

Flame Retardants: Fire Safety in Vehicles



Flame retardants (FRs) are an essential part of a vehicle's safety system, helping to prevent or slow the spread of fire in the event of an accident or electrical fault. [Studies show](#) that FRs can delay interior ignition by several minutes, providing crucial escape time and reducing fire-related fatalities. Without FRs, some materials used in auto components can ignite quickly, [burning as intensely as gasoline](#) and leading to faster cabin flashover and increased risk to occupants.

As the automotive industry evolves, FRs are enabling innovative, lightweight, and modular interior designs while supporting compliance with U.S. and global chemical and fire safety regulations. These FRs not only help automakers meet regulatory demands and standards but also produce safer, more efficient vehicle designs for the next generation of vehicles.



Statistics and Research on Automotive Fires in the United States

- The average number of vehicle fires per year from 2018-2022 was [215,096](#).
- Vehicle fires accounted for [approximately 16%](#) of the total reported fire incidents from 2018-2022.
- These [fires caused](#) an estimated annual 643 civilian fatalities, 1,532 injuries, and \$2.8 billion in direct property damage.
- Today's power vehicles [are older](#) than in the past. In 1990, the average household vehicle was 7.7 years old, compared to 10.3 years old in 2022.
- [More than 75%](#) of vehicle fires begin in older cars due to a mechanical malfunction or an electrical problem.
- A small flame can engulf a vehicle's interior in [under five minutes](#) and result in total loss within 15 minutes without flame retardants applied.

Benefits of FRs in Vehicles

Enhanced Fire Safety

- Reduces ignition risk from heat, sparks, or electrical faults
- Slows flame spread, giving passengers more time to escape
- Minimizes toxic smoke and gas release, improving survivability

Critical for High-Risk Components

- Used in vehicle materials that are highly flammable or used in high-temperature environments
- Protects electrical systems and wiring from short-circuit fires
- Essential in overall fire prevention system for battery enclosures for hybrid gas-electric vehicles

Proven Performance

- Helps materials meet FMVSS 302 flammability standards
- Reduces [burn rate to \$\leq 102\$ mm/min](#), preventing or delaying flashover

Benefits of FRs in Vehicles

Regulatory Compliance

- Supports adherence to NHTSA, EPA, and CPSC safety requirements
- Helps automakers avoid recalls, liability, and reputational damage

Design & Durability Advantages

- Enables use of lightweight plastics without compromising safety
- Improves thermal and mechanical stability of vehicle components
- Supports innovative interior designs with built-in fire protection



Where FRs Are Used in Vehicles

- **Seat Foam:** Helps prevent ignition of flammable materials from small flames.
- **Dashboard Panels:** Reduces fire risk from electrical faults or heat exposure.
- **Door Trims:** Helps to resist fire ignition and prevent spread of smoke, allowing for easier escape.
- **Wiring & Connectors:** Helps ensure electrical safety by preventing short-circuit fires.
- **Upholstery Materials:** Limits potential flame spread in cabin.
- **Interior Textiles & Carpets:** Treated to meet flammability standards while maintaining comfort and aesthetics.

Regulatory Oversight and Landscape for FRs in Automobiles

Federal Motor Vehicle Safety Standards

- FMVSS 302: Requires interior vehicle materials to burn at a rate of no more than 102 mm/min to reduce fire-related injuries and fatalities.
- Applies to seat cushions, headliners, door panels, floor coverings, and other materials within 13 mm of the occupant compartment air space.

EPA Oversight Under TSCA

- The Toxic Substances Control Act mandates manufacturers to report health and safety data on 30 flame retardants.
- TSCA enables EPA to assess risk for potential health and environmental impacts of chemistries across their applications and conditions of use.

CPSC Rulemaking & Guidance

- The Consumer Product Safety Commission initiated rulemaking under the Federal Hazardous Substances Act to assess risks of additive, non-polymeric FRs. The CPSC recognizes this dynamic broad term for a diverse sub-grouping of flame retardant chemistries and technologies.
- FRs in electronics casings, furniture, and children's products are under oversight, with voluntary guidance issued for manufacturers.

For more information, please visit the [North American Flame Retardant Alliance's website](#).