



PDHonline Course G474 (2 PDH)

Introduction to Truck Fires

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PDH Online | PDH Center

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Discussion Areas

- Expert Qualifications
- Why?
- Major Components of Trucks
- NFPA 921 Methodology
- Truck/Vehicle Fire Investigation Methodology
- Fire Involvement of Truck Components

Expert Qualifications

- This course is informational and not designed to qualify attendees as experts for the purposes of litigation or litigation support.
- Completion of this course will not enable attendees to safely perform the duties of a fire investigator.
- For more information about how to become a Certified Fire and Explosion Investigator (CFEI) or Certified Vehicle Fire Investigator (CVFI), visit the National Association of Fire Investigators (NAFI) website at www.nafi.org/certification .
- For more information about how to become a Certified Fire Investigator (CFI), visit the National Fire Protection Association website at <http://www.nfpa.org/training/certification-programs> .

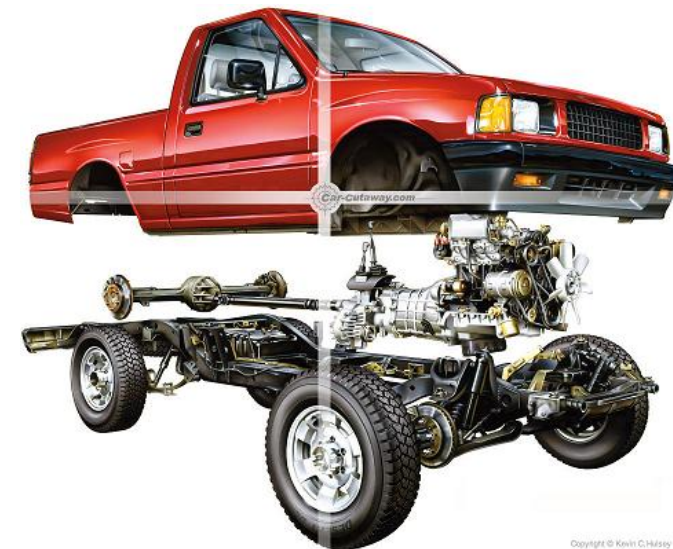
Why Investigate Truck Fires?

- Truck Fires typically result in a larger loss of economic value due to the inherent cost of the truck vs. an automobile.
- Truck Loads in trailers can have a phenomenally high value.
- Truck Fires can result in earning loss or production down-time or business interruption loss for an independent trucker.
- Trucks are typically parked close to each other resulting in a higher potential for fire spread damage vehicle to vehicle.
- Some trucks are parked indoors or adjacent to building structures again resulting in higher potential for fire spread damage to commercial structures (as opposed to residential structures).

Major Vehicle Systems

Take the time to press control and click on each hyperlink below. Each link has a basic summary of the major vehicle systems.

- Powerplant: [Engine](#) and [Transmission](#) ([Transmission Video](#))
- Electrical System: Engine/Powerplant System, Safety Restraint Systems, FMVSS required Systems: lighting/horn/wipers/gages, Body Control Systems.
- [Suspension](#) and [Steering](#) (Fig 2-1 and 2-2)
- Body ([diagram](#))
- [Heating and Cooling](#)
- Brake System: [Primary](#), [Secondary](#), and [Trailer](#)



Commercial Truck Extra Consideration

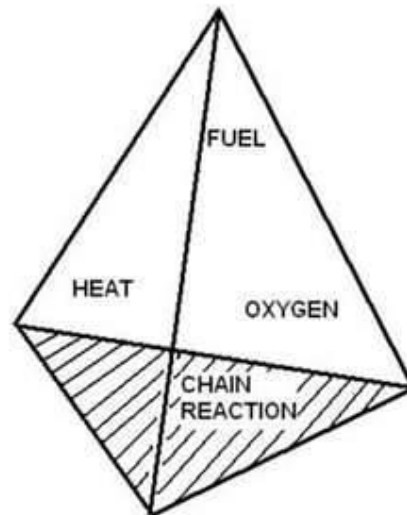
- Scalability of Components – i.e. larger size
- Trailer – chassis, structure, electrical, brake system, lift gates, heating or cooling system
- Contents of Trailer
- Specialized Loads and Configurations – i.e. Tankers, Construction Equipment, Motor Vehicle Carrier, Dumps, School Buses, Commercial Buses, Recreational Vehicles

