Current Metering Safety Topics

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For North Carolina Electric Meter School
Single Phase Panel Discussion
Thursday, June 27, 2019 at 10:00 a.m.

Metering Safety

Fatal Electrical Injuries

- The 154 electrical fatalities that occurred during 2016 represent a 15% increase over the 2015 total.
- Exposure to electric current increased one place to sixth on the list of occupational exposures leading to fatal on-the-job injury, trading places with aircraft fatalities.
- Once again, electrocutions constituted the vast majority of electrical fatalities while electrical burns of all degrees were responsible for four fatalities.

Metering Safety

Fatal Electrical Injuries

- The highest rate of fatal electrical injury in 2016 occurred in the Utility industry (0.87/100,000), followed closely by the Construction industry (0.82/100,000).
- In 2016, there was one electrical fatality for every 34 fatalities from all causes versus one for every 36 fatalities in 2015. The long-term trend has declined from one electrical fatality for each 23 fatalities from all causes in 2003 to the 2016 level of one in 34.

Does Age Matter – Or Experience?

Fatal Electrical Injuries

- In 2016, 3% of fatalities from all causes involved electricity. The data show that younger workers experience fatal electrical injury at up to 2.3 times the frequency of more experienced workers.
  - Workers 16 to 17 years of age experienced electrical fatalities at 2 times the average for all age groups;
    - 18 to 19 years age group - 2.3 times;
    - 20 to 24 years age group - 1.7 times;
    - 25 to 34 years age group - 1.3 times, and;
    - those 45 years and up are at or below the average frequency of electrical injury.

Non-Fatal Electrical Injuries

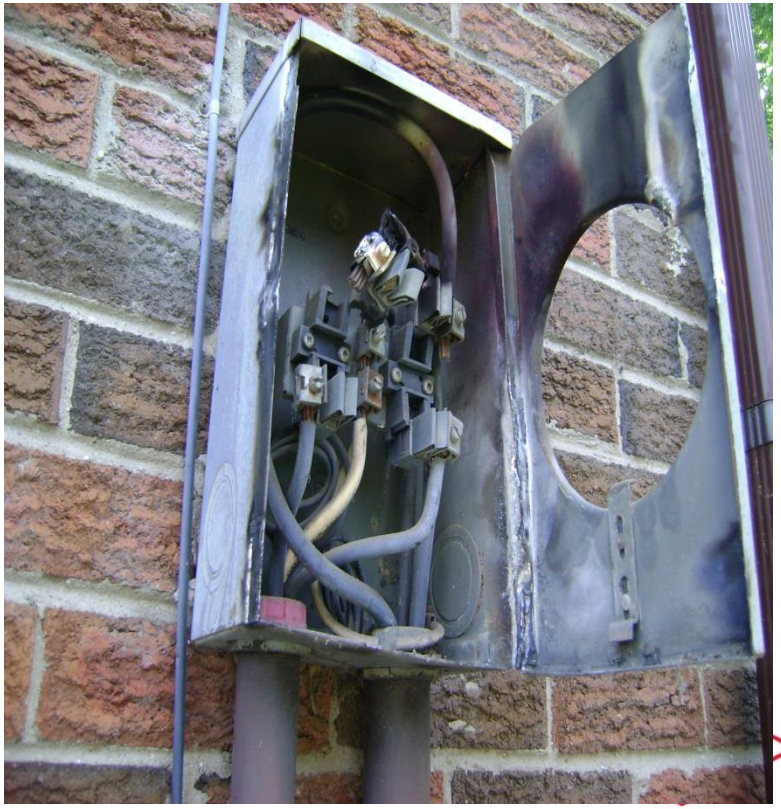
- The median number of days away from work for nonfatal electrical injuries was 5.
- More electrical burn injuries (270) than electric shock injuries (150) occurred in the Construction industry in 2016. Numbers of electrical shock injuries for the Utility industry were unavailable for 2016, while 50 electrical burn injuries were recorded.
- The Utility industry rate of nonfatal electrical injury involving days away from work (0.9/10,000) surpassed the Construction industry rate (0.7/10,000) in 2016.
- The Mining industry had rate of nonfatal electrical burn injury of 1.0/10,000 for 2016, followed by the Utility industry (0.9) followed by the construction industry (0.4). The rate for all of Private industry remained consistent at 0.1.

