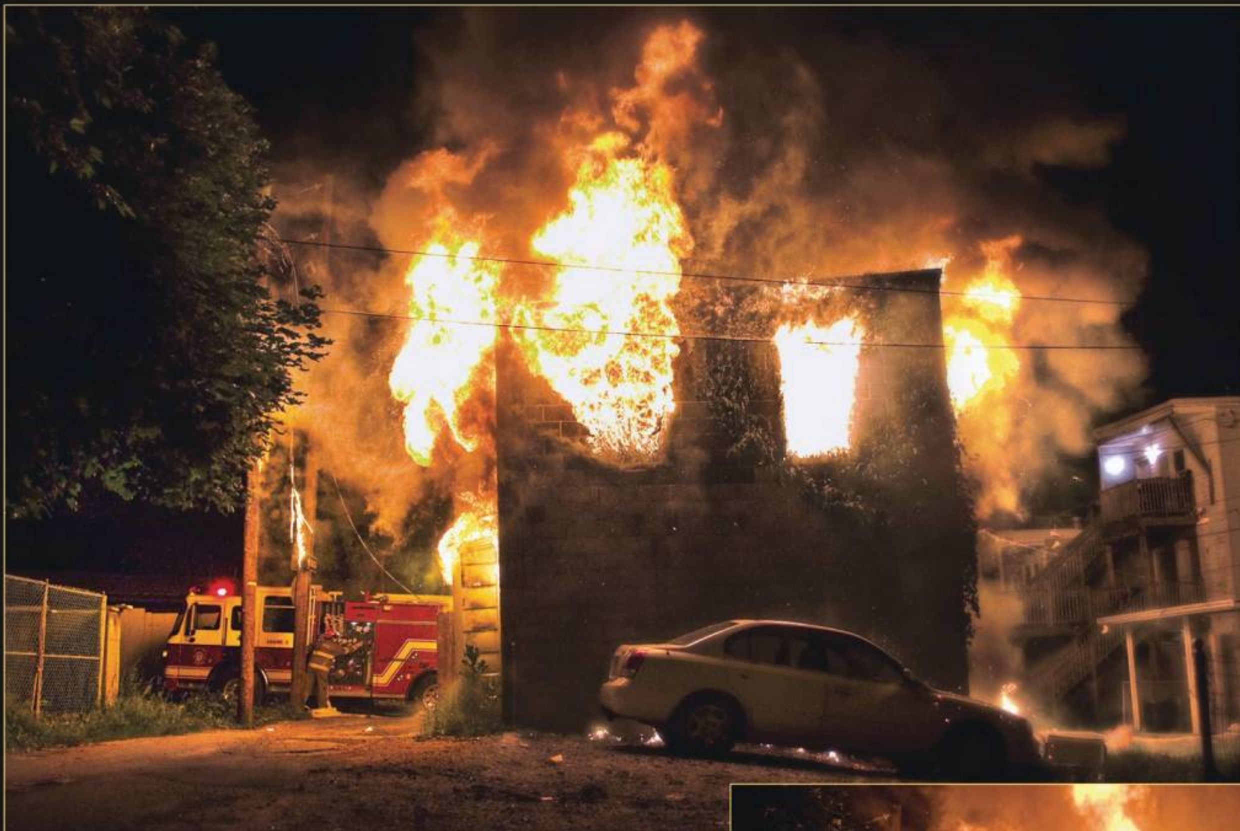
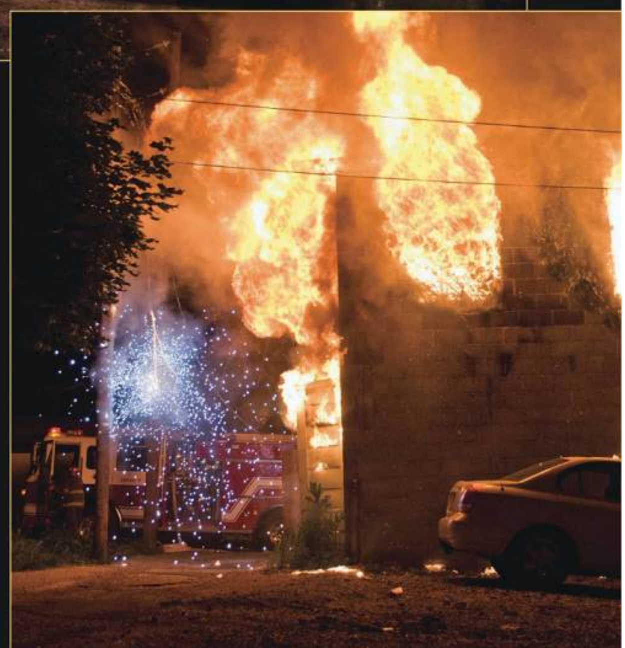




