefighters being injured during water-based suppression of EV fires, typically due to exposure to HF, aerosols, steam plumes, and sudden gas releases.
To date, there are no known cases of comparable firefighter injuries associated with the use of fire blankets on EV fires. This record highlights that fire blankets consistently reduce exposure, avoid gas surges, prevent steam-driven HF transport, and maintain controlled burnout conditions that minimize risk.

Clear breakdown of operational risk

When using water in confined space

What is deflagration?

Deflagration is an explosion-like event that propagates below the speed of sound. It can range from a mild pressure pulse to a violent blast and may occur in any EV fire if hydrogen accumulates and later mixes with oxygen and an ignition source. Water contact with heated or damaged lithium-ion cells is known to accelerate hydrogen generation, increasing this risk.

Formation of metallic lithium

In normal operation, lithium-ion batteries contain lithium ions, not lithium metal. However, when cell temperatures exceed ~200 °C, the SEI layer and graphite structure break down, allowing lithium ions to plate as highly reactive metallic lithium on the anode. Metallic lithium reacts violently with water, producing large amounts of hydrogen. This is a central reason why water should not be introduced into heated or compromised battery packs.

Hydrogen buildup

Metallic lithium in contact with water or humidity releases hydrogen rapidly. The study provided shows a consistent and fast rise in hydrogen concentration during water exposure, reaching explosive thresholds in confined spaces within minutes. If hydrogen accumulates under a blanket and oxygen is reintroduced too early, for example by lifting the blanket prematurely, deflagration may occur.

Conclusion:

Correct use is essential

Large volumes of water used during EV fire suppression can accelerate both corrosion and hydrogen evolution. This increases the likelihood of deflagration. By contrast, a controlled “dry” scenario, without water intrusion into the battery, greatly reduces this risk.

- Keep the blanket in place until the vehicle has cooled fully.
- Do not introduce water beneath the blanket.
- Do not lift or disturb the blanket prematurely, as re-entry of oxygen can ignite accumulated gases.

For full report:
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This study is grounded in the independent work of leading researchers on lithium-ion batteries. It explains why fire blankets are the obvious choice for protecting firefighter health, addressing environmental challenges, and managing gas dynamics and deflagration, both for today’s and next-generation batteries.