How Dangerous is Metering?

Electricity is Organized Lightning – George Carlin

Any Voltage without current will not kill you, but any voltage with current can kill you.

How Dangerous is Metering?



Safety First - PPE

Personal Protective Equipment

- Leathers
- Rubber Gloves
- Face Shield
- FR Clothing
- Safety Shoes

Arc Flash

What is Arc Flash?

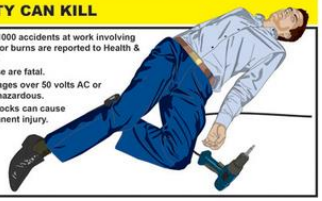
While an arc flash is sometimes used interchangeably with “arc fault”, an arc flash is more accurately defined as the light produced during an arc fault. An arc fault is a type of electrical fault that results from the breakdown of an insulating medium between two conductors where the energy is sufficient to sustain an arc across the insulator (often air) and can cause extreme amounts of light (arc flash), immense heat upwards of 19,000 degrees C, and a resulting explosive pressure wave (arc blast). These forces combine to create a hazardous condition that can vaporize metal, destroy equipment, and pose a significant hazard to anyone in the vicinity.

Covering the Basics

More of the Basics

Electrical Safety

ELECTRICITY CAN KILL



- Each year about 1000 accidents at work involving electrical shocks or burns are reported to Health & Safety Executive.
- Around 30 of these are fatal.
- Shocks from voltages over 50 volts AC or 120 volts DC are hazardous.
- Even non-fatal shocks can cause severe and permanent injury.

WHAT DO THE REGULATIONS REQUIRE?

The Health and safety at Work Act 1974 states that:

- Employers are responsible for ensuring the safety and health of their employees and the public, if they are at risk from work activities.

The Electricity at Work Regulations 1989 states that:

- Electrical systems must be constructed in a way that prevents danger.
- Employers, employees and the self-employed must maintain electrical systems as necessary to prevent danger.
- Employers, employees and the self-employed should carry out work on electrical systems in a manner that prevents danger.
- Electrical equipment used in hazardous environments must be constructed or protected to prevent it becoming dangerous.
- Only those with competent knowledge or experience or under adequate supervision should work with, or on, electrical equipment that could cause danger or injury.

The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 requires employers, and other people who are in control of work premises, to report:

- Work-related deaths
- Major injuries
- Certain 'dangerous occurrences'

For example an injury resulting from an electric shock or electrical burn leading to unconsciousness, resuscitation or admittance to hospital for more than 24 hours must be reported.

If electrical short circuits or overloads causing a fire or explosion, which results in the stoppage of the plant for more than 24 hours or has the potential to cause death, the event must be reported.

How to report?

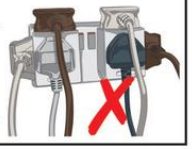
- Online at www.hse.gov.uk/riddor completing the appropriate online report form.
- By Telephone only in the case of fatal and major injuries only. Call the Incident Contact Centre on 0845 300 9923.

ASSESSING THE RISKS

Risk assessment consists of 5 steps:

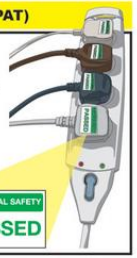
01. Identifying the hazards.
02. Deciding who might be harmed and how.
03. Evaluating the risks and deciding on precautions.
04. Recording your findings and implementing them.
05. Reviewing your risk assessment and updating it if necessary.

Most common risks come from:



- Contact with live parts.
- Electrical faults, the risks are greatest where the equipment contains a heat source.
- Flammable or explosive atmospheres.
- Harsh conditions where unsuitable equipment can easily become live and make its surroundings live and dangerous.
- Confined spaces, where, if an electrical fault develops it will be difficult to avoid a shock.
- Equipment such as extension leads and flexible leads which are particularly liable to damage.

PORTABLE APPLIANCE TESTING (PAT)



PAT is the examination of electrical appliances and equipment to ensure they are safe to use as some types of defect can only be found by testing.

