



Minutes submitted by: Heath Garrison
EFCOG Electrical Safety Subgroup
Spring 2011 Meeting Minutes
Toronto Sheraton City Centre
Sheraton Hall C Room
January 24 2011

Monday, January 24, 2011 - 8:00 - 5:00

Attendees

Searfoss, Skip	DOE
McAlhaney, Jackie	Chairman-SRNS
Christensen, Greg	Vice Chairman-INL
Garrison, Heath	Secretary-B&W Pantex
McNellis, Mark	Chair Emeritus-SNL
Gordon, Lloyd	Past Chair-LANL
Inskeep, Dave	INL
Whipple, John	INL
Jacobson, Jim	INL
Cooper, Roger	INL
Waters, Richard	INL
Wright, James	BNL
Mills, T. David	SRNS
Sparks, Bobby	PNNL
Sferrazza, Sal	NREL
Gershon, Keith	LBL
Dreifuerst, Gary	LLNL
Clark, Eva	LLNL

Time	Topic	Lead
8:00 – 8:15	Purpose and Introductions (new officers)	Jackie McAlhaney
	<ul style="list-style-type: none"> Jackie opened the meeting with introductions from around the room, and introduced the new officers for the next two years. (Jackie McAlhaney-Chairman; Greg Christensen-Vice Chairman; Heath Garrison-Secretary; Mark McNellis-Chair Emeritus; Paul Chapman-Member at Large(Paul was not in attendance)) Jackie presented a power point. It was to discuss ESSG business, review recent events, status of current initiatives and schedules, identify new initiatives and goals for 2011, and plan the 2011 workshop. See attached power point below for more details. Jackie discussed the Agenda for today. See attached agenda below. 	
8:15 – 8:45	Review ESSG Charter	Jackie/group
	<ul style="list-style-type: none"> Jackie asked the group to read and review the current charter. All read and no one had any suggestions for change. Jackie had a suggestion to add the past chairs to continue on the executive board as advisors. Sal commented that he liked the idea. Jackie motioned to add this wording, Greg seconded, and no one opposed. Motion passed. Lloyd commented that the role as an advisory would carry no authority for this role; it would also help with travel for these past chairs to be included on the board. 	
8:45 – 9:15	ESSG Business	Jackie





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Review of current members list

- Jackie passed out the current list of members for the ESSG. He asked all to review and make sure that we were all on it and if there are any changes. There are a few changes.

Teleconference

- Jackie asked about the teleconference and was asking for suggestions or ideas to change or continue with the current way we are doing it.
- Greg suggested having more guest speakers. Everyone was okay with this. Several people commented on how good the last meeting was when Lanny Floyd was on the call.
- Jackie suggested having an update from the subcommittees. Maybe have two sub groups give an update one month and the next month have the other two give an update.

Website

- See the power point by Jackie for web site update info.
- Jackie asked for volunteers to look over the best practices on the web site and make sure we are still up to date, or if the best practices have changed or need to be changed.
- **Greg Christensen and David Mills said they will look them over.**
- Center of Excellence website: Lloyd was asking for ideas to add to the COE web site. He stated that the site is getting thousands of hits a month worldwide. The draft DOE ES Handbook is on the site.

Pending Initiatives

- See Jackie's power point.
- Jackie asked for volunteers for interpretations for the v-rated gloves and the NEC 422.51 vending machines papers. Lloyd said that they use the current letter for their v-rated gloves and when to use them. Keith said that we need to be careful on how we do these and make sure we do not violate some of the local OSHA state rules. There was lots of discussion about what is contact and the definitions from the NFPA 70E. (Richard, Sal, Keith, Gary, Lloyd, Mark)
- A suggestion was made to formalize a process for implementing the interpretation process. Jackie and Sal talked about this subject. **Gary Dreifuert and Mark McNellis will work together to develop this process.**
- The vending machine letter was discussed. The letter is attached below. **The group was asked to review that letter and provide feedback.**
- **Lloyd will develop a method for the DOE ES Handbook change requests.**
- Follow up on 2007 workshop working group Engineering Solutions to Electrical Safety: What should we do with this working group? Is this for facility or R&D? Gary said from what he remembered, the group was mainly for facility type issues. Lloyd suggested the possibility of this continuing as a working group this fall.

Electrical Safety Assessment document

- The document is good. It was developed by Randy Unger. Jackie is asking for reviewer.
- **Mark McNellis, Greg Christensen, Gary Dreifuert, and Lloyd Gordon will review the document.** Jackie will lead this team.

Future Meetings

- Jackie had some slides about the future meetings. See his power point below.
- Jackie was asking for possible future sites for the fall workshops. 2012 in Argonne is still up in the air. Jackie will contact Jerry Grant to discuss this. Greg said that INL could be a possible alternate to Argonne if Jerry could not get it there.

Proposed 2011 Goals

- See Jackie's power point below for complete list.
- Jackie also suggested that the group develop another IEEE paper for the 2012 ESW in Daytona Beach. Abstracts will be due by May, and the paper due by October. Jackie suggested that the paper be on "Establishing an Electrically Safe Work Condition for R&D Work". **Lloyd Gordon, Marc Williams, Gary Dreifuert, Bobby Sparks, Heath Garrison, Greg Christensen, John Whipple, and Eva Clark will work together on this effort.**





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- Mark suggested as another option to have someone from the subsurface subcommittee present on their best practices or someone present on use of the electrical severity index tool as these were almost complete and would be easy to put together quickly

9:15–9:45 NFPA 790/791

Keith Gershon

- See the power point Keith presented below.
- This is not a standard, it is a recommended practice. the acceptance is similar to the one in the DOE ES Handbook. Keith is the expert and on the committee for these two new documents. **Lloyd will put him as the expert on the COE website.**

9:45 – 10:00 Break

10:00 – 10:30 2010 Event Analysis

Skip Searfoss

- See Skip's power point below.
- Skip talked about how all reporting is up. 20% of all reports were electrical in 2009 and 15% in 2010. Electrical events are down for January. Mark suggested that if electrical events are up for the past year and reporting in general is up, while the Electrical Severity Index is down then this is a positive sign and that this is what the severity index tool was intended to do. Skip also believes this is due to use of the severity tool. Skip thinks we need to advertise the tool more.
- After Skip's power point, Lloyd was bragging on the Electrical Severity Tool and how it was the best product the ESSG has produced.
- Jim Wright asked about how many of the events are from new construction job, Skip did not have the answer.
- Richard asked about using the tool to analyze the hazards before the work starts. He thought it would be a good tool to analyze the available hazards. All agreed.

