"Moving Installed Central Muon Walls inside the Collision Hall"

This procedure outlines the procedure to be used to move Central Muon Wall in the Collision Hall.

Due to the weight and cost of a Central Muon Wall, it is required that the head of the Research Division review and approve this moving procedure.

Approvals:

(Safety Committee Head)	(Date)
(CDF Department Head)	(Date)
(Research Division Head)	(Date)
(Accelerator Division Head)	(Date)

1.0 Controlled Copies of this procedure.

Two controlled copies of this procedure will exist.

One will be held in the CDF Department Office.

One will be held in the CDF (B-0) Office Complex, Room 171i.

All other copies will be marked, " **INFORMATIONAL COPY ONLY** "

2.0 CDF Movement Procedures

STEP 1: Identify Key Personnel, their Responsibilities and Minimum Personnel Requirements

2.0.1: Objective: To identify the responsibilities of each individual involved in the movement of the Muon Wall

2.0.2 Responsibilities:

a). **Qualified Instructor:** is a person with rigging experience and designated by CDF. May be called upon to instruct people in this procedure. May be called upon to serve any function in the procedure.

b). **Responsible Engineer:** may be called on to function as the Task Leader. May also be called upon to solve structural/mechanical problems such as: how to move obstacles, or how to cross gaps in the floor. Will be a structural or mechanical engineer designated by CDF.

c). **Task Leader:** will insure that all personnel under his/her direction have performed their checks of the equipment and will insure that the equipment is installed properly. He/she will make certain that his/her personnel are located in their designated areas before the move begins. He/she will specify who will operate the equipment such as motor drive controller and the hydraulic pump. He/she will move freely in the work area to insure that the movement of the wall is slow and completely controlled. His/her directions will be followed completely and therefore he/she becomes responsible for the safety of the personnel and equipment involved during the move. **NO** movement of the wall will be conducted without his/her presence.

d). **Operator:** will be designated by the task leader and will be qualified to operate the "Hydraulic Pump," used to raise and lower the Muon Wall, and the "Motor Drive Controller," used to push and pull the Muon Wall. This person will follow all directions of the task leader.

e). **Workers (2 required):** will keep the area clean and free from obstructions, will watch for proper operation of screw drives and will follow all directions from the task leader.

2.0.3 Minimum personnel requirements for move of the Muon Wall

a). Task Leader or Qualified Instructor (1 required)

b). Operator (1 required).

c). Two (2) Workers -- must be personnel qualified under 2.0.2a, b, c, d or e above.

2.1 Operating Procedures for Moving Muon Wall in North and South Directions

The following procedures for moving a Muon Wall in a North or South direction will be followed with the strictest adherence to each step and will be verified by the task leader. A completed checklist (Section 3) must be filed with Bob Shovan, CDF Complex, Office 171i, for each Muon Wall move.

STEP 2: Area Preparation

CAUTION! Rolling a Muon Wall over loose debris could cause the Hillman Rollers to bind or stop suddenly. This could cause damage to the Hillman Rollers.

2.1.1: Objective: To provide a safe working environment for the safety of the personnel as well as the Muon Wall and chambers.

2.1.2: Procedure: The area in which the Muon Wall will be moved, will have all obstacles moved clear of the area and will have the floor completely swept of debris. During the move, the workers will continuously verify that no objects are lying in the movement area. All over-head obstacles will be cleared from the area.

STEP 3: Key Equipment/Inspection of Equipment:

2.1.3: Objective: To maintain proper performance of equipment for serviceability and safety.

2.1.4 Equipment:

a). Drive Controller: will be inspected before each use for proper electrical connections and proper hook up. The task leader will designate who is qualified to operate this equipment.

b). Hydraulic Pump (2): will be inspected for leaks, cracks or other defects. The task leader will designate who is qualified to operate this equipment.

c). Hillman Rollers: will be free from defects and will roll easily.

d) Small Tools: (2) Tape Measures

e). Safety Glasses: (4) pair

STEP 4: Placement of Equipment/Personnel

WARNING! A displacement of + / - 1/2" could cause damage to the drive screws.

NOTE: While conducting the move, all directions will be given ONLY by the task leader.

a). The Drive Controller Operator should always be in eye or voice contact with the task leader.

b). The Hydraulic Pump Operator should always be in eye or voice contact with the task leader.

c). The workers will be positioned so that they can identify problems with Hydraulic Jacks, Hillman Rollers, Drive Shafts, and Gear Drives. They will be located at the ends of the Muon Wall.

d). The task leader is free to move around the work area to supervise and give instructions.

2.2 Across The Floor Operating Procedures

2.2.1: Objective: To reposition a Muon Wall in a slow (about 6 inches per minute), controlled manner so that safety to personnel and equipment is maintained.