The Electricity at Work Regulations 1989 require that any electrical equipment that has the potential to cause injury is maintained in safe condition.

There are no specifications in the regulations on what needs to be done, by whom or how frequently. The frequency of inspection and testing depends upon the type of equipment and the environment it is used in.

Testing should be conducted by a competent person with appropriate equipment and the knowledge to carry out the tests and to understand the results.

Labeling equipment that has been inspected or tested as well as keeping records is not a legal requirement but can be a useful management tool for monitoring and reviewing the maintenance scheme.

REDUCING THE RISKS FOR EMPLOYERS

Ensure people working on or with electrical equipment or systems are 'competent' for the task.

Ensure the electrical installation

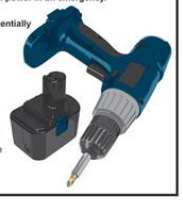
- Complies to BS 7671:2008 Requirements for electrical installations.
- Is maintained in a safe condition.

Enough socket outlets are provided.

Provide safe and suitable equipment

- Equipment must be suitable for its working environment.
- Consider using air, hydraulic or hand-powered tools in harsh conditions.
- Provide a switch near each fixed machine to cut off power in an emergency.
- Replace damaged sections of cable completely.
- Special electrical equipment should be used in potentially flammable or explosive atmospheres.
- Consider asking for specialist advice.

Reduce the voltage



- Temporary lighting can be run at lower voltages.
- Battery-operated tools are safest.
- Portable tools designed to be run from a 110 volt centre-tapped-to-earth supply are available.

Provide a safety device, such as a residual current device (an RCD), if equipment operating at 230 volts or higher is used. An RCD is a device which detects some faults in the electrical system and rapidly switches off the supply.

A competent person should carry out preventative maintenance periodically.

REDUCING THE RISKS FOR EMPLOYEES

Visual inspection should also be done by employees.

Work safely

- Suspect or faulty equipment must be taken out of use, labeled 'DO NOT USE' and kept secure until examined by a competent person.
- If possible, tools and power socket outlets should be switched off before plugging in or unplugging.
- Equipment should be switched off and/or unplugged before cleaning or making adjustments.

Always expect that cables will be present and live when digging in the street, pavement or near buildings.

Have overhead electric lines switched off if possible or maintain safe working distance from the lines.

The line or track operating company must be consulted before starting work near electrified railways or tramways.

The information contained in the poster is for guidance only and should not be used as a substitute for recognised training.

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How Bad Can Things Get?

Many thanks to Dominion Power

https://youtu.be/2Xoyb9M5-EA

Rubber Gloves and FR 4:10

Meter enclosure – shorted out 10:48

Thanks to Meter Grabber

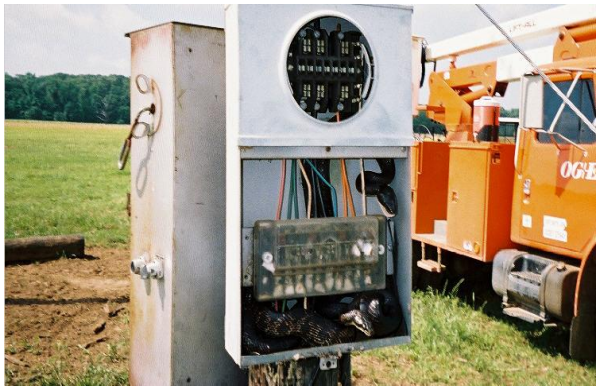
https://youtu.be/Azuu8VnM36g

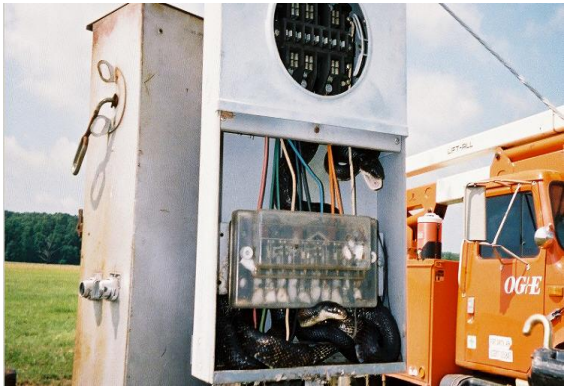
Field Audits, Trouble Shooting and Testing