10:30 – 11:00 Recent events and lessons

All (Jackie lead)

- Lloyd asked to go first. He wanted to let everyone know of a recent event that happened in LANL. This dealt with workers working in a medium voltage vault. The task was to core drill some 8" hole into the vault for a new tie in. There was some arguing and union issues between the lineman and the inside wireman, both groups believed that it was their work. The inside wiremen decided to go head and perform the core drilling work. The workers drilled from the outside in. The core drill penetrated the vault and missed the energized medium voltage cable by about an inch. There were no injuries. They had an employee looking into the vault to verify the penetration was coming through in a good location. These were LANL employees.
- Lloyd talked about the March 2009 shock event. He stated that they are having several problem areas: security, environmental, and construction. These groups are not implementing the ES program.
- Jim Wright asked the question; Should we shutdown the medium voltage in manholes for pulls and splices? The industry standard is to not shutdown yet the DOE sites do. INL has a white paper about assessing this type work.
- Jackie spoke about the SRS arc flash event that they received the Preliminary Notice of Violation. The report is available for all that would like to read it. Jackie said it was a willful violation. He told us that the workers were using hammers and pry bars to try to line up the bucket. The workers placed a level on the bucket, left for lunch, came back, and continued working on the bucket. That is when the level fell into the energized parts faulting phase to ground.

11:00 – 11:15

DOE Electrical Safety Handbook

Lloyd Gordon





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- Lloyd gave an update on the handbook. He stated that it is ready for Rev.Com. In addition, he said that we would need resolution help when the comments state to come back. We will need 3 to 4 volunteers. Maybe even all meet together at a location to work through all the comments at once.

11:15 – 11:30 Proposed ORPS Criteria Status

Mike Hicks

- Lloyd said that the proposals have been submitted for the complex review. See proposal below. Now we just wait.

11:30 – 1:00 Lunch

1:00 – 2:30 Subcommittee Reports

DC

Keith Gershon/Lloyd Gordon

- Lloyd talked for the DC working group. He said that there is not much going on right now. we need to be working on NFPA 70E proposals. He said that the DC shock boundaries table will be in the 2012 70E. There is still some work to be done on DC arc flash calculations. We should do some work on the DC absence of energy verification.
- Gary talked about some DC arc flash work and said he had a spreadsheet built to calculate the DC arc flash boundary. He talked about how <42 KJ capacitor bank was not much of an arc flash hazard, but it was still deadly. Most of the energy would be in the shock wave. The group is working on a paper for the DC arc flash. He said that the Dan Doan calculation was proposed for 70E.

Hazardous Energy Control

Heath Garrison/Skip Searfoss

- Heath gave a presentation for the update on the HEC committee. See the power point below.

Subsurface Investigation

Dave Inskeep

- Dave Inskeep talked about the subsurface group. He said that they are continuing to work with other sites to develop their programs, review new technology, and access new methods. He stated that they purchased a new Mala Mira System GPR that is the best available technology for sub-surface investigation. The group wants to set up a meeting to demo the new technology.
- Sal said that they have a new company performing their sub-surface investigations. He said that it was too expensive. He would like for the meeting to be in Golden and have people come out and visit NREL and review their program and see the new technology demo.
- Dave said he could bring the system to NREL and provide a demo possibly in July.

Lightning Safety Maintenance

Jim Wright

- Jim talked about the lightning protection group. He stated that they are still trying to gather info about what other sites or DOD type-sites are doing. He stated that bonding was the biggest issue that the group is trying to address. **The group is looking to develop a best practices draft by June.**

2:30- 2:45 Break

2:45 – 3:15 Best Practice- LOTO Permitting

Keith Gershon

- Keith briefly talked about the LOTO permitting process that they use at Berkley. The permitting has been very successful. It is used for sub-contractors only. He believes the permitting is working well. Senior management does not like it. They think that it is creating reporting issues, or they are having more LOTO events. The numbers are going up, but Keith believes that the numbers are going up because more people are aware of the program and people are just doing a better job of reporting. HSS says that this





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process does not meet OSHA and the training part of OSHA. Keith says that each permit provides the required training.

- Gary provided a peer audit of the permitting process. He found that the tool was good. Not many issues. Only a few training concerns. The hands on training is 4 hours with live energy.
- Lloyd talked about how his site training does not cover PPE in the LOTO training.
- Keith said that PPE is very heavily involved in the training. Arc flash, shock, meter selection, and verification techniques are all covered thoroughly. HSS says that the program needs training and not just the individual permits.
- Keith also stated that their site would hold an "Electrical Safety Summit". His senior management wants it to be 1-2 days sometime in April or May. The management wants it to be for safety and the workers. Keith is requesting presentations from this group.
- Mark suggested that the HEC sub group meet at LBL for the summit in late April to roll out the May Electrical Safety month packets that we are working on.