Exploded View of Basic Truck



NFPA 921 Guidelines

- NFPA 921 Guidelines for Fire Investigation
- Investigate scene or evidence from least damage to most damage, from outside to inside.
- Attempt to locate the basic components of a fire: fuel, oxygenating agent, ignition/heat source, and ability to sustain combustion (uninhibited chemical reaction).
- Use the scientific method to prove or disprove theories of cause and or origin.



Right Mouse Click and open and read the following Link: [NFPA 921](#)

NFPA 921: Scientific Method

- Recognize The Need – typically a fire, cause, and origin is needed to what may have caused the fire.
- Define The Problem – What caused the fire.
- Collect Data – scene and evidence inspection, photos, reports, destructive evidence examination/testing, and etc.
- Analyze Data
- Develop an Hypothesis
- Test Hypothesis
- Select Final Hypothesis – Final Cause determination

NFPA Fire Cause and Origin Methodologies

- Fire Patterning – Establish area of origin based on degree of burn and V patterns
- Arc Mapping – Identifying and locating electrical arcs and attempting to establish origin based on distance from power source
- Analysis of Combustibility of Materials
- Fire Suppression Effects on Patterns
- Time Line Analysis – Witness statements, photos, and videos if available
- Computer Fire Modeling



Truck/Vehicle Fire Methodology

- Same basics as regular Fire Cause and Origin
- Complicated by:
- Lack of Remaining Evidence
 - Spoliation of Remaining Evidence During Transport and Storage
 - Close proximity of fuels and ignition sources
 - A plethora of different materials used in mfg. of truck
 - No standardization in components/design
 - Interaction w/ site
 - MVA



Truck/Vehicle Fire Methodology, cont.

- Investigation Assisted by:
 - Large Size of Commercial Truck
 - Limited Number of Sources of Fuel and Possible Ignition Sources