LIVE WIRE

HOW TO IDENTIFY & AVOID ELECTRICAL HAZARDS ON THE FIREGROUND

BY ED HACKETT

House fires are the bread and butter of most structural firefighting organizations, and a common source of multiple hazards. Most departments have standard operating procedures (SOPs) that address electrical issues, such as disconnecting utilities, lockout protocols and the use of ladders and equipment around overhead wires. If your department doesn't have them, look into establishing them.

Yet even when such SOPs exist and are followed, there are several relatively common scenarios that can complicate or defy safe operations where electricity is involved. These complications involve construction methods, material failure and human tampering—and they're more common than you think.

ENERGIZED UTILITY PANELS

One of the more common situations occurs when a fire involves the area around the electrical panel/breaker box. How do you shut off the power when the area around the breakers is on fire? The initial response is often to reach for the CO_2 or dry chemical extinguisher, put out the fire around the breaker box and then shut off the breakers.

In many cases, this is the appropriate action. However, this method can still be hazardous. When the supply to the electrical panel/breaker box is in a conductive pipe or weatherhead that has been exposed to high heat, it can degrade or melt the insulation around the wires or the spacer/grommet in the weatherhead, allowing the wires to touch the metal of the weatherhead. These failures allow electricity to flow into the pipe, the weatherhead, the electrical panel/breaker box, and whatever is attached to the electrical panel/breaker box. This causes the electrical panel/breaker box, as well as any conduit or other conductive material attached to it, to become energized, creating an electrocution hazard.

Shutting off the breakers in such a situation does not stop the flow of electricity, as electricity just bypasses the breaker and travels through the metal box and panel. Not only does this create an electrocution hazard to the person securing the utilities, it also endangers anyone who touches any conduit or piping attached to the electrical panel/breaker box, weatherhead or even ground wires attached to the electrical system.

Some building codes allow the grounding of electrical equipment to copper or galvanized water systems. If the electrical system is grounded to the water system, then the entire plumbing system for the house, as well as the panel/breaker box, may be energized. Watch out for that green line—it may bite!

The bottom line: When an electrical service drop or electrical panel/breaker box is involved in a fire, the firefighter securing the utilities must be aware of the possibility that the electrical panel/breaker box itself may be energized, and follow appropriate departmental policies. They must also inform the incident commander (IC) and incident safety officer (ISO) that the electrical system may not have been secured. For most departments, when a service drop or an electrical panel/breaker box has been heavily involved in a fire, the only way to guarantee the safety of the personnel

PHOTOS BRIAN BASTINELLI

If the structure has an overhead electrical service drop, and the point of attachment on either the pole or building is involved in fire, there's a significant chance that the wires will eventually fall.


archer
HazMaster
AMMONIUM NITRATE FERTILIZER
NITROMETHANE
Precursor outcomes:
Field PC

working in the area is to have the utility company disconnect service from the structure at the supply side before operations are resumed in the potentially energized area.

