

EV Battery Fires: Understanding EV Battery Fires, Risks and Safety Measures

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EV Battery Fires Latest News

- A devastating fire tore through a house in Indore recently, killing 8 people — including 2 children.
- The blaze is suspected to have originated from an EV charging point located outside the house. An official investigation is currently underway.

Safety of EV Batteries

- **Lithium-Ion Batteries: Common but Efficient** – Most EVs use lithium-ion batteries, similar to those in smartphones and laptops. They offer high energy density and are generally safe when properly managed.
- **Role of Battery Management System (BMS)** – EVs are equipped with a Battery Management System (BMS). It regulates temperature and ensures the battery operates within safe limits during charging and discharging.
- **Risk of Thermal Runaway** – A key risk is thermal runaway, where:

- One battery cell overheats
- Heat spreads to nearby cells
- A chain reaction occurs, overwhelming the cooling system.
- **Fire and Toxic Gas Risk** – During thermal runaway, batteries release flammable and toxic gases such as hydrogen fluoride. These gases can intensify fire risk and make incidents more hazardous.
- **Overall Insight** – EV batteries are generally safe, but rare failures like thermal runaway can lead to serious fire hazards if not properly controlled.

Causes of Thermal Runaway in EV Batteries

- **Physical Damage to Battery Pack** – Strong impacts (especially to the undercarriage) can damage the battery casing. This may puncture or deform cells, leading to internal short circuits and overheating.
- **Overcharging and Faulty Chargers** – Charging beyond safe limits can cause charge buildup in unstable areas of the battery. Use of third-party or damaged chargers increases this risk. Repeated overnight charging with unsafe chargers can worsen the problem.
- **Manufacturing Defects** – Rare defects like metal protrusions inside cells can connect positive and negative electrodes. This leads to sudden high current flow, generating excessive heat and triggering thermal runaway.
- **Electrical Infrastructure Issues** – Weak or old wiring and extension cords may not handle sustained current. This can cause overheating during charging, indirectly increasing fire risk.

Impact of External Conditions on EV Battery Safety

- **Heat and Thermal Stress** – High temperatures, especially during Indian summers, can strain the cooling system. Parking in direct sunlight or charging immediately after long drives increases thermal stress on batteries.
- **Battery Age and Maintenance** – Over time, batteries degrade internally, increasing risk. Ignoring warning signs or skipping inspections may hide issues like swelling or chemical breakdown.
- **Risk from Flooding** – Floodwater can enter battery packs, causing short circuits. Several EV fires have been reported days after vehicles were submerged.
- **EV vs Petrol Vehicle Fires** – EVs are not uniquely dangerous—petrol vehicles catch fire more often. However, EV battery fires:
 - Burn hotter and faster
 - Are harder to extinguish due to oxygen release
 - Firefighting requires large amounts of water or special equipment.
- **Role of Surrounding Factors** – Fire risks can increase due to external elements like: LPG cylinders stored nearby; Presence of other vehicles; Power failure affecting safety systems (e.g., electronic locks).

Industry and User Measures to Improve EV Battery Safety

- **Advanced Cooling Technologies** – EVs use coolant channels to absorb and dissipate heat. New systems are being developed where coolant evaporates to improve heat transfer, helping manage sudden temperature spikes.

- **Safer Battery Design Innovations** – Shift towards solid-state batteries (using solid electrolytes) to reduce fire risks. Improved internal firewalls to prevent fire from spreading between cells if one fails

User-Level Safety Precautions

- Use only manufacturer-approved chargers.
- Avoid unattended or overnight charging with unsafe setups.
- Ensure home electrical systems can handle high loads.
- Get batteries checked after impacts.
- Allow battery to cool after long drives before charging and keep charging areas clear.

Strengthened Safety Standards in India

- Bureau of Indian Standards (BIS) updated EV battery safety norms in 2023.
- Under AIS-156 standards, batteries must:
 - Undergo tests for heat propagation
 - Provide at least five minutes for passenger evacuation in case of fire

Source: TH

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