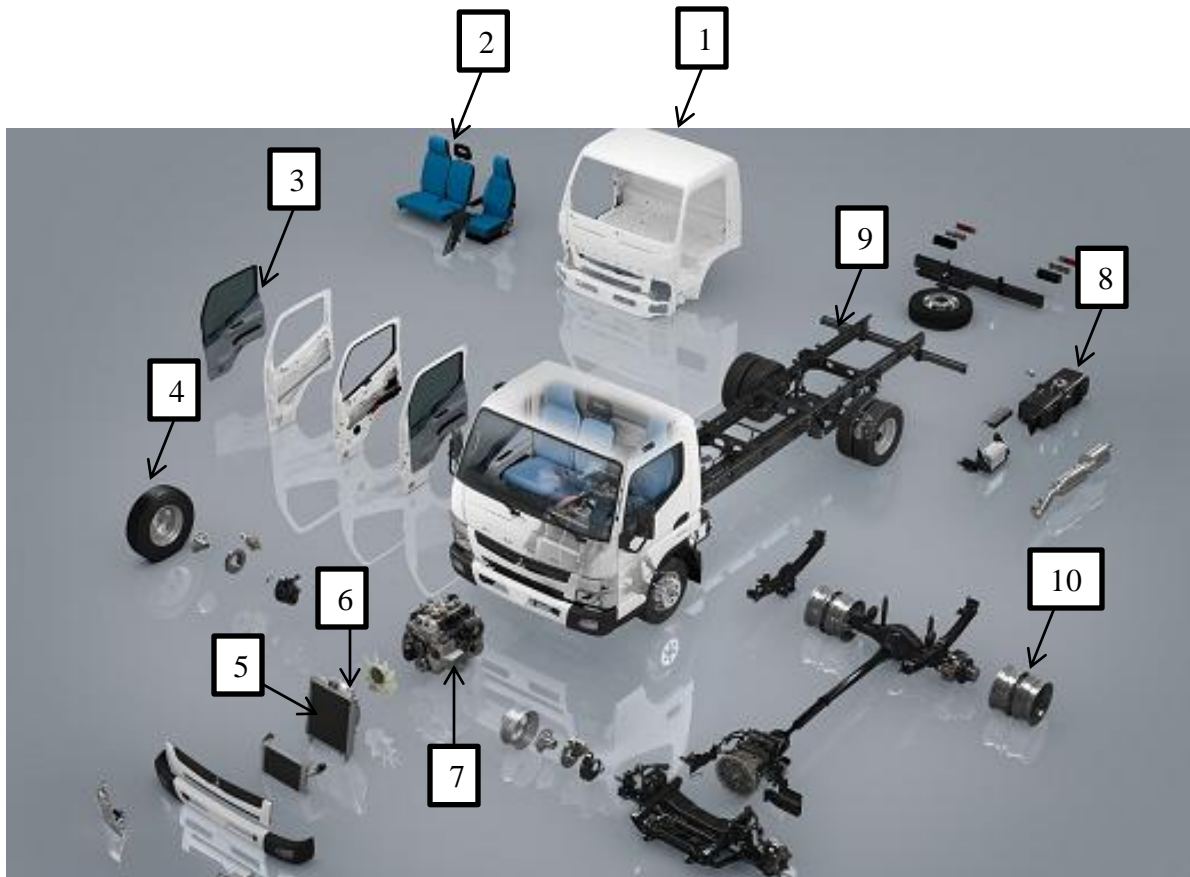


Fire Investigation Data Gathering

- Preserve Evidence
- Preserve Site or Scene (if possible)
- Get Configuration/Construction History of Truck
- Log books/Use History
- Maintenance History



Component Involvement in Fire: Fuel Sources and Materials



1) Cab: Fiberglass
Ignition T = 1040 F

2) Seats: Polystyrene
Ignition T = 655 to 689 F

3) Interior Trim: Plastic
Melt T = 428 to 510 F
Ignition T = 775 to 932 F

4) Tires: Rubber
Melt T = 260 F
Ignition T = 650-700 F

5) Radiator: Aluminum
Melting T = 1050-1200 F

6) Coolant
Ignition T = 748-770 F

7) Engine: Engine Oil
Ignition T = 644-680 F

8) Fuel Tank: Diesel or Gasoline
Ignition T = 489 F or 660 F, min
respectively

9) Frame: Steel
Melt T = 2600 F

10) Wheel Rims: Steel or
Aluminum

11) Auto Transmission Fluid
Ignition T = 626 to 716 F

Note: Temperatures are from multiple references including
NFPA 921 2017 and Investigation of Vehicle Fires by Lee S.

Cole

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Plastics in Fire Involvement

How does plastic burn (Lee S. Cole)

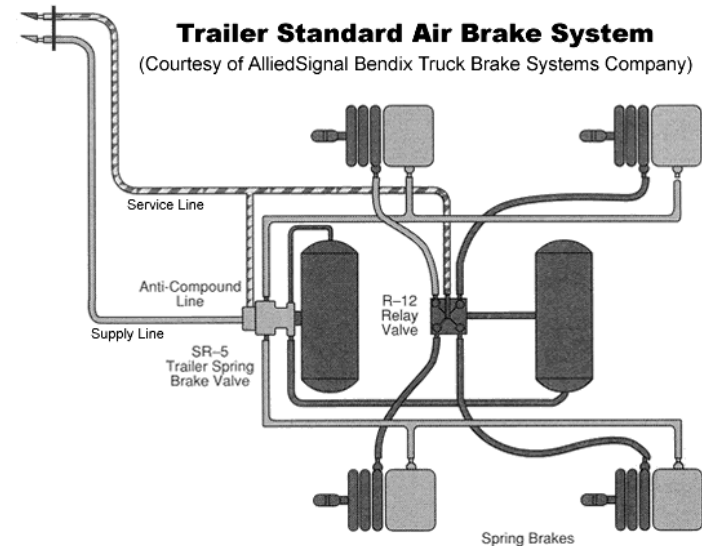
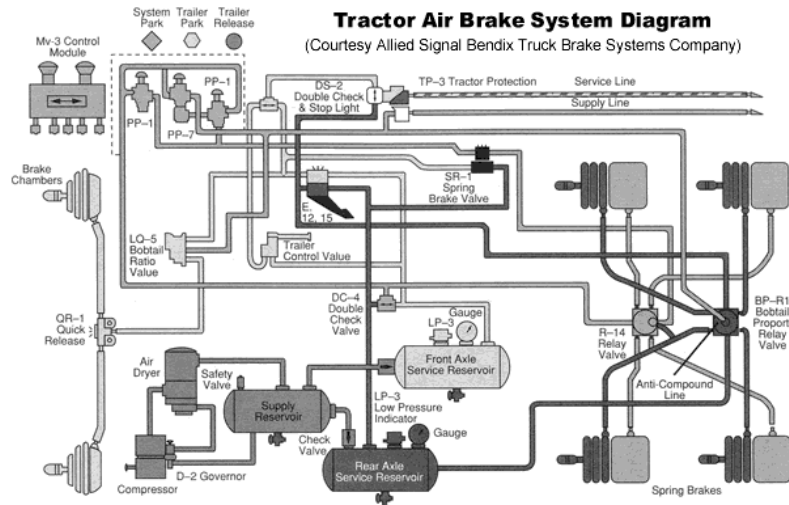
1. Heating
2. Decomposition
3. Ignition
4. Combustion

