Operation of the CDF CEM Source Calibration System

(This is a Safety Procedure)

This procedure outlines the steps and training required to use the Radioactive Source Calibration system for the CDF Central Electromagnetic and Hadronic Calorimeters.

Editorial Hand-Processed Changes Other Than Spelling
Require Department Head Approval

HPC Number	Date	Section Number	Initials
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Approvals

(CDF Department Head) (Date)

(PPD Division Head) (Date)

1 Controlled Copies of this Procedure

Three controlled copies of this procedure exist. One is held in the CDF Department Office Library. The others will be on the CDF web page at

http://www-cdf.fnal.gov/cdfsafe/cdfproclist.html

and at

ADMIN.CDF/ES&H/PROCEDURES.

All other copies will be marked "INFORMATIONAL COPY ONLY".

2 The Procedure

This Procedure describes the proper use of the CDF CEM/CHA Source Calibration System. The system consists of 49 source drives and associated electronics. Each source drive is comprised of a source, a motor, a gear box, and a set of pulleys and wheels over which a plastic coated steel wire runs. The source is tied to this wire, and the position of the source is determined by limit switches which detect stripped sections of the wire. A short stripped section indicates that the source is in the garage, and each of the two longer stripped sections indicates that the source is at the limit of it's travel inside the calorimeter.

The individual sources are the isotope Cs-137 in the form of Cesium oxide powder sintered in a stainless steel tube which is then soldered in a copper "source bucket". The original activity of the sources was 3.1 mCi in 1984. Each source drive also has a lead "garage" which is installed when the detector is open. When not in use, each source should be in the center of it's garage. The source drives are mounted on the ends of the central calorimeter, with one drive per wedge except for the chimney wedge, which has two source drives. A source identification tag is attached to the detector in the vicinity of each source drive. The sources should never need to be removed from the source drives. In the event that such removal is necessary, it must be done with the supervision of the ES&H Radiation Physics Section.

The source drives can be operated in one of three modes. The recommended methods of operation are via the CDF CEM Calibration Card, which automatically stops the source in the garage or at one of the limits. The Calibration Card can be operated either via software or via front-panel switches. Software operation requires a password to enable the source drive, and front-panel operation requires a key. In addition, if the Calibration Card is not functioning or cannot deliver enough voltage to move the source, a benchtop DC power supply can be connected to the motor and used to run it manually. In this mode of operation a DVM should be used to monitor the garage limit switch. In order to determine the position of the source when it is not at a limit, the calorimeter PMT's must be read out.

This procedure does not outline the three modes of operation, but only the safety procedures required for source drive operation. A list of experts and trained operators is maintained at the end of this document, and anyone wishing to operate the source drives must be trained by one of the experts and added to the list of operators. See the section on supporting documents for the location of instructions describing the technical aspects of operating the source drives.

2.1 Standard Procedure

1) The person using the source drive must be on the list of trained operators.

2) It is necessary to review the Emergency Procedures at the end of this section before proceding.

3) When the arch on which the source drive is being operated is "in", no special safety precautions are necessary.

4) All further steps assume that the CDF calorimeter arch on which the source drive is being operated is "out".

5) The operator must wear a TLD badge and personal dosimeter (whose reading is taken before and after the source operation session), and must operate the source from an area in the assembly hall/pit where it is possible to observe the source drive and enforce the following precautions. A portable radiation monitor must be available in the area of the sources when they are being operated. This monitor can be used to locate a source in the event that it becomes stuck outside of the garage.

6) An area at least 2 meters away from the source drive must be roped off and posted with "Caution, Radiation Area:Personnel Monitoring Devices Required". This area should encompass all space necessary to ensure that personnel working above the floor (on lifts or via other methods) do not enter the radiation field. No special precautions are necessary for the ground floor or catwalks.

7) Once the previous steps have been followed, the source may be operated. Operators and other personnel should work as far as reasonably possible from the source drive, following the ALARA protocol.

8) When this session of use of the source drive is finished, the source should be returned to the "garage" position. This should be verified by checking the garage limit switch.

2.2 Emergency Procedures

If the source cannot be returned to it's garage, maintain the roped and posted area and contact the RSO.

If the source is believed to be damaged, maintain any roped and posted area and follow the standard SWIM emergency response:

1) SECURE: remove yourself from close proximity to the source and SECURE the area, insuring that no one can come in contact with the source. DO NOT LEAVE THE SOURCE UNATTENDED.

2) WARN: initiate the 3131 emergency response - they will contact the area RSO and the ES&H Section. Again, do not leave the area - wait for emergency response personnel and provide them with information on what happened.

3) ISOLATE: isolate area by roping off and posting a large enough area to prevent exposing personnel in the area. A good technique is to survey the perimeter of the roped off area to insure dose rates at the perimeter are below 1 mrem/hr.

4) MINIMIZE: minimize personnel entering the area and, in the case of a broken source, minimize the potential spread of contamination. ONLY emergency response personnel should be allowed to enter the area to begin recovery.

3 Checklist

No Checklist is needed for this procedure.

4 Deviations from the Procedure

The only deviations from the above procedure allowed are for freeing a stuck source. The operator may approach the source drive to seek the cause of the stuck source. The location of the source should be ascertained using either calorimeter PMT information or a radiation meter. If the source is outside of the calorimeter and outside of the garage, an effort should be made to minimize the time spent in the vicinity of the source and to maximize the distance from the source, as per the ALARA protocol. Adjustment of the wire tension and manipulation of the source drive mechanism is allowed in order to free the source.

5 Required Training and Authorized Training Personnel

Anyone operating the source drive must get training from Fermilab ES&H. The required courses are FN000048 (source training) and FN000301 (Radialogical Worker training). Training is valid for two years. In addition any operator must be trained in the use of the source drive by one of the experts listed in this document.

6 Training Materials

The training materials include this document and any other materials relevant for the ES&H courses listed under Required Training.

7 List of Trained People for this Procedure

Experts		
1	Steve Hahn	x2123
2	Young-Do Oh	x8473
3	Andrew Kovalev	x2389
4	Edward McKigney	x2389

Operators		
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8 References and Supporting Documentation

There are technical instructions for the operation of the CEM Source Drives which are called Operation of the CDF CEM Source Calibration System, kept together with this document.