3:15 – 3:30 Sharing of Best Practices

Jackie/Greg Christensen

- Greg handed out a paper titled "Implementation of NFPA 70E 2009, Energized Electrical Work". Greg walked everyone through the handout and the talked about the automated system for energized electrical work planning.
- Lloyd warned about troubleshooting and voltage measurements as still being energized work, just not requiring a written permit. He did say too that the tool looked great.
- Lloyd suggested that we review what some of the other sites are using for this same type tool. Such as SNL, LANL, PNL. He also talked with Keith about what software he was using for the LOTO permitting. Keith said that they us a Quick base by Intuit software.
- We need the following sites to provide best practices so the group can review them:
 - SNL
 - LANL
 - PNL

3:30 – 4:30 Workshop Planning

Jackie and Lloyd

Y12 Plans

- Lloyd started this talk. He said that the meeting would be the week of October 17th. Paul Chapman would be hosting the meeting in Oak Ridge. Lloyd asked if we should keep the format the same, 3 days of meeting and 2 days of tours, or if we should change it up. Lloyd suggested that we do 1 day of presentations, 2 days of working groups and save the final day for tours.
- Mark cautioned that if we spend too much time in working groups that the participation could go down as some people like to come and see the presentations. The good presentations are important to keeping the workshop successful.
- A suggestion was brought up to start the presentations early on Monday instead of waiting until Tuesday. DOE generally wants the meeting to start on Tuesday or late Monday.
- The suggested format for this workshop is as follows;
 - Monday start @ 0800 with Mark Ode
 - Monday presentations begin after noon.
 - Tuesday possible joint general session with the entire EFCOG ES&H group
 - Tuesday begin working group break outs
 - Wednesday continue working groups break outs
 - Thursday present work performed by each working group
 - Friday tours and wrap up the workshop
- There was no objection from the group.

Lessons learned from BNL

- The only complaint brought up from Brookhaven was that there was too much NFPA 70E.





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- Mark said that we need to continue to focus on 70E and keep a working group for 70E proposals. He also said that no proposals were submitted for the new 70E article 350 (R&D) and that if we did not populate the article it may get deleted by committee vote.
- Lloyd suggested that we form steering committee to talk and develop what is to happen at the workshops. This committee would work with the site and host of the workshop. The committee would need to be formalized and the structure developed.
- Jackie and Dave were all for this committee.
- The committee would help develop ideas for the workshops, and help with the speakers and presentations also.
- The members of this committee will be: Lloyd Gordon, Greg Christensen, Jackie McAlhaney, Bobby Sparks, Jerry Grant, and Richard Biscardi. This committee will decide on which workshops are kept.

Workshop topics and presentations

- These are the possible workshops:
 - 70E proposals
 - HEC
 - DC
 - Sub-Surface
 - Lightning Protection
 - Engineering Controls for R&D
 - Risk Analysis
 - EAHJ Qualifications
- Keith talked some about risk analysis. He said this would be a hard task. He suggested this be a working group. Sal asked what would be the product of this working group. Possibly a table or a list to help analyze our risks. Greg said we should look at the ANSI risk book. Also the group could talk about events and the ORPS reporting.
- Bobby talked some about the EAHJ qualifications and suggested we have a working group determine these qualifications. Lloyd spoke about some training that was developed years ago for the DOE people, and how this training was never passed on to the DOE people. Bobby was saying how his DOE people want us to have this training to prove our qualifications. Several people talked on this subject and asked what would the qualifications levels be? AHJ, System/Equipment, Inspectors, Electrical Safety Officer?

4:30 – 5:00 Open floor discussion

All

- Lloyd said that his site has performed the 2011-2008 NEC crosswalk and he would share it with the group. No need to duplicate efforts. It was also suggested that all site review it and the ESSG produce a consensus document on accepting the 2011 NEC.
- Lloyd will provide this crosswalk to Jackie to disseminate and review with the EFCOG and then adopt as a Best Practice and then post to website.
- Gary asked if other sites are experiencing failures from metering PTs or CTs in their medium voltage equipment. His site has had two fail and is now replacing all on their site. No one else has experienced this type of failure.

5:00 Meeting adjourned.

Below are the presentations and materials presenting at the meeting. The slide shows will open if you double click on them.





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**EFCOG Electrical Safety Subgroup
Spring 2011 Meeting Agenda
Toronto Sheraton City Centre
Sheraton Hall C Room**

Monday, January 24, 2011 - 8:00 - 5:00

Time	Topic	Lead
8:00 – 8:15	Purpose and Introductions (new officers)	Jackie McAlhaney
8:15 – 8:45	Review ESSG Charter	Jackie/group
8:45 – 9:15	ESSG Business <ul style="list-style-type: none"> • Teleconference • Websites (EFCOG and COE) • Future meetings and workshops • Proposed 2011 Goals 	Jackie
9:15 – 9:45	Recent events and lessons <ul style="list-style-type: none"> • LANL PNOV lessons • SRS PNOV lessons 	All
9:45 – 10:00	Break	
10:00 – 10:30	Update of NFPA 790/791	Keith Gershon
10:30 – 11:00	2010 Event Analysis	Skip Searfoss
11:00 – 11:15	DOE Electrical Safety Handbook	Mike Hicks, Pat Tran, Ajit Gwal
11:15 – 11:30	Proposed ORPS Criteria Status	Mike Hicks
11:30 – 1:00	Lunch	
1:00 – 2:00	Subcommittee Reports <ul style="list-style-type: none"> Hazardous Energy Control Subsurface Investigation Lightning Safety Maintenance DC 	Heath Garrison/Skip Searfoss Dave Inskeep Jackie McAlhaney Keith Gershon/Lloyd Gordon
2:00 – 2:30	Best Practice- LOTO Permitting	Keith Gershon
2:30- 2:45	Break	
2:45 – 3:15	Best Practice- Auto. Process Ener.Elec Work	Greg Christensen
3:15 – 4:30	Workshop Planning <ul style="list-style-type: none"> • Lessons learned from BNL • Y12 Plans • Workshop topics and presentations 	Jackie Lloyd Gordon Paul Chapman
4:30 – 5:00	General Group Discussion and Wrap up	All





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**EFCOG Electrical Safety Task Group
Position on implementing NEC 422.51**

The EFCOG Electrical Safety Task Group (ESTG) is providing this guidance for field NEC Authorities Having Jurisdiction (AHJ) to ensure consistent implementation of NEC 422.51, which was added to the 2005 National Electrical Code (NFPA 70). The subject rule states:

“Cord-and-plug-Connected Vending Machines.