How to use?

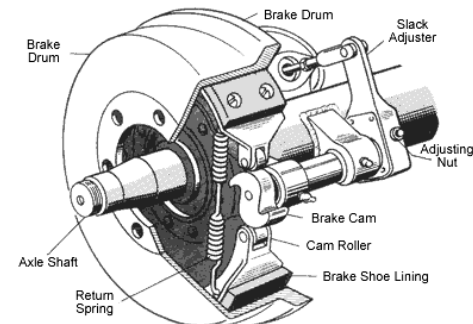
- Fire Patterning (V- Patterns)
- Determining Fire Spread and Direction of Fire
- Determine if fire started from interior of compartment to outside or vice versa

Component Fire Involvement

Least Likely: Brake System



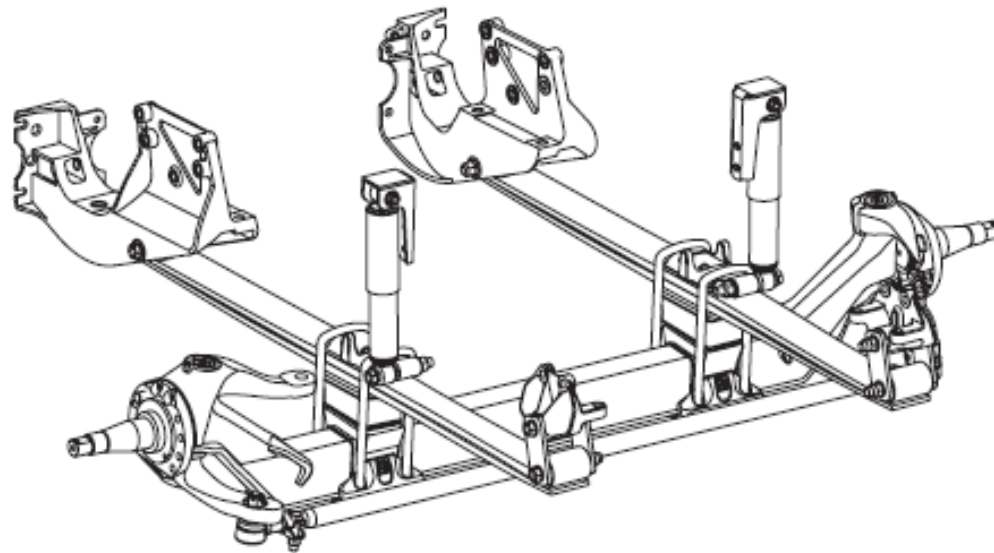
- Usually Air System
- Rubberized Air Hoses and Lines are good source of fuel
- Exception: MVA related or failed brake line locking of brakes