FALLING WIRES

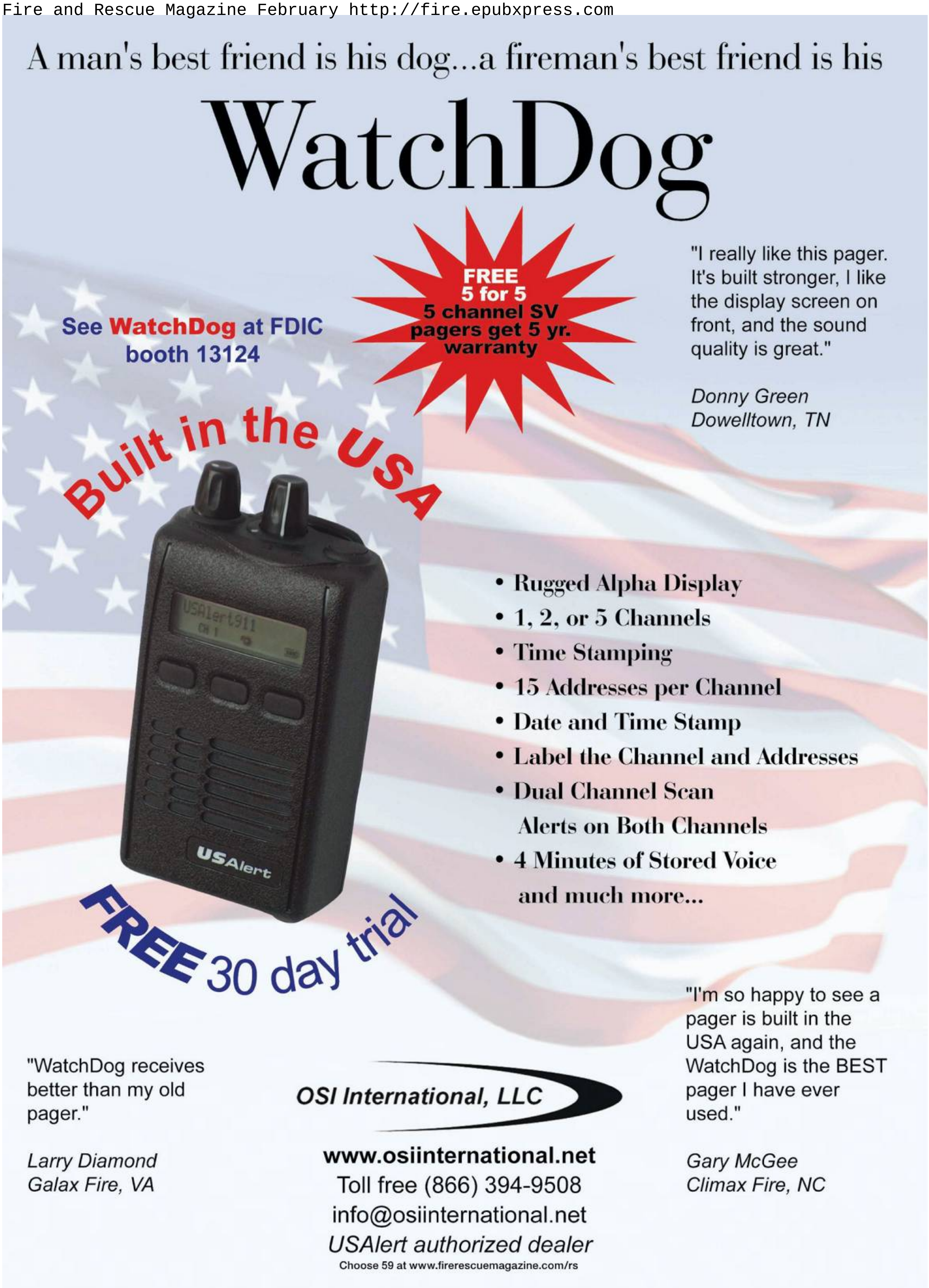
Overhead service drops are the source of another electrical problem associated with material failure. If the structure has an overhead electrical service drop, and the point of attachment on either the pole or building is involved in fire, there's a significant chance that the wires will eventually fall. In many circumstances, a steel or aluminum cable supports the service drop from a utility pole to a structure, with the electrical wire attached to or wrapped around the cable. The cables easily support the weight of the electrical wire under most conditions. However, these aluminum cables and the aluminum crimp connections that secure them can fail at relatively low temperatures.

In cases where these aluminum attachment points or cables have been exposed to heat or fire, they can melt and allow the cable to fall, bringing the electrical service wire with it. This downed cable can cause a number of different shock hazards. Initially, the cable may fall on or near people working in the area, causing a direct contact hazard that's difficult to see in the haze of firefighting operations, especially when it isn't expected or conditions have suddenly changed.

A more insidious hazard occurs when the wire falls into a pool of water that has formed in the area due to firefighting efforts, creating a hazard zone as large as the wet area while hiding the fallen wires under the muddy surface of the water.