Cord-and-plug-connected vending machines manufactured or re-manufactured on or after January 1, 2005, shall include a ground-fault circuit-interrupter as an integral part of the attachment plug or located in the power supply cord within 300 mm (12 in.) of the attachment plug. Cord-and-plug-connected vending machines not incorporating integral GFCI protection shall be connected to a GFCI protected outlet.”

The rule was added in response to a proposal by the Consumers Product Safety Council (CPSC). In the substantiation in support of the proposal, it was noted that at least four fatalities have been recorded due to internal wiring failures and inadequate grounding paths in vending machines. It should be noted that none of the fatalities occurred at DOE work sites.

The first sentence of the section clearly assigns responsibility for providing the GFCI protection to the manufacturer of the vending machines for new or refurbished machines. At least one Nationally Recognized Testing Laboratory (NRTL) has revised their standard covering vending machines to require the protection for listed machines manufactured on or after April 1, 2008. The last sentence, however, is not as objective as to responsibility or expectations for retroactive compliance.

In attempt to determine whether the sentence in question is intended to direct vending machine suppliers to provide the external protection for machines not included in the first sentence, or to facility owners to modify existing premises wiring to accommodate the protection, the ESTG contacted several subject matter expert resources. The resources included a CPSC representative, NFPA technical staff member, and an NEC code-making panel chair and recognized NEC consultant. All resources essentially provided the same advice. The NEC does not obligate facility owners to revise premises wiring to comply with subsequent NEC changes.

All resources and the ESTG agree, that even though there is no requirement to revise premises wiring, the consequences of contact by general workers warrant consideration of providing protection for machines not covered under the rule. The ESTG concludes, however, that the controlled environment in DOE work places and the routine maintenance conducted on vending machines located in DOE facilities substantiates making the changes in a gradual evolution, rather than on an emergent basis.

The ESTG recommends the following actions be taken in the established priority:

1. Notify, in writing, all vending machine suppliers that the rule exists and all new or re-manufactured machines must be compliant.
2. Request vending machine suppliers to ensure existing machines are modified to provide GFCI protection.
3. Request vending machine suppliers to add temporary GFCI protection in series with the machine power supply cord and test the device monthly.
4. Request the vending machine suppliers to relocate the machine to a location where permanent GFCI protection is provided.
5. Request the vending machine suppliers to remove the machine and replace with one that is compliant within a reasonable amount of time.

If you have any questions regarding this compliance recommendation, contact Lloyd Gordon, LANL on (505)667-0778 or Mark McNellis, SNL on (505)845-4895.





Minutes submitted by: Heath Garrison

Power point presented by Jackie McAlhaney:

EFCOG ESSG Spring 2011 Meeting

Toronto
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January 24, 2011

Power point presented by Heath Garrison:

Hazardous Energy Control Subcommittee Update



Heath Garrison
January 24, 2011
EFCOG Electrical Safety Task
Group





Minutes submitted by: Heath Garrison

Power point presented by Skip Searfoss:



Review of Electrical Safety 2010

Skip Searfoss, DOE HQ, HS-32
Glenn.Searfoss@hq.doe.gov
301-903-8085
January 24, 2011

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Power point presented by Keith Gershon:

NFPA 791 Recommended Practice and Procedures for Unlabeled Electrical Equipment Evaluation (A brief overview)

Keith Gershon
LBNL
1-24-2011





Minutes submitted by: Heath Garrison

Charter:

EFCOG ELECTRICAL SAFETY SUBGROUP

I. Vision

The vision of the EFCOG Electrical Safety Subgroup (ESSG) is that electrical safety throughout the DOE Complex will improve continuously as a result of the efforts and actions taken or guided by the ESSG.

II. Purpose

The purpose of the ESSG is to integrate DOE and DOE-Contractor electrical safety activities under a single EFCOG umbrella in order to foster consistency in achieving excellence in electrical safety throughout the DOE Complex.

III. Methodology

The methods incorporated by the ESSG to accomplish the goals and purpose include:

- Promote, coordinate, and facilitate the exchange of successful electrical safety programs;
- Develop leading/lagging indicators for electrical safety;
- Develop and integrate model procedures and processes that flow from applicable regulations to field personnel, including subcontractors;
- Provide technical leadership for electrical safety to the Department of Energy and technical expertise for electrical safety projects and improvements throughout the DOE Complex.
- Develop and promote best practices and lessons learned for electrical safety

IV. Initiatives

Annual initiatives will be determined at the Fall Meeting. The ESSG has identified several ongoing electrical safety improvement initiatives to support four discrete areas: Leadership/Advisement, Programmatic, Training/Education, and Performance Measurement. Subcommittees will be established for each initiative for developing and completing actions designed to facilitate improvement in the respective area. The identified initiatives are as follows:

A. Leadership/Advisement

1. Plan and conduct an annual DOE Electrical Safety Conference/Workshop;
2. Provide guidance for consistent interpretation of electrical safety regulations addressed in 10 CFR 851;

B. Programmatic

1. Assist DOE in updating and maintaining the DOE Electrical Safety Handbook and sponsor its use within EFCOG;
2. Provide a resource pool for baseline independent assessments
3. Interface with DOE/NNSA to support the “Center of Excellence for Electrical Safety.”

C. Training/Education

1. Maintain and augment the EFCOG Electrical Safety training resources
2. Collaborate with DOE’s National Training Center, Fluor Hanford’s HAMMER Facility, and other DOE locations to enhance hands-on electrical safety training;

D. Performance Measurement

1. Maintain and promote the Electrical Severity Measurement Tool for effective electrical safety data collection and trending;
2. Review electrical events and provide technical assistance to lessons learned authors to prevent recurrence.





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V. Membership

The membership of the EFCOG Electrical Safety Subgroup includes both DOE and DOE-Contractor personnel. DOE members act in an advisory capacity and ensure the goals of the ESSG are consistent with those of the Department of Energy. They are expected to actively participate in all ESSG efforts to ensure a teaming environment and maximize collective expertise. Contractor personnel will be selected to ensure complete representation from affected DOE responsible units and selected contractor work groups.

