

The Arson Research Project

Test of the TIF 8800 Combustible Gas Detector in a Post-Flashover Environment

Background:

At the Soulotes fire scene in January 1997, fire investigators used a Snap-On, ACT 8800 Combustible Gas Detector to confirm the presence of liquid accelerant. According to trial testimony of fire investigators, positive readings were obtained in the garage, kitchen and living room of the house. All of the areas of the house where the positive readings were obtained had experienced flashover conditions.

At the time of the Souliotes fire investigation the detector was manufactured by TIF Inc. for the Snap-On Corporation. TIF continues to manufacture the detector, which is now called the TIF 8800 Combustible Gas Detector.¹

The purpose of the testing described below was to examine the reliability of the TIF 8800 in detecting the presence of an ignitable liquid in a post-flashover fire scene.

The owner's manual describes the detector as a "general purpose combustible gas detector," and lists the following applications where the detector may be used: Gas lines and pipes, fuel in marine bilges, exhaust and fuel leaks, liquid or gas fired heating systems, propane filling stations and to check manholes for safety.² The owner's manual does not include fire scene examination in its list of applications.

NFPA 921 emphasizes the use of laboratory analysis, rather than a combustible gas detector, to confirm or dismiss the presence of an ignitable liquid.³

NFPA 921: "...If the presence of ignitable liquids is suspected, supporting evidence in the form of a laboratory analysis should be sought. It should be noted that many plastic materials release hydrocarbon fumes when they pyrolyze or burn. These fumes may have an odor similar to that of petroleum products and can be detected by combustible gas indicators when no ignitable liquid accelerant has been used. A "positive" reading should prompt further investigation and the collection of samples for more detailed chemical analysis." (2011, 6.3.7.8.2)

Test of the TIF 8800 at a post-flashover fire scene:

On Monday, October 3, 2011, a new TIF 8800 Combustible Gas Detector was purchased from Professional Equipment.⁴

On Sunday, October 9, 2011, a live burn exercise was conducted in Palo Alto, CA, where four 12'x12' furnished burn cells were each burned beyond flashover. Approximately 90 oz. of paint thinner was poured in the center of the floor of burn cell #2 and ignited. No ignitable liquid was introduced into burn cells #1, #3 or #4.

On Tuesday, October 11, 2011, the TIF 8800 was turned on and calibrated in a non-contaminated atmosphere in accordance with the owner's manual.⁵ After warming up, the sensitivity knob was adjusted to its highest level.

¹ <http://www.tif.com>

² <http://www2.otctools.com/otctools.com/newcatalog/products/TIF8800A.pdf>

³ *NFPA 921, Guide for Fire and Explosion Investigation, 2011 edition*

⁴ www.Professionalequipment.com

The detector was brought into burn cell #4 and the probe was placed near burned debris of a couch and vinyl tile on the east side of the room. The TIF 8800 alerted by increasing the rate of audible clicking noise when its probe was placed near either item.

The instrument was then held in a non-contaminated atmosphere and the sensitivity was readjusted to moderate level. With the sensitivity lowered to “moderate”, the probe alerted when brought near the vinyl tile on the floor of burn cell #4.

The sensitivity was readjusted to high sensitivity in a non-contaminated atmosphere, and the instrument was then brought into burn cell #3. The rate of the audible clicking began to increase as soon as it entered burn cell #3. When held near a burned mattress, the instrument alerted.

When brought into a non-contaminated atmosphere, the rate of the audible clicking returned to normal (moderate to high sensitivity). The instrument was then brought into burn cell #2. Burn cell #2 was the only room that had been ignited in the presence of a flammable liquid, and the rate of the audible clicking increased as soon as the instrument entered the room.

The instrument alerted when brought near the area where the flammable liquid had been poured in the center of the room, but also equally alerted to burned plastic debris and burned carpet in the southwest corner, areas where no ignitable liquid had been used.

The instrument was brought into burn cell #1. When adjusted to high sensitivity the instrument alerted on a burned couch, and when adjusted to moderate sensitivity it alerted on burned carpet and padding in the northeast corner.

When the instrument was brought into any of the post-flashover burn cells, the audible rate of clicking began to increase, even before getting close to any fire debris. The increased rate was especially noticeable when the detector was brought into burn cells #2 and #3.

In sum, when the TIF 8800 was brought into any of the post-flashover burn cells, the audible rate of clicking began to increase, even before getting close to any fire debris. The increased rate was especially noticeable when the detector was brought into burn cells #2 and #3. The TIF 8800 alerted to nearly all burned objects, including areas where no liquid accelerant was present.

Test of the TIF 8800 on fire debris:

On Wednesday, October 12, 2011, the TIF 8800 was tested with burned floor samples that had been removed from each of the burn cells. The floor samples had been removed on Monday, October 11, and stored in separate plastic containers.

The instrument was turned on, calibrated and warmed up in accordance with the owner’s manual. The sensitivity knob was set to a “moderate” setting. The instrument’s probe was placed near each of the floor samples in a non-contaminated atmosphere with the following results:

Sample #	Burn Cell #	Flooring material	Alert
1	Burn Cell 1	Hardwood floor	Hi
2	Burn Cell 1	Carpet and pad	Very Hi
3	Burn Cell 2	Plywood	Very Hi
4	Burn Cell 2	Carpet and pad	Very Hi
5	Burn Cell 2	Vinyl tile	Hi
6	Burn Cell 2	Hardwood floor	Hi
7	Burn Cell 3	Plywood with carpet	Moderate
8	Burn Cell 3	Carpet and pad	Hi
9	Burn Cell 4	Carpet and pad	Moderate
10	Burn Cell 4	Vinyl tile	Moderate
11	Burn Cell 4	Vinyl tile	Moderate

Conclusions:

When using the TIF 8800 to determine the presence of a flammable or combustible vapor in a post-flashover setting the false positive rate is nearly 100%. The same held true when using the TIF 8800 in the presence of fire debris removed from a post-flashover fire scene.

As a result, conclusions regarding the presence or the absence of an ignitable liquid derived from use of a combustible gas detector in a post-flashover fire environment, specifically the TIF 8800, unless the detector is specifically designed and tested for that purpose, are not scientifically valid and not in compliance with the standard of care established by NFPA 921.

The Arson Research Project is a criminal justice research project hosted by the Constitutional Law Center of Monterey College of Law.
Our mission is to examine the reliability of evidence used in the investigation and prosecution of arson,
and to identify convictions obtained secondary to unreliable evidence.