



**FESHCom**  
**Electrical Safety Subcommittee**

ESS Determination D2011-1 01-Feb-2011

**Is MCC Bucket Removal/Insertion Manipulative Energized Work?**

The Electrical Safety Subcommittee has considered the topic of motor control center (MCC) bucket replacement without de-energizing the MCC bus. We categorize this procedure as manipulative energized work as described in FESHM 5040:

**Manipulative** Energized Work describes all other activities within the Limited Approach Boundary, other than Diagnostic, that typically involve making, tightening or breaking electrical connections or the replacement/removal/addition of electrical or mechanical components. Manipulative Energized Work is prohibited at Fermilab unless it can be demonstrated that de-energization introduces additional or increased hazards or is infeasible due to equipment design or operational limitations. If justified, Manipulative Energized Work shall be performed by written permit only and subject to approval by the Fermilab Directorate. Associated permit forms and their requirements for Manipulative Energized Work on utilization or AC Power Distribution Systems are presented in FESHM Chapters 5041 and 5042 respectively.

The Committee acknowledges that some situations may necessitate that bucket replacement be done while keeping the bus of the MCC energized; in these situations this work is permitted if approval is granted and work is carried out as described in FESHM 5042 and NFPA 70E.

## **Rationale for the Determination**

Recently a FESS electrician needed to replace a bucket in a motor control center (MCC) in the Linac area. The electrician asked the AD Senior Safety Officer (SSO) if the MCC needed to be powered down for the bucket replacement. The SSO asked about FESS procedures, reviewed the NFPA 70E hazard risk categories, the impacts to the facility from powering down the MCC, and requested the MCC bus be powered down prior to replacing the bucket. The SSO is also a member of the ESS. He brought it up to the committee asking whether or not to make powering down an entire MCC for a bucket replacement a lab-wide policy. He felt regardless of the decision, there should be consistency with the determination across the laboratory. After considerable discussion and in light of the FESHM definition included in the determination on page 1, it is the opinion of most of the ESS members that bucket replacement falls under the definition of manipulative energized work.

FESS/Ops has stated they are not in favor of adding language in FESHM that requires de-energizing the entire MCC before replacing one of its buckets, but have and will certainly continue to comply with any requirements of individual laboratory divisions/sections/centers. The biggest impact to operations we could find from a powered down MCC was at Central Utility Building, where it may take six to ten hours total to ramp down a boiler prior to work on a bucket sharing the MCC, replace the bucket, and ramp-up the boiler again. These boilers could affect the Wilson Hall and accelerator division heating/cooling.

Much consideration was given to the fact that these units are apparently designed to be removed and inserted onto a live bus, though finding endorsements in manufacturers literature to that effect has not been successful. Much consideration was also given to the fact that it has been normal operating procedure to perform such hot replacements at Fermilab. NFPA 70E 2004 makes little mention of the procedure except in Table 130.7(C)(9)(a) "Hazard/Risk Category Classifications" where it indicates insertion or removal of individual starter "buckets" from MCC is classified at Hazard/Risk Category 3 providing the MCC has less than 65 kA short circuit current available, otherwise this would be a Hazard/Risk Category 4 and V-rated gloves must be worn.

Historically, the laboratory has viewed national safety standards as minimum requirements for safe operations and sometimes implements safety procedures that are more stringent than those required by the national standards. We view this as such a case. Since the replacement of a bucket in an energized motor control center so closely fits the description of manipulative energized work already written in FESHM, we elect to state that bucket removal and insertion be governed by the same language. We realize and expect that, in some circumstances, the MCC must remain energized in order to keep critical systems up and running. In those cases bucket replacement is permitted providing all specified safety precautions are taken as stated in FESHM 5042 and NFPA 70E.