VI. Process and Schedule

A. Meetings

The ESSG operates in an open forum that encourages participation and contribution from all interested in the ultimate goal of protecting DOE facilities, equipment, and personnel from the hazards associated with the use, installation, and maintenance of energized electrical components. Formal decisions are adopted by a 2/3rds majority vote of the present designated representatives of supporting entities. Designated representatives unable to attend a meeting may send an alternate from their organization to vote for them. The quorum for a formal vote is representation by at least 50% of the supporting entities. Designated representatives will remain voting members of the ESSG until replaced in writing by the sponsoring organization.

Formal meetings are held by the collective membership of the ESSG at least twice annually. In addition, monthly conference calls are scheduled for the third Wednesday of each month.

B. Officers

An Executive Board of the ESSG consists of:

- Chair
- Vice Chair
- Secretary
- Workshop Lead
- Past Chair

The term of the Chair is two years, beginning January 1 of the odd years. The Vice Chair assumes the role of Chair and a new Vice Chair is elected each time a new Chair assumes office. The term of the Secretary is two years, beginning January 1 of the odd years. A new Secretary is elected each time a new Chair assumes office. The Workshop Lead assumes the officer-at-large position beginning January 1. The outgoing Chair will continue to serve on the Executive Board for two years to provide coordination and advice to the new Chair. Nominations for Vice Chair and Secretary will be obtained by the Past Chair during the even years and elections will be held at the Fall Meeting of the even years.

C. Commitments

The ESSG will evaluate and establish annual commitments for electrical safety deliverables and publish them in a document to be posted on the EFCOG Electrical Safety Subgroup web page.





ORPS Criteria Proposal 10/21/2010

1. Added the “Electrical Severity Measurement Tool” as Appendix E to DRAFT revision to DOE-HDBK-1092-20XX, Electrical Safety, dated 10/20/2010.
2. Remove electrical hazardous energy from Group 2, Subgroup C Hazardous Energy Control, and add Subgroup D Electrical Hazardous Energy Control.

Subgroup D Electrical Hazardous Energy Control

Note: *Failure to establish an electrically safe work condition (e.g., lockout/tagout) resulting in the discovery of an incomplete isolation of hazardous electrical energy is considered an exposure. This **does not include** discoveries made by zero-energy checks before work is authorized or administrative errors.*

#	SC	Criterion
(1)	2	Exposure to a hazardous electrical energy source with a High Electrical Severity (ES) Score ($ES \geq 1750$) as defined in DOE-HDBK-1092-20XX, Electrical Safety, Appendix E, DOE/EFCOG Electrical Severity Measurement Tool.
(2)	3	Exposure to a hazardous electrical energy source with a Medium Electrical Severity (ES) Score ($30 < ES < 1750$) as defined in DOE-HDBK-1092-20XX, Electrical Safety, Appendix E, DOE/EFCOG, Electrical Severity Measurement Tool

If the electrical severity score cannot be determined for initial categorization or reporting, the Electrical Hazard Factor (EHF) as defined in DOE-HDBK-1092-20XX, Electrical Safety, Appendix E, DOE/EFCOG, Electrical Severity Measurement Tool can be used for initial categorization as follows:

(3)	2	Very-High (EHF = 100) and High (EHF = 50) Electrical Hazard Factor; and
(4)	3	Moderate (EHF = 10) Electrical Hazard Factor.

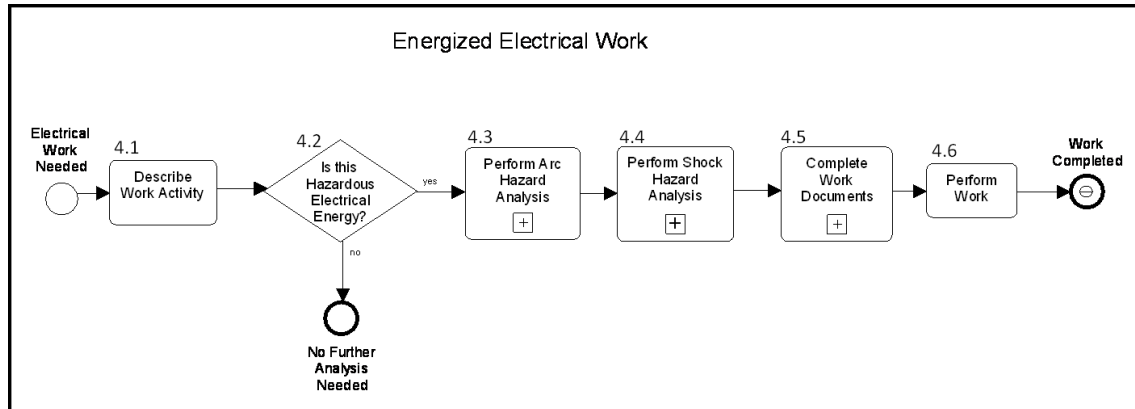
If initial categorization is determined using the Electrical Hazard Factor (EHF), the event must be re-categorized as a # (1) or # (2) using the Electrical Severity (ES) Scoring as soon as it has been completed, but prior to submitting the Final Report.





Minutes submitted by: Heath Garrison

Implementation of NFPA 70E Energized Electrical Work



Energized electrical work involving hazardous electrical energy (see section 4.1.6 for thresholds) requires an approved work instruction.

4.1 Describe Work Activity

- 4.1.1 Describe work location.
- 4.1.2 Identify equipment to be serviced/repaired/maintained/installed.
- 4.1.3 List equipment identifiers (e.g., motor number).
- 4.1.4 Identify nominal voltage.
- 4.1.5 Provide one line drawings if possible.
- 4.1.6 Identify all electrical work tasks to be performed.

4.2 Determine if Hazardous Electrical Energy Exists

- 4.2.1 Use criteria in the tables below to make this determination. If any of the thresholds are exceeded, it is considered hazardous energy. Continue on to Section Q.
- 4.2.2 If hazardous thresholds are not exceeded, no further analysis is needed.