Another hidden or remote danger can be created when the wire falls onto a chain-link fence, metal roof or other conductive surface. This allows the energized wire to transmit its electrical hazard long distances to wherever the electricity finds a sufficient grounding path, providing a significant hazard to both fire personnel and the public along the way.

Wires can also fall onto any vehicles in the area, including fire and emergency vehicles, adding the unfortunate element of professional embarrassment to the dangers of electrocution. If the stability of these service drop supports is in question, inform the IC and ISO, and make sure to alert the local utility company to disconnect power at the pole.


A man's best friend is his dog...a fireman's best friend is his
WatchDog
FREE
5 for 5
5 channel SV pagers get 5 yr. warranty
See WatchDog at FDIC booth 13124
"I really like this pager. It's built stronger, I like the display screen on front, and the sound quality is great."
Donny Green
Dowelltown, TN
Built in the USA
USAlert911
CH 1
USAlert
• Rugged Alpha Display
• 1, 2, or 5 Channels
• Time Stamping
• 15 Addresses per Channel
• Date and Time Stamp
• Label the Channel and Addresses
• Dual Channel Scan
Alerts on Both Channels
• 4 Minutes of Stored Voice
and much more...
FREE 30 day trial
"I'm so happy to see a pager is built in the USA again, and the WatchDog is the BEST pager I have ever used."
Gary McGee
Climax Fire, NC
"WatchDog receives better than my old pager."
Larry Diamond
Galax Fire, VA
OSI International, LLC
www.osiinternational.net
Toll free (866) 394-9508
info@osiinternational.net
USAlert authorized dealer
Choose 59 at www.firerescuemagazine.com/rs

POLE FIRES

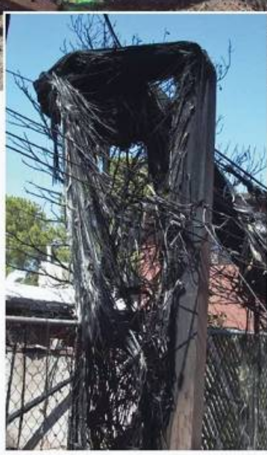
Pole fires are relatively common occurrences, often caused by lightning, electrical component failure and people doing the things that keep us in business. The typical scenario involves fire personnel and apparatus standing by, preventing spot fires or extension from falling embers, waiting for the utility crews to arrive and secure the electricity so fire personnel can apply water to the fire safely, if it hasn't already gone out.

When a wooden or metal pole is involved, it usually doesn't burn fast or long enough to become structurally weak enough to fail, but when it does burn enough to become dangerous, it's usually evident, giving fire personnel ample time to reposition their resources as needed.

The basically stable pole fire scenario can change dramatically when fiberglass utility poles are involved. Fiberglass utility poles are becoming increasingly common and are most often used in areas where it's difficult to maneuver the heavy equipment necessary to place or replace the more traditional, predictable wooden or steel utility poles. They are most common at the ends of long, narrow alleys, remote areas and many confined locations, both rural and urban. They are also increasingly being used in residential areas as "disguised" utility or cell phone tower structures, built in the shapes of trees, cactus or any other visually attractive shape.

When presented with a high heat source such as lightning or electrical component fire, a vehicle or structure fire, or even a sustained brush fire, the resin in fiberglass poles can ignite and burn, significantly weakening the pole. Although very strong when intact, fiberglass poles are easily weakened by fire or impact, such as from a vehicle accident. The hollow, lightweight poles don't need much time or visible damage to lose their structural integrity and fail. Unfortunately, it's often very difficult to safely determine the difference between a fiberglass pole and a steel utility pole until it's too late. If you're uncertain of the construction of an involved utility pole, position personnel and apparatus as if the pole is made of fiberglass and prone to failure. Be aware of the fall zone of the pole and any hazards, such as structures and fences, contained within that zone, and evacuate and secure as per your local SOPs.