Courtesy of Allied Bendix Truck Brake Systems Company

Component Fire Involvement

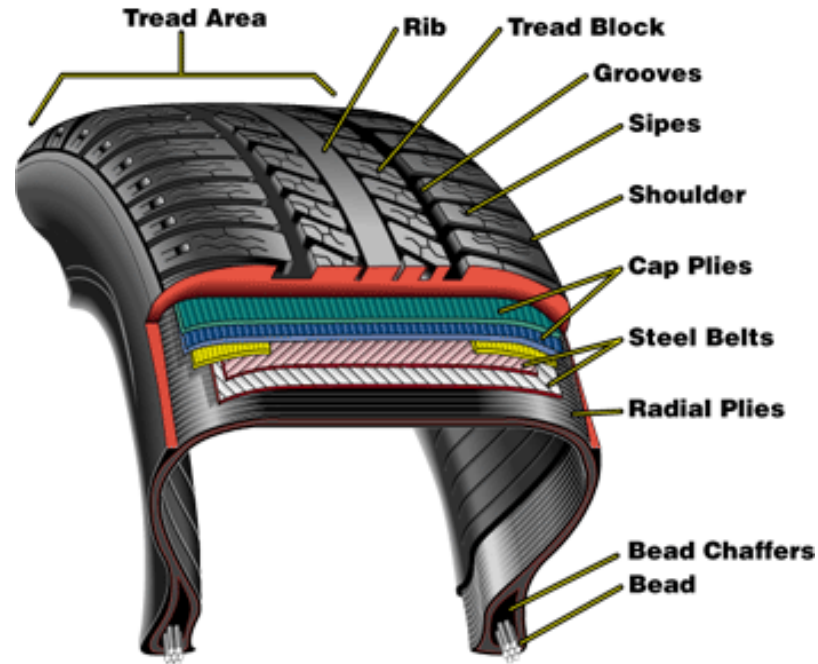
Least Likely: Chassis & Steering



- Constructed Largely of Non Combustible Materials
- Rubber Isolator Burns Useful for Burn Patterning

Component Fire Involvement

More Likely: Tires



- Burns Easy and Likely to Be Consumed
- Not likely Cause and Origin Because of Design
- Exception: MVA related high speed braking or failed brake system locking of brakes. Friction can result in a fire.

Component Fire Involvement

- More Likely: Engine/Hydraulic Units/PTOs



- Check NHTSA and Web for Recalls or Complaints
- If Engine was Cause and Origin, Check Maintenance and Use History
- Integrity of fuel, oil, or hydraulic lines should be checked
- Line fittings, routings, and clearances should be checked
- Reservoir levels need to be checked

Component Fire Involvement

- More Likely: Main Powerplant Electrical System

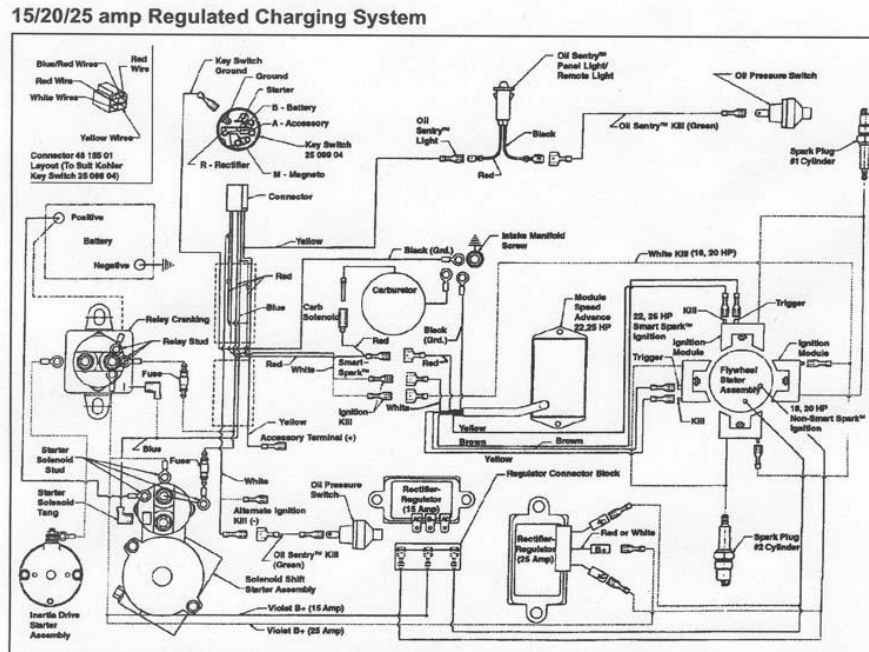


Figure 8-14. Wiring Diagram - 15/20/25 amp Regulated Battery Charging System.

