

Looking for Dangerous Installations and Incorrect Billing

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- Importance
- Dangerous Installations and Conditions
 - Incorrect Billing
 - Useful Tools and Equipment



Metering Safety

Fatal Electrical Injuries

- There were 166 electrical fatalities in 2019, which was a 3.75% increase over 2018 and the highest number of electrical fatalities since 2011.
- In 2019, 8% of all electrical injuries were fatal.
- The number of electrical fatalities varies between ages:
 - 11% of electrical fatalities occurred in workers aged 20 24
 - 30% of electrical fatalities occurred in workers aged 25 34
 - 27% of electrical fatalities occurred in workers aged 34 44
 - 17% of electrical fatalities occurred in workers aged 45 54
 - 13% of electrical fatalities occurred in workers aged 55 64





Metering Safety

Fatal Electrical Injuries

• 30% of all electrical fatalities occurred at a private residence. Industrial places and premises accounted for another 30% of fatalities. Public buildings accounted for 13%, street and highway accounted for 11%, and farm for 6%.





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



TESID .

More of the Basics



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More of the Basics

IMPORTANT

Always follow your own utility's and PSC/AHJ's requirements and guideline for PPE, correct meter installations, and safety procedures.



Approaching the Meter Installation

- 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
- Signs of Vandalism and Tampering
- Storm Damage
- Missing knock-outs
- Cracked or broken conduit
- Loose connections of the meter base, including meter pulling away from the building wall and loose mounting screws
- Inadequate fastening of the meter base and/or mast to the building





Approaching the Meter Installation





Approaching the Meter Installation







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





Once the Box is Open Issues to Look For

- Mechanical breakdown of components
- Excessive moisture
- Environmental contaminants
- Frequent meter change outs (resulting in loss of jaw tension)
- Excessive electrical load (overload or short circuit)
- Loose or melted conductors
- Ground settling
- Signs of previous arc flashes
- Corrosion levels on components





Once the Box is Open Issues to Look For

- Back fed meter socket
- Ground fault
- Phase to phase fault
- Pulling a meter jaw with the meter
- Evidence of a <u>hot socket</u>





What is a Hot Socket?

- Hot Sockets are not a new phenomenon. Virtually every meter man has pulled a meter with a portion of the meter base around a blade melted and virtually every utility has been called to assist in the investigation of a fire at a meter box.
- AMI deployments because of the volume of meters involved put a spot light on this issue.
 - What causes a hot socket?
 - Are the meters ever the cause of a meter box failure?
 - What are the things to look for when inspecting an existing meter installation?
 - What are the best practices for handling potential hot sockets?
- This presentation will cover the results of our lab investigation into the sources for hot sockets, the development of a fixture to simulate hot sockets, the tests and data gleaned from hot sockets, and a discussion of "best practices" regarding hot sockets.





Common Features and Common Sources of Concern



- Pitted and discolored meter blades
- Melted plastic around one or more of the meter stabs (typically the plastic around one stab is where the deformation starts)
- Pitted and discolored socket jaws
- Loss of spring tension in the socket jaws















Slide 21

ZESCO 21

- Calipers show a .01" gap, with that size gap between jaws and stabs we were able to heat meter stabs over 1000 degrees Fahrenheit in a few minutes.
- The rough spots you see on the post-test jaw next to the calipers are over .005" high. This surface degradation appears on the stab as well.
- Between the two surfaces you can have large gaps, along with insulating byproduct of the arcing, that can sustain heavy arcing in a solid state.





Insertions	Normal #1	Normal #2	Heated #1	Heated #2
1	56	55	13	22
2	54	53	7	6
3	36	32	6	6
4	33	31	0	0
5	28	31	0	0
6	31	18	0	0
7	23	15	0	0
8	19	14	0	0
9	16	15	0	0
10	16	15	0	0
11	16	15	0	0
12	15	15	0	0
13	15	15	0	0
14	15	15	0	0
15	15	15	0	0
20	14	13	0	0
25	12	12	0	0
30	11	11	0	0









• Any mistake in any part of the service can cause a billing issue









- CT's Mis-wired
- CT's Shunted
- Wrong Label
- Magnetized





- Reversed CT Secondaries
- Crossed CT's
- Mis-wired Test
 Switch
- Test Switch Left
 Open





- Inaccurate Meter
- Incorrect Multiplier





Incorrect Multiplier





Incorrect Multiplier

- Difference between meter reading and actual energy usage





Incorrect Multiplier

- Difference between meter reading and actual energy usage
- VT's 480:120 = x4





Incorrect Multiplier

- Difference between meter reading and actual energy usage
- VT's 480:120 = x4
- CT's 400:5 = x80





Incorrect Multiplier

- Difference between meter reading and actual energy usage
- VT's 480:120 = x4
- CT's 400:5 = x80
- Multiplier = 320

The multiplier is multiplied to the meter registration to equal primary energy used.



Useful Tools and Equipment



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References

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Questions?



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