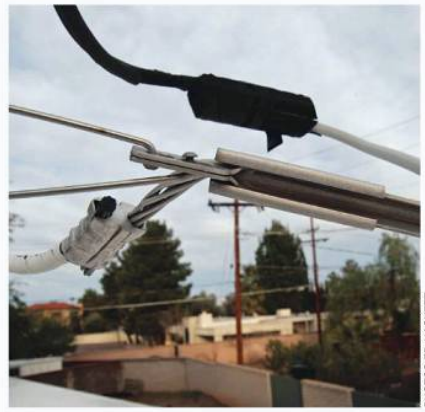
PHOTOS TUCSON FIRE DEPARTMENT



A fiberglass utility pole that was exposed to heat from a shed fire (inset photo shows closeup). The pole failed, dropping high-voltage wires onto apparatus parked in attack positions. Note the wooden pole still standing right next to the failed fiberglass pole. Also note the wires lying on the chain-link fence that runs several houses down the street, posing a long-distance electrocution hazard.

SOLAR INSTALLATIONS

A recent addition to the electrical hazards firefighters may face is the solar power generating system. These systems are largely unregulated or under-regulated from an electrical code standpoint and often carry much more current than standard residential systems. A fully operational solar panel system for a large residence or small business can generate upward of 200 to 600 volts and average 10 to 50 amps on a bright, sunny day. In addition, their output is not reduced on cloudy days as much as you may think. As long as the panels are ▶



PHOTOS ED HACKETT

An aluminum connector is crimped to an aluminum cable that acts as both a ground wire and support cable for other electrical service wires. Both connector and cable can fail quickly when exposed to typical fire temperatures.

exposed to light, there's a strong possibility that the system is generating current, and lots of it.

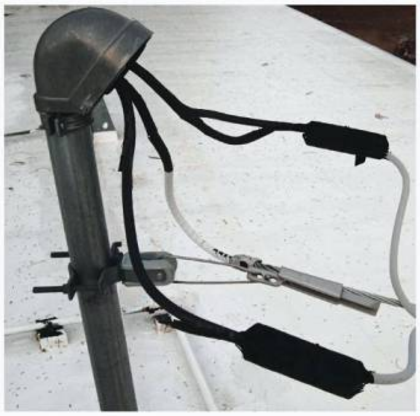
Anyone cutting into a solar power system or its wiring in an attempt to ventilate a roof may be in for a deadly surprise. These systems can be live as long as there's light, even when the breakers are thrown to the rest of the house. Although a few jurisdictions require cutout relays on such systems, most do not. At this point, the only way to safeguard any of these systems is to wait for night, or cover the panels with salvage covers or other light-proof cover. It's imperative to talk to the local installers and check your local codes so you can develop SOPs to work with these increasingly popular and potentially dangerous systems.

ILLEGAL/IMPROPER WIRING

Last but not least in our discussion of possible electrical hazards: the "freeloader," or do-it-yourself electrician. In trailer parks, apartment buildings, strip malls or even residential neighborhoods, it's not unheard of for multiple structures or businesses to be illegally or improperly wired from a single breaker box, panel or meter. Improperly wired additions pose the same problems. Although this practice is more common in structures with multiple service boxes close to each other, it can occur nearly anywhere.

There's often no easy way to discover this situation without testing outlets or appliances in the structure in question. Some indicators may be a secondary shutoff between an alley supply and a breaker box

[redacted]



A residential weatherhead service drop with aluminum cable and crimp connectors supporting the wires. These aluminum cables and connectors can fail under fire conditions, dropping the service wires to the fireground below.

or between a breaker box and a structure, a missing tamper clip on the meter, or large-diameter wires running from the back of a utility box or meter to a neighboring structure, business or service box.

A common victim of this scenario is the fire investigator, who, while digging through the structure for evidence, contacts a wire that is supposed to be de-energized only to find out that it is indeed still energized. Investigators or any personnel involved in overhaul or mop-up should use a "voltage pen" or similar indicating device to determine if a wire is de-energized before touching it. Don't assume that just because you've thrown what looked like the right breakers or switches that the service is disconnected. Better yet, wait for the utility company to disconnect the service if there is any doubt.

CONCLUSION

All of the above scenarios have occurred in my department over the past few years. They are presented here to help you recognize and prevent potentially dangerous electrical situations. Keep your eyes open and let the IC and ISO know of anything unusual or uncertain, and you may help someone you know go home at the end of their shift.

Ed Hackett is a paramedic fire captain with 15 years of career service for the Tucson (Ariz.) Fire Department. He worked as a wildland firefighter for the U.S. Forest Service prior to his structural career. A certified Fire Science instructor, Hackett also moonlights as a freelance writer.