GUIDANCE:

- Consult with Engineering or the Electrical Safety SME if necessary.
- All equipment gets its power from the facility 60 Hz or battery power. Thus, equipment starts with one of these sources.
- Most small appliances, hand tools, and portable laboratory equipment plugs into 120 to 240 V.
- Larger facility and laboratory equipment may use 138 V.
- All electronic equipment and much other R&D equipment converts facility power into DC. Thus, DC power supplies have capacitive characteristics and must be evaluated.





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- All UPSs have hazards in battery and 60 Hz hazards.
- It is possible for a worker to be exposed to more than one shock hazard at any given location.
- There may be other electrical hazards below the shock thresholds listed in Table 1 (e.g., a thermal burn hazard.) See Table 3.
- Injuries may result from startle reactions due to contact with energized components, even though there is no shock hazard, especially high voltage, low energy.
- Shock and burn hazards from induced and contact radio frequency (RF) currents become negligible above 100 MHz.

Table 1. Thresholds for defining shock hazards.

Source	Includes	Thresholds
AC	60 Hz sub-rf 1 Hz to 3 KHz	> 50 V and > 5 MA
DC	all	> 100 V and > 40 MA
Capacitors	all	> 100 V and > 1 J
Batteries	all	> 100 V
RF	3 KHz to 100 MHz	A function of frequency

Table 2. Thresholds for defining arc flash hazards.

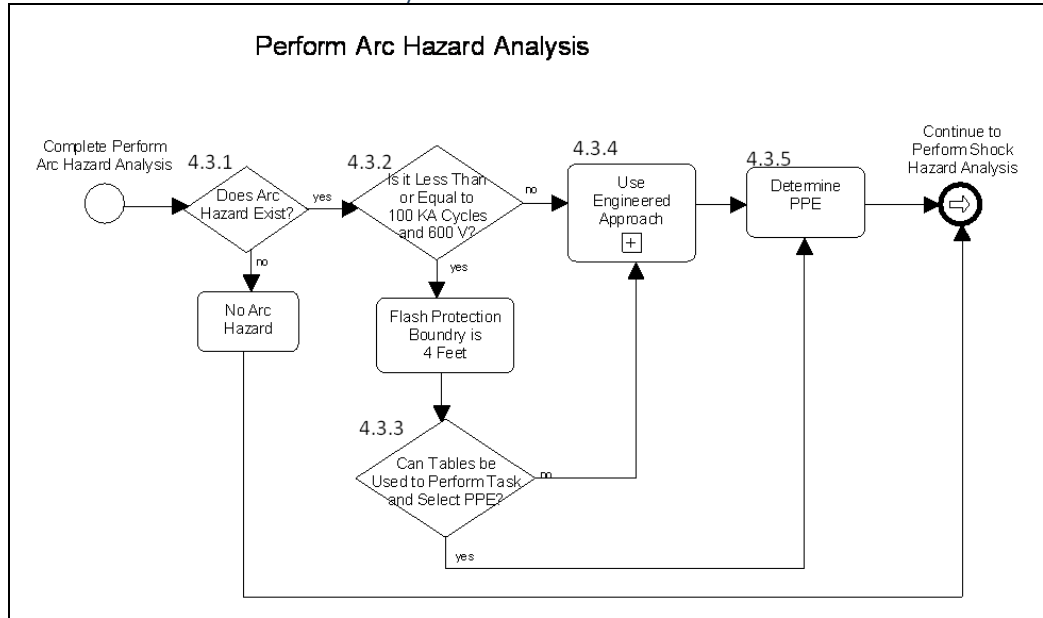
Source	Includes	Thresholds
AC (facility)	50 and 60 Hz	>240 V where system transformer \geq 125 KVA or combined capacity of multiple transformers \geq 125 KVA.
AC, R&D	1 - 3 KHz	> 250 V and > 500 A
DC	All	> 250 V and > 500 A
Capacitors	All	> 100 V and > 10 KJ
Batteries	All	> 250 V and > 500 A
RF	NA	Not applicable (NA)

Table 3. Thresholds for defining thermal burn hazards.

Source	Includes	Thresholds
AC,R&D	1 -3 KHz	< 50 Vand > 1000 W
DC	All	< 100 V and> 1000 W
Capacitors	All	< 100 V and> 100 J
Batteries	All	< 100 V and> 1000 W
RF	NA	Not applicable (NA)

4.3 Perform Arc Hazard Analysis





Arc flash hazard analysis is performed to evaluate a worker's potential exposure to arc flash energy, and identify the engineering, administrative and safe work practices to ensure a high level of safety is achieved through planning and program execution. If applicable, the analysis will determine the Arc Flash Protection Boundary (AFPB) and identify appropriate levels of personal protective equipment (PPE). Further, a determination is made regarding the applicability of NFPA Table 130 (C)(9) or whether the Engineered Approach must be used.

4.3.1 Determine if Arc Hazard Exists

4.3.1.1 Refer to Table 2 - "Arc Flash Hazards" and contact Engineering for support if threshold is exceeded for the arc hazard.

If threshold for arc hazard is not exceeded, go to Section 4.4.

4.3.2 Determine if Arc Hazard is Less Than or Equal to 100 KA Cycles and 600 V

4.3.2.1 Characterize the capacity of the electrical system with Engineering Support, refer to Table 2.

4.3.2.2 If the threshold is exceeded, the flash protection boundary must be calculated using the Engineering Approach. Go to Section 4.3.4.

4.3.2.3 If the threshold is not exceeded, you may use the default boundary of four feet.

GUIDANCE: *100 KA cycles is a product of the bolted fault current in kilo amps multiplied by the fault clearing time in cycles.*

4.3.3 Determine if Tables Can Be Used to Perform Task and Select PPE

4.3.3.1 Review **Table 130.7(C)(9)** to see if task is listed in the Table and if criteria is met or exceeded. See specific notes at bottom of Table 130.7(C)(9) for the specific criteria for task.

