

# ES&H Coordinator's Meeting

## Accident Investigation Scenes

*June 11, 2008*



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NATIONAL LABORATORY

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# Incident Investigation

Recently during an investigation of a non-obvious electrical shock event, the incident scene was changed prior to the conclusion of the investigation.

## ■ Overview

- During a rain storm a technician was in a basement area (pit), wearing contamination PPE, and appeared to get 2 static shocks.
- We all know that high humidity diminishes the chances of static shocks, so we investigated for another source.
- At another Lab there was an ORPS of a person getting a shock entering a building caused by a short to ground of under-walkway snow melting circuitry, so we know electricity can travel through wet concrete.

# Overview -Testing and Investigation

- Because of the radiation pre-planning, testing was not able to start until long after the rain had stopped.
- A Plant Engineering electrician went into the pit area and measured for stray voltages without success.
- He also verified all the metal and equipment was grounded.
- We then did testing with the equipment energized and running and again the results were negative.
- The next testing the technicians repeated the task and the only suspicious result was a static meter reading of the collection funnel and bottle. The electric potential of the funnel and contamination clothing increased to 1kV while sample water was flowing, however it was not raining.

# Final Testing to Determine Actual Cause

- The one possible cause not ruled out was stray voltage from an unknown underground or concrete embedded 480 volt utility that required wet conditions to energize the area.
- The electrician set-up external wires to test exterior to the pit on short notice with a metal plate on the floor to simulate the technician standing.
- 2 weeks after the initial incident we again had rain that would raise the water table to the original conditions.
- Upon setting up to perform the testing the electrician observed the plate had been moved and the floor had been epoxied.

# Conclusion

- We set the plate back on the floor and took measurements
- All voltage readings were negative and all grounding readings were as expected.
- The likely cause of the shock was a static build-up on the anti-contamination clothing, however because the floor was epoxied we can not rule out stray utility voltages even though it is unlikely because of the rubber shoe covers.

# Another Incident Scene Disturbance

- Another static like shock occurred in physics - the technician went to the clinic, the clinic called SHSD and the Electrical SME was notified the next day and went to investigate.
- The experiment had been taken apart and the SME couldn't take any measurements or even examine the scene as incident happened. He had no choice but to write up the investigation as possible causes.

# Lessons Learned

- We cannot determine the cause of an injury or incident if the equipment/site is changed before the investigation is complete.
- Do Not change an accident/incident site before an investigation can be conducted:
  - Most important is to take care of injured personnel.
  - Make site safe so others don't get hurt.
  - Don't allow any clean-up or repairs until approved by investigators.

# ES&H Coordinator's Meeting

## Lockout/Tagout Annual Audit

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# Lockout/Tagout Training Questionnaire

Training Department is doing a Lockout/Tagout assessment that can meet your requirement for annual audit.

Large Departments have their own representatives on the LESC and can take care of themselves. Any volunteers for the questionnaire?

# ES&H Coordinator's Meeting

## Use of Voltage Rated Gloves

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# Use of Voltage Rated Gloves Requirement from 70E

**Table 130.7(C)(9)(a) Hazard/Risk Category Classifications**

Task (Assumes Equipment Is Energized, and Work Is Done Within the Flash Protection Boundary)	Hazard/ Risk Category	V-rated Gloves	V-rated Tools
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Panelboards Rated 240 V and Below — Notes 1 and 3
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Circuit breaker (CB) or fused switch operation with covers on	0	N	N
CB or fused switch operation with covers off	0	N	N
<u>Work on energized parts, including voltage testing</u>	<u>1</u>	<u>Y</u>	<u>Y</u>
Remove/install CBs or fused switches	1	Y	Y
Removal of bolted covers (to expose bare, energized parts)	1	N	N
Opening hinged covers (to expose bare, energized parts)	0	N	N

# Use of Voltage Rated Gloves

## Why not required

OSHA published an Interpretation saying not required to wear insulating gloves while working with test equipment if:

1. Probes are designed so employees hand can not slip off
2. No other exposed energized parts that hands might contact.
3. Also meet other requirements of Subpart S:
  - Hazard of electrical shock must be to a safe level
  - Qualified worker
4. EFCOG has accepted this Interpretation and will publish on the Center of Excellence for Electrical Safety web site.

# Use of Voltage Rated Gloves

BNL LESC has accept EFCOG Interpretation and do not require voltage rated gloves for testing provided:

- Equipment is 120 volt single phase
- Available short circuit current is less than 10 kA
- Test equipment is rated Cat III or Cat IV
- Probes are designed non-slip
- The only energized parts the hands can come into contact are those being tested.

We are changing training right now and will change the Subject Area when we get all the revisions together for the next change.

# ES&H Coordinator's Meeting

## High Voltage Low Current

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# High Voltage, Low Current Shock Hazard

Electrical Equipment operating above 50 volts and below 10 kV and:

- 5mA or less of current
- Or less than 10 Joules

Are not electrical shock hazards.

Secondary hazards received from the shock must be addressed in work planning

- Falling off a ladder or stool
- Dropping a tool
- Banging arm from jerking away

# High Voltage, Low Current Shock Hazard

Old ESH 1.5.0 – Electrical Safety for Range B, C, or D had in the Criteria:

“...with greater than 10mA of available current or capable of an instantaneous release of greater than 10 Joules of energy.”

Why 5 mA now?

- Research shows 99.5% of people can release at 5 mA or less.
- GFCI's are set at 5 mA

# Thankfully – The End Questions?