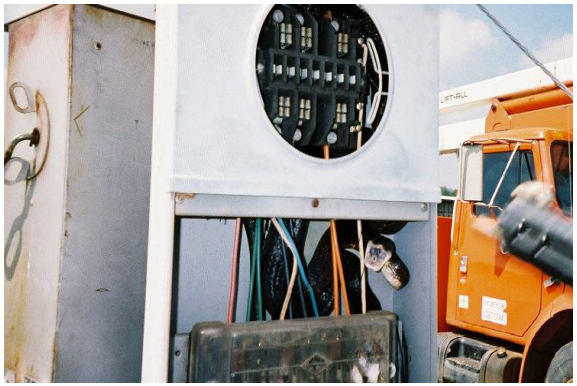
- Always approach an electrical service with caution and while wearing your full PPE. Why?
- Never stand directly in front of the meter when removing the meter
- Before you even open the box or get the cover off….
    - Live box
    - Bees
    - Other live animals
- Broken Seal
- Cover dropping off

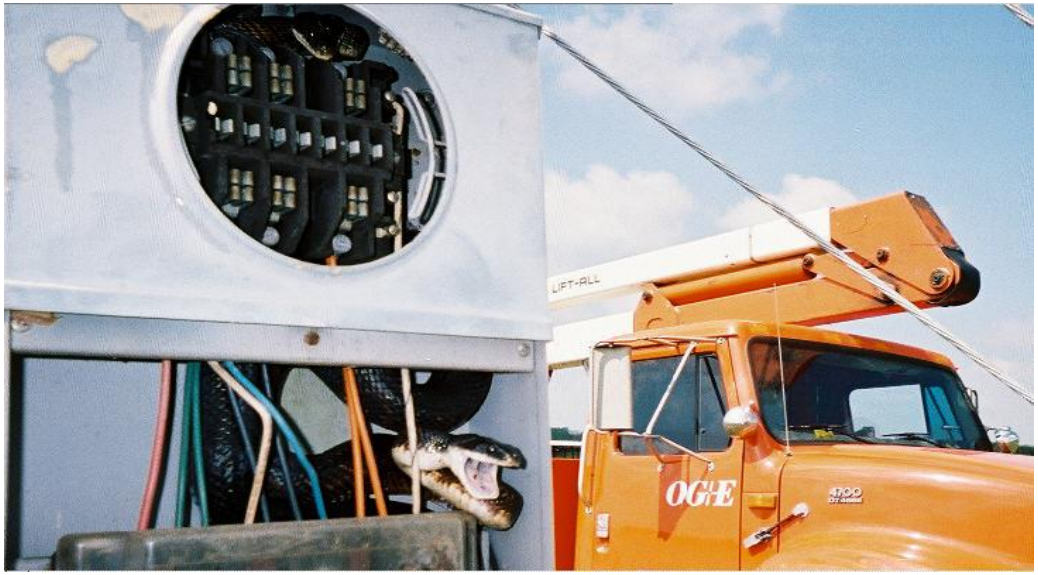
Field Audits, Trouble Shooting and Testing

Field Audits, Trouble Shooting and Testing









Once the box is Open
Issues to Look For

- Open line – open line side connection to the meter socket.
- Missing neutral – missing neutral connection to the center lug in the meter socket
- Cross phase condition – cross wiring between the test block and the meter socket.
- Hidden jumpers line to load – diversion on both legs.
- Dead Short - dead short phase to ground on the load side of one leg of the socket.
- Partial Short - partial short phase to ground on the load side of one leg of the socket

Backfeed, Ground Fault and other Issues to Look For

- Back fed meter socket
- Ground fault
- Phase to phase fault
- Pulling a meter jaw with the meter

Tools

- Socket Pullers
- Volt meters
- Specialized tools

Summary

- Be Careful
- Assume the box is live
- Assume there is something live in the box
- Treat electricity with respect
- Treat all meter boxes with respect

Questions?

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This presentation can also be found under Meter Conferences and Schools on the TESCO website:
www.tescometering.com