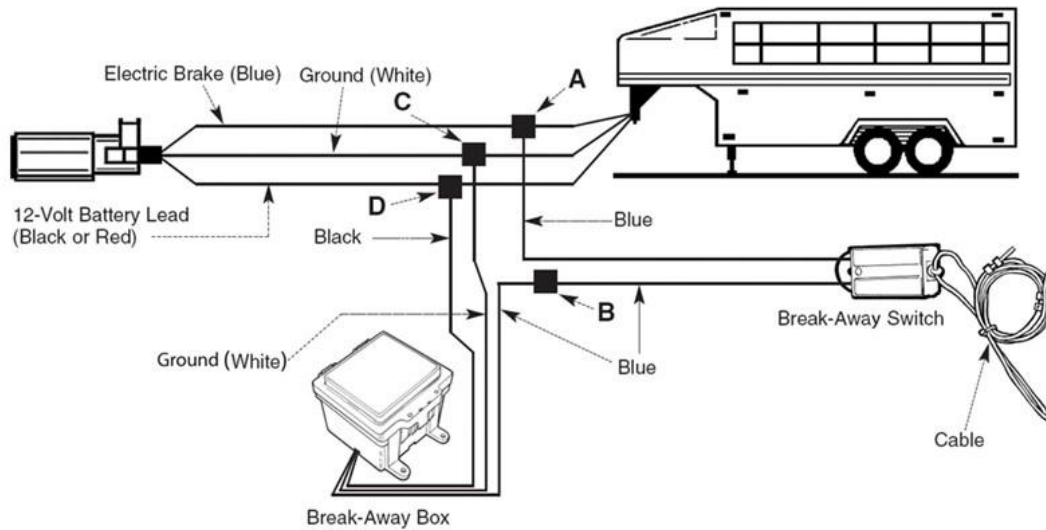
- Prime candidate if fire started while vehicle was not in operation.
- Battery-Alternator-Fuse Box Circuit has highest load potential.

Component Fire Involvement

- Possibility: Accessory System
- Seat Heaters
- Aftermarket and standard entertainment systems: stereo, video, or audio
- Plug in devices such as chargers and phones
- Trailer hook ups and connections
- Recording devices or backup cameras
- Living or comfort devices for sleeper cabs or RV's
- Cooking devices
- Refrigeration or cooler devices
- Lighters and other smoking accessories
- Trailer hitch or towing devices
- Plowing devices
- Dump Bed

Component Fire Involvement

- Possibility: Accessory System



Example 1: Area of Origin?



Example 1: Cab Fire



- Fire Pattern suggests a cab fire.
- Preferentially on the driver's side.
- Area of origin: sleeper



Example 1: Cab Fire



Better Shot of the Sleeper

Example 2: Area of Origin?



Example 2: Electrical



- Fire Pattern suggests a cab fire.
- Engine hood was damaged but present (left in cab).
- Front tires have no fire or heat damage
- Closer examination reveals a blowout (arcing) over the battery.
- Area of origin: Battery



Example 3: Area of Origin?



Example 3: Cab Interior



- Fire Pattern suggests a cab or engine fire.
- Aluminum radiator and tire have low resistance to fire and heat.
- Cab is entirely gutted, whereas radiator is still present and tires aren't consumed
- Area of origin: Cab interior

Example 4: Area of Origin?



Example 4: Content Fire



- Fire Pattern suggests a fire occurred in the transport portion of the truck.
- Only superficial fire and heat damage to cab, and engine underneath looks clear.
- Area of origin: Content