FESHCOM
Electrical Safety Subcommittee
Ad-Hoc Committee to discuss SLEDs, Arc Flash Calculations, and Electrical Panel Labeling

June 1, 2011

Meeting Minutes

Attendance

Mike Utes, Chair	P	Jim Ranson	P	John Anderson	P
Adam Walters	P	Bob Demaat	P	Patrick Liston	P
Jim Niehoff	P	Dave Baird	P	Randy Wielgos	A
Keith Schuh	P	Rafael Coll	P		
John Reid	P	Miguel Nunez	P		

Meeting Called to Order: 10:01

The meeting started with the review of the language in the Fermi Site Office report on the Fermilab safe electrical work practices assessment, which is reproduced here:

"Efforts are underway by all the Fermilab divisions/sections to have completed sets of single line electrical drawings (SLEDs). In August 2006, the ESS had developed a *Standard Conventions for the Fermilab Electrical AC Power Distribution System* to assist in this effort. At the time of this assessment all SLEDs had not been completed. FESS is identified as the "clearinghouse" for all the division/section SLEDs. Unfortunately, all the division/section SLEDs are not all compatible electronically; hence it cannot be insured that all the needed details will transfer electronically to FESS. The AD Electrical Coordinator starts revisions with hand written markings on the existing SLEDs. The marked up SLED is then handed over to other AD employees responsible for updating SLEDs using CAD. Likewise the AD electrical coordinator demonstrated a similar process for updating panel schedules to reflect new and upgraded electrical installations.

FESS has assisted the Fermilab Computing Division (CD) by obtaining an engineering subcontractor to perform their SLEDs, arc-flash calculations, and provide labeling of electric distribution equipment to reflect arc-flash calculations and PPE needs. Besides CD, only the Technical Division is reported to have taken on performing arc-flash calculations, and providing labeling of electric distribution equipment. A FESS employee indicated that there is now an "informal policy" in place for all new Fermilab construction projects calling for documentation of installation details necessary for performing future arc-flash calculations. FESS management was not aware of any such policy.

After discussion with the ESS Chairperson, FESS, and the ES&H Section, it was learned there were never any other commitments made than just performing SLEDs. Regardless, it was expressed by some they believe there is also a need to perform arc-flash calculations, and

labeling of electrical distribution equipment. Though AD has established a process of updating their SLEDs, there is no formal path forward for managing and sustaining the effectiveness of the Laboratory-wide initiative for documenting SLEDs, performing flash protection boundary calculations, and providing precautionary labeling of electrical distribution equipment."

Since Computing Division has completed this process, Adam Walters showed a slide presentation outlining how their SLEDs were completed and power systems studies were done, all by outside vendors. Adam also commented on thermographic surveys and breaker maintenance. Costs for SLED verification and arc-flash study can range up to $35,000 per 480V service. Power systems study ranges $10,000 to $15,000 per system, and thermographic surveys from $5000 to $10,000 per 480V service. Regarding breaker maintenance on 110 breakers rated at 400 amps or higher, and assuming three to five 8-hour shifts, estimated costs range from $186,000 to $330,000, depending on if we required the testing firm to work shifts around the clock. The buildings that CD oversees are FCC, FCC2, HACC/FCC3, GCC and LCC; each have several services per building. John Anderson commented that AD might very well have ten times as many such services as CD.

Jim Niehoff showed us the web location where the SLEDs are stored by FESS.
http://fessesri.fnal.gov:8080/FessViewer/index.html
The main page shows an aerial map of the Fermilab site, and one can zoom in and highlight a building, select "engineering projects", click on the FIMS number near the top of the page, and then pick the desired SLED from the pop-up list.
Most SLEDs from CD, TD, BSS, and FESS are here. AD and PPD will begin sending their SLEDs to Jim soon.

We then heard status reports from the various divisions/sections. For TD, Miguel said the calculations were all done in house using a worksheet from Bob Ducar based on IEEE 1584 Arc Flash Hazard Calculator, and used a conservative clearing time of 1/10 second for all breakers, so the resulting PPE requirements are conservative. Hazard/Risk categories are based on NFPA-70E.

For PPD, Patrick Liston stated the SLEDs are now about 75% converted to AutoCAD format. There are 619 panels in the division not including DZero, the SLEDs of which are completed. Due to recent changes, the SLEDs are documented at the 95% level and are 65% verified.

For AD, John Anderson stated there are no official arc flash calculations. About 76% of the SLEDs are now in AutoCAD format with 67% verified; this work is being done by an on-call drafter on weekends. Jim Ranson pointed out that the two main concerns are finding the downtime to do the work, and of course the extra funding for such a project.

The ad-hoc committee then reviewed two draft documents prepared for PPD by Patrick Liston and Dwight Featherston intended to outline policies concerning SLEDs, flash calculations, and labeling. The titles of these draft documents are

1) "SLED Creation, Modification & Maintenance Policy" , and
2) "Panel Index Creation & Maintenance Policy"

Pat explained that these documents are a starting point for discussion. Both documents are

similar in format. The SLED document, for example, suggests who in the division is responsible for SLED creation, receipt of any new or modified drawings from FESS, approval, sign-off, and submission to the division's Document Coordinator.

John Anderson commented that any new additions should have SLEDs as a primary requirement. Jim Ranson said that in retrospect, the MI-8 project should have had construction SLEDs done beforehand.
John advised that the ESS should make a determination that arc-flash calculations should be prepared by a Professional Engineer or internal to Fermilab.

Keith pointed out that at one time, the purchase of an arc flash calculator was rejected because of the disclaimer associated with the software. Whatever software we might buy, Keith thinks it should be based on IEEE 1584. The basic IEEE 1584 is about $700 but is basic and does not do as much as commercial products like ETAP. However, Randy already has a copy of ETAP. In a follow up discussion with Randy, it is a single license and cost about $25,000; a networked version of the software was rejected by the legal department because of the licensing terms. He thinks a version of ETAP suitable for our present arc flash calculation needs could possibly cost under $10,000. Furthermore, he thinks if we bought a networked version through GSA, the licensing terms are predetermined and the legal department would not have to make a decision on the issue. We will investigate this further.

John Reid and Bob Demaat talked about having in house engineers trained to do arc flash calculations.

The general consensus was that we should consider recommending to laboratory management that if hiring outside firms, as Computing Division did, is out of the question, appropriately trained people in the various divisions/sections verify the SLEDs and create the arc-flash calculations as downtime and budget allow and then have a Professional Engineer do the verification. This implies using the IEEE 1584 spreadsheet calculation or ETAP-style software. At that point standardized labels can be made and attached to the equipment. The highest powered 480 volt circuits should be finished first.

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The meeting adjourned at 11:32

Minutes Drafted by M. Utes

Electronic Distribution:

Bruce Chrisman
Division/Section/Center Heads
Senior Safety Officer Subcommittee
Martha Michels
ESS Members
Division/Section Electrical Coordinators
Guest Attendees