STEP 5: Starting/Stopping the move:

CAUTION! A sudden start/stop or impact into another object could cause damage to the Muon Chambers and/or the Screw Drive.

2.2.2 A controlled, very slow (about 6 inches per minute) move of the Muon wall is critical for maintaining accuracy in the location of the Muon Chambers and more importantly, the safety of the workers.

STEP 6: Adjusting the Hillman Rollers to run straight:

WARNING! Hands and fingers must never be placed between the jacking surfaces and jacks. Loss of extremities could result.

2.2.3 Confirm Hillman Roller alignment:

a). Confirm that the north or south edge of the Hillman Roller is parallel to the surface of Muon Chamber. If not, perform step 2.2.4.

NOTE: Position Hillman Roller and Hydraulic Jack, so that the Hydraulic Jack is just off center (in the direction of the Detector). This is to allow the security board to be placed across the opening between the Muon Wall

and the CMEX. Remember that the wall's "Ear" is asymmetric. The center of the wall is the center of the middle plate.

2.2.4: Realigning Hillman Rollers:

a). To realign the Hillman Rollers, the hydraulic jacks must be retracted, to lower wall to floor and allow a space between Hillman Rollers / hydraulic jack and the hydraulic jack support. The Hillman Rollers can be adjusted . With the Hillman Rollers in a new alignment configuration, the hydraulic jacks can be extended to lift the Muon Wall.

<u>STEP 7:</u> Lifting the Muon Wall:

WARNING! Hands and fingers must never be placed between hydraulic jack and hydraulic jack support.

NOTE: Only a qualified "hydraulic pump" operator may operate the lifting system. The task leader will designate this operator.

2.2.5: Objective: To safely raise the Muon Wall on to the Hillman Rollers / hydraulic jacks to allow the wall to be moved, using screw jacks.

2.2.6 Lifting Procedures:

a) Confirm that all (4) hoses, from each hydraulic pump are connected to their respective hydraulic jacks.

NOTE: Confirm that all hydraulic quick disconnect fittings are completely seated.

b). The task leader will verify that all equipment and workers are in the proper position before lifting begins.

NOTE: Confirm that all valves on manifold are open.

c). Activate the jacks and begin the lifting. This is accomplished by turning the pump motor and the control switches on and moving the control pendant switch to the extend position.

NOTE: The wall should lift with between 2000 and 2500 PSI showing on the manifold gauge. IF WALL DOES NOT LIFT BY 2500 PSI, START OVER AT 2.2.6a.

d). Lift the Muon Wall to clear the floor by about 1/2".

e). Close manifold valve that feeds the lifting direction on the piston (the side that shows pressure).

STEP 8: Moving the Muon Wall:

NOTE: Only a qualified "motor drive controller" operator may operate the "motor drive controller." The task leader will designate this operator.

2.2.7 Objective: To safely move the Muon Wall on the Hillman Rollers and hydraulic jacks to a new position.

2.2.8 Moving Procedures

a). Connect power cable from Motor Controller to 210 VAC outlet.

b). Reset two (2) counters for motor controllers, to "0."

c). Set drive speed control pots to "60."

d). The task leader will verify that all equipment and personnel are in the proper place before moving begins.

NOTE: When wall is returned to original operating position, it should be within .02 inches of reading indicated on meter panel.

NOTE: By placing the Motor Drive Controller switches in the "Reverse" position, they will open the wall. By placing the Motor Drive Controller switches in the "Forward" position they will close the wall.

e). Activate the motor drive controller (Turn both switches in the desired direction simultaneously) and begin the move.

NOTE: The motors and screws should turn freely, and the motors should draw between 3 and 8 amps.

NOTE: Spray the rollers of the Hillman Rollers with WD-40, occasionally.

CAUTION! If the beam deflection meter on the control panel for the north Muon Wall reads (.750) or higher, the "Motor Drive Controller" must immediately turned off.

CAUTION! The two (2) ends of the wall should move together. Do NOT allow travel of one (1) end of the wall to exceed the travel of the other end of the wall by more than 4 counts (1/4 inch). Change the speed of the motor slightly to correct for discrepancies.

NOTE: It may take 10 to 15 seconds for the counters to settle to correct number.

f). Move wall to desired position, and stop motors.

<u>STEP 9:</u> Lowering the Muon Wall:

WARNING! Hands and fingers must never be placed between hydraulic jack and hydraulic jack surface.

NOTE: Only a qualified "hydraulic pump" operator may operate the lifting system. The task leader will designate this operator.

2.2.9: Objective: To safely lower the Muon Wall off the Hillman Rollers / hydraulic jacks, when it is in the desired position.

