



# Electrical Safety Alert



## Voltmeter Probes Catch Fire While Testing 120V Outlet

### Lessons Learned

- Do not store materials on wiremold strips, or directly above receptacle outlets.
- When testing damaged electrical equipment, use extreme caution. Ensure that conditions are known, and use PPE and electrical safe work practices appropriate for the conditions and equipment.
- Damaged electrical equipment must be Locked and Tagged (LOTO'd) at the source and verified de-energized.
- Multiple isolation points require Complex LOTO with a written procedure and verification.

### What Happened

A researcher was attempting to plug into a standard 20A wiremold outlet. View of the outlet was partially blocked by a wall-mounted shelf above the wiremold. A niobium level sensor rod was stored on top of the wiremold. The rod was knocked off the wiremold and fell between the plug blades and ground pin as the researcher pushed the plug into the outlet. This created a short circuit as the connection was completed, causing arcing between the plug and outlet (Figure 1). A 1000A circuit breaker in an upstream panel tripped from the ground fault, deenergizing the faulted circuit.



Figure 1

Electricians responding to the incident identified two circuits feeding the wiremold containing the damaged outlet, and turned off the circuit they believed fed the damaged outlet. A LOTO was not applied, and no zero energy verification was performed.

An electrician was dispatched the next day to troubleshoot power issues for the researcher and scope out repairs. The researcher requested that the damaged outlet be tested. The electrician inserted the voltmeter probes into the damaged outlet to get a voltage reading. When the Fluke T5-1000 probes were inserted into the outlet, sparking occurred, and the plastic of the Fluke CAT III / IV probe tips caught fire and had to be extinguished (Figure 5).

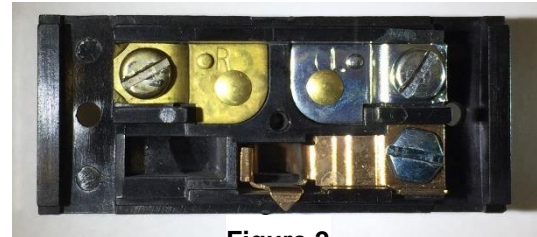


Figure 2

### Analysis

Analysis of the damaged outlet after removal from the wiremold showed very little damage to the internal components of the outlet. Furthermore, the likelihood of some contact between the hot and neutral blades, or hot and ground blades was nearly impossible, as disassembly of the outlet showed complete separation inside the outlet (Figure 2).



Figure 3

Further examination showed that the front of the outlet was not only damaged (melted), but that it had a thin film of soot and discolored material (Figure 3). Application of a multimeter showed continuity across the face of the outlet (Figure 4), and it was found that metal vapor from the plug, as well as the niobium rod had been deposited to the face of the outlet. Testing across multiple points on the face of the outlet showed readings ranging from 9 to 100 ohms. It is surmised that when the electrician inserted the voltmeter leads into the outlet, it created a short circuit across the face of the outlet.

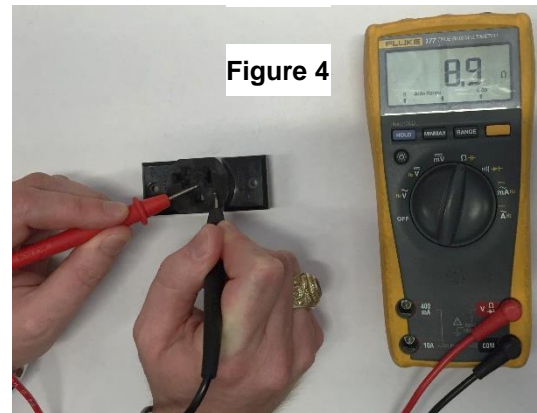


Figure 4



Figure 5