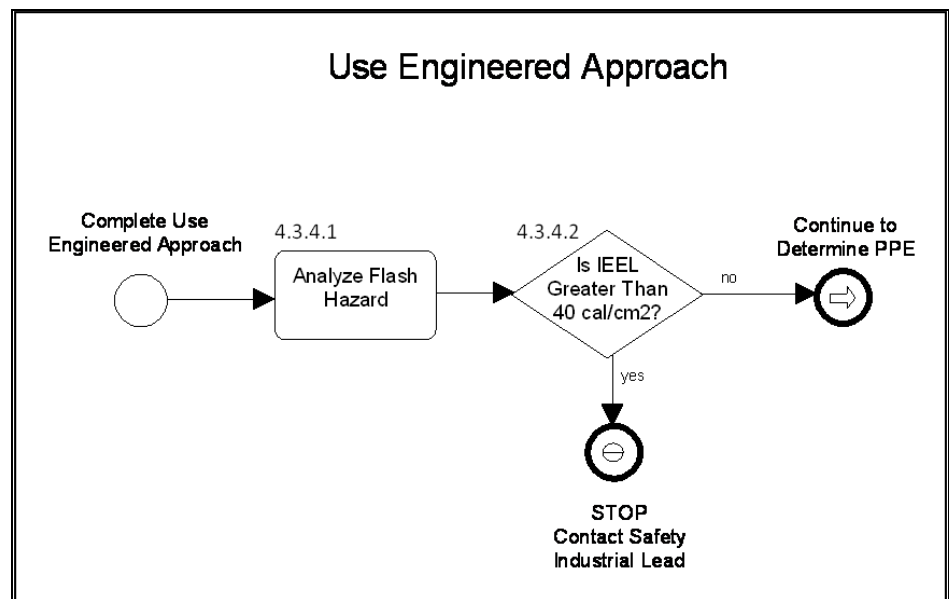
4.3.3.2 If the task is not listed in the table, go to Section 4.3.4 and use the Engineering Approach.

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- 4.3.3.3 Compare available Short Circuit Current (SCC) and Maximum Fault Clearing (MFC) against notes in [Table 130.7\(C\)\(9\)](#). See SCC notes in Table 130.7(C)(9) for determination.
- 4.3.3.4 Obtain the SCC and MFC of the equipment and determine if criteria in notes is met or exceeded.
- 4.3.3.5 If criteria in notes are exceeded, go to Section 4.3.4.
- 4.3.3.6 If the criteria in the notes are not exceeded, go to Section 4.3.5.

GUIDANCE: *For tasks not listed, or for power systems with greater than the assumed maximum short-circuit current capacity or with longer than the assumed maximum fault clearing times, Table 130.7(C)(9) cannot be used and the Engineered Approach must be used.*

4.3.4 Use Engineered Approach



The Engineered Approach is performed under engineering supervision and utilizes approved and validated software to evaluate the worker's potential exposure to arc flash energy, determine the arc flash Incident Energy Exposure Level (IEEL), Arc Flash Protection Boundary (AFPB), and the appropriate levels of personal protective equipment. The Engineered Approach is required if the criteria for use of NFPA 70E [Table 130\(C\)\(9\)](#) "Hazard/Risk Category Classification and use of Rubber Insulating Gloves and Insulating and Insulated Hand Tools" has been exceeded.

4.3.4.1 Analyze Flash Hazard

- 4.3.4.1.1 Determine if documented arc flash hazard has been performed.
- 4.3.4.1.2 If it has not been performed, engage Engineering to perform it.
- 4.3.4.1.3 Use information from Engineering to plan and/or mitigate the hazards associated with the job.



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- 4.3.4.1.4 Include instruction to apply NFPA-70E Arc Flash labels as a part of this work request, or initiate separate request to apply these labels. If the label(s) have already been completed, applied, and are current, no additional instruction is necessary.
- 4.3.4.1.5 Utilize SKM Power Tools software
- 4.3.4.1.6 Determine flash protection boundary in feet and/or inches.
- 4.3.4.1.7 Determine Incident Energy Exposure Level (IEEL) in cal/cm².
- 4.3.4.1.8 Forward this information to Planner.

4.3.4.2 Take Action if IEEL is Greater Than 40 cal/cm²

- 4.3.4.2.1 If IEEL is greater than 40 cal/cm², contact Engineering and Industrial Safety for support as needed.
- 4.3.4.2.2 If IEEL is less than 40 cal/cm², go to 4.3.5.
- 4.3.4.2.3 Engineering and Industrial Safety: Provide support to mitigate hazards as requested.
- 4.3.4.2.4 If appropriate, initiate an engineering work request for future action to modify the system.

GUIDANCE:

- *Cannot be worked live with PPE only.*
- *Develop engineering and/or administrative controls to mitigate hazards such as:*
 - *Administrative controls may include but not be limited to remote racking and actuation of breakers, alter switching sequence (e.g. actuate upstream switch isolation).*
 - *Engineering controls include: consider current limiting fuses, type 2 motor starters, protective relays, etc.*
 - *Post danger signs*

