



Coffee Break Training - Fire Investigation Series

Back to the Basics: The Fire Tetrahedron

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Learning Objective: The student will be able to explain why and how to apply the fire tetrahedron to individual fuel packages in a fire or arson investigation.

How often have you heard the phrase “back to the basics”? It seems as though every time you turn around you are being instructed to go “back to the basics,” whether it’s with our children and their math homework or it’s in the fire service with establishing a water supply, advancing a hose line, or conducting ventilation. The “basics” are those tasks that you need to complete first, and they must be completed every time.

Fire investigation is no different. You have heard about the fire tetrahedron that consists of **heat, fuel, oxygen** and an **uninhibited chain reaction**. In fire investigation, in order to determine an area of origin and a cause, you need to identify the source of ignition, the first material ignited, and the ignition sequence or the event that brought them together. Seems pretty basic! It wasn’t all that long ago that an investigator’s consideration of the fire tetrahedron stopped at this point: A fire occurred, so all the components of the fire tetrahedron must have been present. This is where the “back to the basics” comes into play.



You should use the fire tetrahedron to confirm that a burning object emits enough energy to ignite nearby combustibles. Examining each fuel package as a separate event is extremely important.

While working from the area of least damage to the area of most damage and examining the various fuel packages, you need to apply the fire tetrahedron to each fuel package. In doing so, you can begin to understand how the fire spread. Several questions come to mind. Was there a competent ignition source to initiate combustion? Which fuel package ignited first? Is this a result of fire travel or an independent area of origin? Was there adequate heat flux from one fuel package to ignite another?

It’s not enough to just identify an area of origin and be done with it. As an investigator, you need to be able to articulate the ignition sequence for each fuel package in order to understand fire travel. After the initiation of the fire, the first material ignited often becomes the ignition source for adjacent combustibles or additional fuel packages. Working within the scientific method, you begin to look at each individual fuel package as a separate event. By applying the fire tetrahedron to each fuel package and the events that led to its ignition, you can begin to understand the chain of events that led to the fire. You can then work back to the area of origin in order to identify the first material ignited, the source of ignition, and the events that brought them together.

Failure to correctly apply the fire tetrahedron to each individual fuel package can easily allow you to draw incorrect conclusions. While there are many factors that influence fire patterns and effects, such as ventilation streams and fire suppression tactics, applying the fire tetrahedron to each individual fuel package will assist you in properly determining the sequence of events.

For additional information, explore the National Fire Academy’s fire investigation courses at <http://apps.usfa.fema.gov/nfacourses/catalog/search?&courseCurricula=1&forget=true>.

This Coffee Break Training is courtesy of Agent David B. Wallace, Arson Unit/Major Crimes, Camden County Prosecutor’s Office, New Jersey.

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