Multi-meter Accident Prevention Plan

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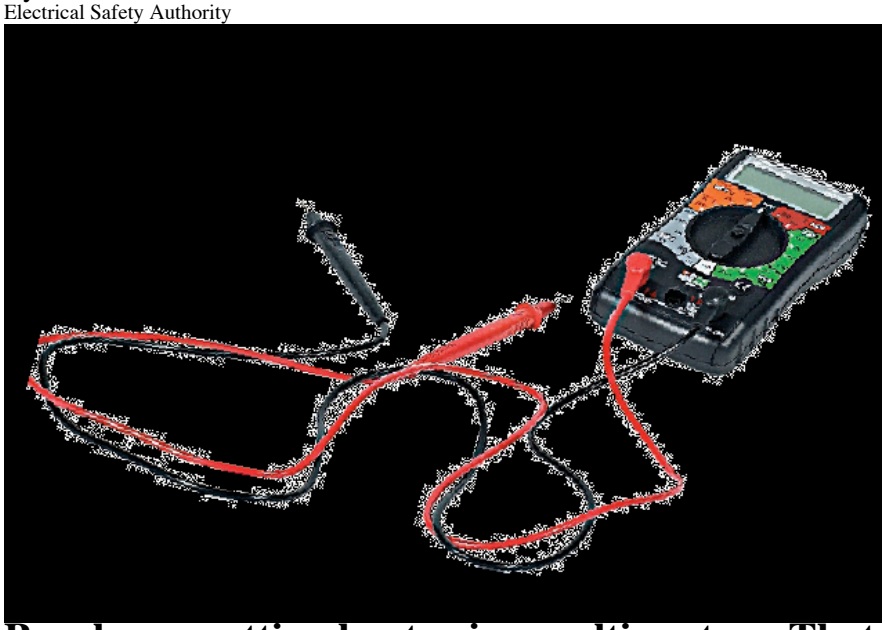


People are getting hurt using multi-meters. That is a fact.

Since the change in the 2002 Ontario Electrical Code requiring the mandatory reporting of electrical accidents to ESA, we have been able to do in-depth investigations, from a root cause perspective, focusing specifically on the electrical factors.

During these investigations, a trend involving multimeter accidents emerged and alarmingly revealed that approximately half of the reported multi-meter accidents resulted in critical injuries to the victim.

The numbers are alarming, in fact I cannot think of another single piece of electrical equipment that has as high a rate of injury to the worker. Something must be done, and ESA is taking the initiative. A recent survey ESA conducted with 5,000 electricians across the province revealed that 11 per cent of respondents had experienced a “violent failure of a multi-meter.”

This number is staggering and unacceptable.

Cause and determination analysis of these accidents pointed to “user error,” in the majority of cases, as the source problem followed closely by internal component failure.

User errors would include:

- Wrong settings (i.e. ohms scale selected when testing voltage)
- Wrong “Cat” area application
- Wrong probe socket used (i.e. amps instead of volts)
- Wrong use of the product, such as switching settings under power
- Wrong voltage applied, exceeding limits of meter.

Adding to the user error problem was wear, tear and contamination within the meter that creates internal component failures.

Closer examination of the devices involved in these accidents indicated that many of these products did not have internal protection and even with some that did, the protection did not

appear to prevent the introduction of a fault into the system, resulting in serious injury to the user from arc flash.
In most cases, it appears that although a direct fault itself did not cause the injury to the user, the meter had initiated a direct fault into the system being tested. As a result, a dead short was initiated right at the test probes' ends. This is the equivalent of putting a coat hanger right across the terminals being tested with the victim standing within a foot or so of the failure point.
With typical fault currents in industrial applications well over 10,000 amps, and the resultant arc flash temperature of up to 3,500 degrees Fahrenheit, it is not hard to see why there are so many critical injuries associated with these accidents.

Next, we assessed the standard governing multi-meters (C22.2 No. 61010) and found that it did not appear to address these specific issues. This is not totally unusual since it is field experience that drives a lot of standard changes. That is why they are constantly being updated by gained field experience.

The biggest challenge before ESA was to determine ways of preventing or reducing such tragic accidents from happening.

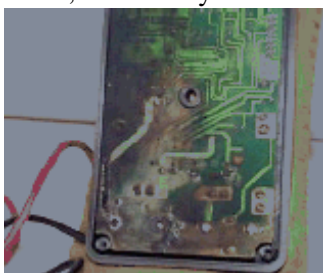
From the user error perspective, the fact that these tools are used for troubleshooting live equipment may be one of the problems. With many distracters, including concentrating on trying to figure out what is wrong with the piece of equipment being tested, the user can forget to switch the meter to the proper function and thereby initiate an internal failure. This dead short is then propagated to the system test point; the probes.

Another cause is associated with aging equipment. When a multi-meter has been in service for many years, it can begin to deteriorate or become compromised with contamination of dirt or moisture conductive material.

Frequent transient spikes are another leading cause of meter failure and unfortunately the user has no idea when a spike has, or will, hit the meter. So how does the user know what is going on inside the instrument? They usually don't, therefore it is important to have adequate, automatic protection for when things go wrong.

Like driving with worn tires and hitting an unexpected icy road, we have learned that seat belts and air bags can save lives, when user error or mechanical failures happen. I ask you then, why do we not have the equivalent of seat belts and air bags in our multi-meters?
The answer is, we can.

It is clear that we must do a better job of protecting the worker from life threatening arc faults, initiated by failures within a multi-meter, whatever the cause.



We need to create a so-called safety net that would better protect the operator of a multi-meter from failures within the meter.

The options include:
• Part II Standard Changes, for new equipment being produced; and,
• Adding protection for existing field product; and
• Education and behavioral changes at the user level.

The good news is that ESA has initiated all three of these options, simultaneously.
Fused leads seem like a viable option. The Electrical & Utilities Safety Association or E&USA has had a fused lead policy in place for some time with good success. However, fused leads needed to be tested to verify if they truly would protect the user from any or all of the five most common user errors as well as other internal failures.

To this end, ESA contracted a high voltage, high current laboratory to test the effectiveness of fused leads in handling internal meter failures.
The resultant testing indicated that when properly applied, fused leads prove to be an effective method in preventing at least four of the five most common user error scenarios and most internal failures. The only scenario the fused leads could not protect the user from was an extreme over voltage condition. This was due to the voltage limitations
of the fuse itself.

At the same time, an initiative was begun to update the Part II Standard, based on these laboratory findings. This is presently ongoing. Since the standard change will take time and will only affect new products built after the adoption of the new standard, something has to be done to address the thousands of multi-meters in use in the field every day. Therefore, the next logical step is to seek stakeholder support for the "mandatory use of approved fused leads on all construction and industrial sites in the province of Ontario."

This initiative is key to the reduction of accidents involving multi-meters and the protection of the worker. With expected stakeholder support, we will begin an aggressive education program, which will reach out to all the electrical trades in Ontario.
With this campaign, we hope to significantly reduce the number of accidents involving multi-meters, making it a safer place to work and build added confidence in the electrical safety system of Ontario.

But don't wait for these changes to take effect, take charge of your own safety, now. Never use a multi-meter without fused leads – your safety may depend on it.
Remember to "fuse it" or "lose it!"

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