



# ANN ARBOR FIRE DEPARTMENT

## Standard Operating Procedures – 3.53 Vehicle Fire



### VEHICLE FIRE

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Effective: May 25, 2018  
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Replaces: 802 Vehicle Fire  
Approved: Fire Chief Mike Kennedy

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#### I. PURPOSE

This procedure identifies operational tactics for safe handling of motor vehicle fires.

#### II. PERSONAL PROTECTIVE EQUIPMENT

- A. Full structural fire-fighting personal protective equipment (PPE) shall be utilized for fighting vehicle fires.
- B. Self-contained breathing apparatus (SCBA) shall be utilized when fighting vehicle fires.
- C. Reflective traffic safety vests shall not be utilized while actively fighting fire.

#### III. APPARATUS PLACEMENT

- A. To afford protection from hazardous liquids and vapors and to reduce smoke in the work area, apparatus should be placed upwind and uphill of the incident if possible.
- B. Consideration must be given to using an apparatus as a barrier, to shield the incident scene and the pump operator from traffic hazards.
- C. Warning lights should be left operating, in conjunction with the use of traffic cones where needed.
- D. Flares can be used to direct traffic flow and warn motorists of hazards. Caution must be used to insure flares are placed so they can not cause a fire or present burn injury hazard.
- E. Traffic cones and traffic delineators can be used to direct traffic flow, close lane (s) and define safe work areas.

#### IV. FIRE ATTACK

- A. Any vehicle fire that has extended beyond an incipient stage requires a minimum 1 $\frac{3}{4}$ " hoseline.
- B. A working fire involving the interior of the vehicle passenger compartment will damage the vehicle beyond repair. As such, the attack plan should consider the vehicle as a "write off" and a safe and appropriate approach and fire attack must be implemented.
- C. Where patients are trapped in the vehicle, first water should be applied to protect the patients and permit rescue.
- D. When rescue is not a factor, first water should be applied for several seconds to extinguish fire or cool down the area around any fuel tanks or fuel systems. This is especially important if the fuel tanks are Liquidified Petroleum Gas (LPG) or Liquid Natural Gas (LNG).
- E. At least one member of the attack team must have forcible entry tools in his/her possession to provide prompt, and safe entry into the vehicle.



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### V. HAZARD AND SAFETY CONSIDERATIONS

- A. Liquid Petroleum Gas (LPG) and Liquid Natural Gas (LNG) are becoming common place as fuel for vehicles. Pressure release devices can create a lengthy "blow torch" effect, or should the pressure relief device fail, a BLEVE may occur. Vehicles may not be marked to identify this fuel hazard. If there is flame impingement on a visible LPG/LNG storage tank, take action to control the fire and cool the tank.
- B. If vapors escaping from the storage tank relief valve have ignited, allow the LPG/LNG to burn while protecting exposures and cooling the tank. Flow of gas through piping can be controlled by shutting off the valve at the storage tank.
- C. Energy Absorbing Bumpers - Consist of gas and fluid filled cylinders that, when heated during a fire, will develop high pressures which may result in the sudden release of the bumper assembly. This could result in serious injury to anyone in its path. Bumper assemblies have been known to travel 25 feet.
- D. Batteries - Explosion hazard due to presence of hydrogen vapors. Avoid contact with battery acid. When the situation is stable, disconnect battery cables (ground cable first).
- E. Combustible Metals - Some vehicles have various parts made of combustible metals, such as engine blocks, heads, wheels, etc. When these metals are burning, attempts to extinguish them with water will usually add to the intensity of the fire. Large quantities of water, however, will cool the metal below its ignition temperature. After some initial intensification, the fire should go out. Dry chemical extinguishers can also be effective.
- F. Trunk/Rear Hatch/Engine Hoods - Hold-open devices may employ, along or in any combination with any of the following: springs, gas cylinders, extending arms, etc. When gas cylinders are exposed to heat, failure or rupture of these devices should be expected. Excessive pressure may develop in lift assists causing a trunk, hatch or hood to fly open with explosive force when the latch mechanism is released. To insure personal safety, be sure to allow sufficient clearance when releasing latches.
- G. Fires involving the trunk/cargo area should be approached with extreme caution. Contents may include toxic, flammable or other hazardous materials. Expect the worst!
- H. Fuel Tanks - May be constructed of sheet metal or plastic. A rupture or burn-through may occur with these tanks causing a rapid flash fire of the fuel. Do not remove gas cap, as tank may have become pressurized. Do not direct hose stream into tank, as this will cause pressurization of tank, with a possible result of burning fuel spewing from the tank fill opening.
- I. Vehicle Stability - Tires or split rims exposed to fire may explode, causing the vehicle to drop suddenly. Expect exploding rim parts or tire debris to be expelled outward from the sides. Approach from the front or rear of the vehicle for maximum protection from potential flying debris. Some larger vehicles, such as buses, employ an air suspension system. When these systems are exposed to heat or flame, they may fail, causing the vehicle to SUDDENLY drop several inches.
- J. Airbags: To avoid injury, firefighters should follow the 5-10-20 rule (airbags can deploy even after the key has been removed and the battery disconnected) for un-deployed airbags:
  - i. Maintain a minimum of 5 inches from side impact airbags
  - ii. Maintain a minimum of 10 inches from frontal airbags
  - iii. Maintain a minimum of 20 inches from passenger side frontal airbags



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### VI. HYBRID VEHICLE FIRE

After the knock down of visible flames, re-ignition is to be expected. This is caused by the thermal runaway at the individual cell level internal to the battery packs. While visible flames from the batteries may be clearly extinguished, temperatures within the batteries may be high enough for thermal runaway of internal cells to occur. Subsequent re-ignition is characterized by “whooshing” or “popping” sounds, followed by off gassing of white smoke and/or electrical arcs/sparks that reignited with visible flames/fire. Typically, this will result in visible flames that can be quickly knocked down by a single hose line. This re-ignition process will repeat until enough water has flowed to sufficiently reduce the internal battery temperatures to the point where thermal runaway will not proceed.

The continuous application of water on a localized area of the battery for a prolonged period of time before moving onto another area of the battery can provide faster total extinguishment. In addition, once the main battery fire has been controlled, continuous application of water to the battery with the nozzle set on fog could further cool the exterior of the battery, thereby helping to reduce the temperatures of the internal cells. This will reduce the likelihood of additional off gassing of electrolyte and re-ignition of internal battery cells.

Based on research from the [Fire Protection Research Foundation](#), water (no foam) is the recommended suppressant agent for hybrid vehicle fires. Given the large quantities of water necessary to sufficiently cool the batteries and the long duration to achieve reduced temperatures, water supply may be an issue.

Use of Class B foam on hybrid vehicle fires is not currently supported in research literature. However, anecdotal evidence has reported success with Class B foam if copious amount of water is unsuccessful.

Hybrid vehicle fires have a significant chance for re-ignition hours after extinguishment. Extinguished hybrid vehicles must be stored away from exposures for at least 24-hours.

### VII. INVESTIGATION

The fire prevention bureau should be notified of vehicle fires when the cause cannot be determined or fires of a suspicious circumstances. Depending on the situation and consult with the fire investigator, the vehicle may be towed to a secured yard for investigation at a later time.