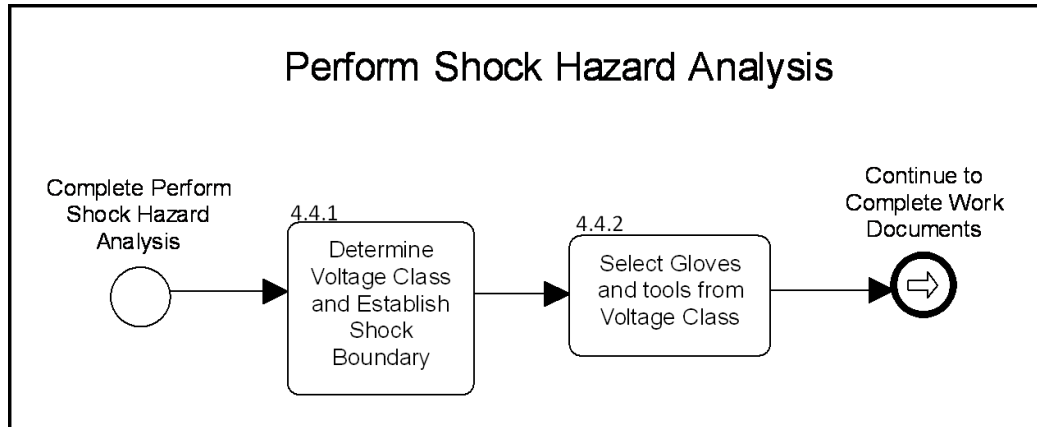
4.3.5 Determine PPE

- 4.3.5.1 Based on the information from the table or engineering approach, select PPE.
- 4.3.5.2 If using the table approach method select task as needed
- 4.3.5.3 If using the engineering approach method select appropriate IEEL
- 4.3.5.4 Specify voltage range from recommended controls.

GUIDANCE: Use [Table 130.7\(C\)\(10\)](#) as a reference.



4.4 Perform Shock Hazard Analysis



A shock hazard analysis is performed to evaluate the potential for contact or approach to energized electrical conductors or circuit parts and identify the safe work practices to ensure a high level of safety is achieved through planning and program execution. In addition, the shock hazard analysis will determine the shock protection boundaries and if applicable, assign the appropriate class of voltage rated gloves and tools for the proposed work.

4.4.1 Determine Voltage Class and Establish Shock Boundary

4.4.1.1 Use [Table 130.2\(C\)](#) to determine voltage class.

4.4.1.2 Establish approach boundaries:

- Boundary, Limited Approach - An approach limit at a distance from an exposed energized electrical conductor or circuit part within which a shock hazard exists.
- Boundary, Restricted Approach - An approach limit at a distance from an exposed energized electrical conductor or circuit part within which there is an increased risk of shock, due to electrical arc over combined with inadvertent movement for personnel working in close proximity to the energized electrical conductor or circuit part.
- Boundary, Prohibited Approach - An approach limit at a distance from an exposed energized electrical conductor or circuit part within which work is considered the same as making contact with the electrical conductor or circuit part.

Voltage, Nominal. A nominal value assigned to a circuit or system for the purpose of conveniently designating its voltage class (e.g., 120/40 volts, 480/277 volts, 500 volts). The actual voltage at which a circuit operates can vary from the nominal within a range that permits satisfactory operation of equipment.

NOTE: For Arc Flash Protection Boundary, see [Section 130.3\(A\)](#) in 70E.

4.4.2 Select Gloves and Tools From Voltage Class

4.4.2.1 Planner: Select voltage rated gloves from table listed below. The appropriate class of rubber insulating gloves shall be used for the maximum use voltage (phase-to-phase or phase-to-ground) per the following table:

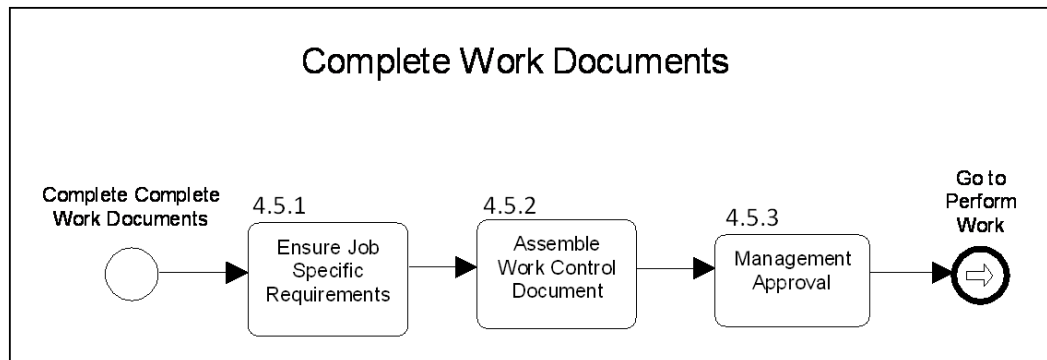


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Class	Voltage	Label
Class 00	500 V	Beige
Class 0	1,000 V	Red
Class 1	7.5 KV	White
Class 2	17 KV	Yellow
Class 3	26.5 KV	Green
Class 4	36 KV	Orange

- Leather protectors shall be used with class 0 or class 00 gloves EXCEPT when making fine adjustments, taking measurements, or performing other similar intricate work.
- 250 VAC shall not be exceeded when using Class 00 gloves without leather protectors. Class 00 insulating gloves that have been used without leather protectors shall not be used at voltages above 250 VAC until retested.
- When leather protectors are omitted extra care is needed in the visual examination of the glove and the handling of sharp objects.

4.5 Complete Work Documents



The completed work document incorporates the results of the electrical hazard analysis and provides the necessary engineering and administrative controls; and personal protective equipment to ensure a high level of safety is achieved through planning and program execution. With authorization, an approved work document incorporating the appropriate controls for energized electrical work meets the intent for an energized electrical work permit.

4.5.1 Ensure Job Specific Requirements

- 4.5.1.1 Ensure that the job specific requirements are incorporated into the LI (Laboratory Instruction).
- 4.5.1.2 Identify the person in charge.
- 4.5.1.3 Incorporate results of Electrical Hazard Analysis.
- 4.5.1.4 Identify Shock and Arc Flash Boundaries.





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- 4.5.1.5 Establish barriers and barricades to control access (keep out unqualified personnel).
- 4.5.1.6 Identify alerting techniques if look alike equipment is present (e.g., safety signs, barricades, attendants). An attendant is required if the safety signs and barricades are not sufficient.
- 4.5.1.7 Identify PPE required for the requested job.
- 4.5.1.8 For equipment modifications/new installations contact AHJ (Authority Having Jurisdiction) for inspection/approval

4.5.2 Assemble Work Control Document

4.5.3 Obtain Management Approval

4.6 Perform Work