2.2.10 Lowering Procedures:

a). The task leader will inspect the hydraulic lifting system for proper installation. He/she will verify that all equipment and personnel are in place before lowering begins.

b). Open ALL (4) valves at the manifold, and begin lowering. This is accomplished by turning the valve switch on. Then, using the hand held toggle switch, activate the switch in the retract (lower) direction.

NOTE: If the wall has been opened for a quick access, do not retract the hydraulic cylinders.

NOTE: After the wall has been moved to the desired position, it should be lowered, and the pump valves closed when the indicated pressure is about 100 PSI (not "0"). This will maintain pressure on the hydraulic cylinders and the alignment of the Hillman Roller and Hydraulic Cylinders will not change.

<u>STEP 10:</u> Clean up of equipment and area

2.2.11 Objective: To properly maintain and store equipment, and to clean up area.

2.2.12 Maintain equipment:

a). When moves are completed, the task leader will see that all equipment is inspected and that all deficiencies repaired.

2.2.13 Clean up area:

a). When moves are completed, the task leader will see that the area is cleaned up and free of debris.

3.0 Checklist

NOTE: Blank copies are kept on clipboard by the screwdrive motor controls
Return completed copies to Bob Shovan, Office 171 i.

3.1 TO OPEN A MUON WALL

_____ North Wall _____ South Wall

_____ Confirm that you have (2) tape measures (ref 2.1.4 d).

_____ Confirm that each person involved in the operation is wearing safety glasses (ref 2.1.4 e).

_____ Unlock RD/OD locks (2) and remove boards (2)

_____ Sweep floor in the area of move, check for debris (ref 2.2.2).

_____ Check that hillman roller is aligned perpendicular to wall (ref 2.2.3).

_____ Check roller and cylinder in / out position
a. Maximum displacement is 3.5 inches off of wall centerline
b. Maximum displacement of lifting cylinder on hillman roller is 3.5 inches front or rear of centerline.

_____ Lift wall 1/2", close valves, turn off pump and valve power (ref 2.2.6).

_____ Check for debris under wall.

_____ Move wall out, unplug motor drive controller

_____ Lower wall (ref 2.2.10).

Completed by _____ Date _____

Operator _____ Time _____

NOTE: Blank copies are kept on clipboard by the screwdrive motor controls
Return completed copies to Bob Shovan, CDF Office Complex, Office 171 i.

3.2 TO CLOSE A MUON WALL

_____ North Wall _____ South Wall

_____ Have RD/OD search between wall and detector.

_____ Position Genie Lift in center area.

_____ Check that hillman roller is aligned perpendicular to wall (ref 2.2.3).

_____ Check roller and cylinder in / out position
a. Maximum displacement is 3.5 inches off of wall centerline
b. Maximum displacement of lifting cylinder on hillman roller is 3.5 inches front or rear of centerline.

_____ Check for debris, cables, etc. (ref 2.2.2)

_____ Confirm that each person involved in the operation is wearing safety glasses (ref 2.1.4.e).

_____ Lift wall 1/2", close valve, turn off pump and valve power (ref 2.2.6).

_____ Check for debris under wall.

_____ Move wall in, unplug drive controller.

_____ Confirm that all cables, etc. are out of the way for lowering the Muon Wall.

_____ Turn on air circulation fans.

_____ Lower wall, turn off pump and valve power (re 2.2.10).

_____ Replace security boards (2) and locks (2).

Completed by _____ Date _____

Operator _____ Time _____

4.0 Deviations from the Procedure

Must be approved by Responsible Engineer or Instructor.

5.0 Required Training and Authorized Training Personnel

5.0.1 To be an Authorized Instructor, the person must have several years experience in the rigging field. The person must be designated by the Responsible Engineer.

5.0.2 When an Authorized Instructor is present, the operation may declared to be a training session. No previous training is required by the other members of the team.

5.0.3 To be a Task Leader: the individual must have a number of years of experience in the rigging field or have been trained by the "Authorized Instructor," in the procedure. The qualifications of this individual are evaluated by the Responsible Engineer or Authorized Instructor.

5.0.4 To operate the Motor Drive Controller: the operator is expected to know how to operate all functions of the Motor Drive Controller, including emergency operations. He will demonstrate his ability to the "Authorized Instructor," before being designated as the Motor Drive Controller Operator.

5.0.5 To operate Hydraulic Pump: the operator is expected to know how to identify problems in operating the system (such as leaks and damaged parts), how to implement the system and how to handle failures. He will demonstrate his ability to the "Authorized Instructor," before being designated as a Hydraulic Pump Operator.

5.0.6 To be a watcher: the watcher is expected to keep area of Hillman Roller movement clear of debris. The watcher is expected to watch for proper operation of screw drives and for any cable or tubing interferences. He / she will demonstrate his / her ability to the "Authorized Instructor," before being designated a "watcher."

LIST OF RESPONSIBLE ENGINEERS FOR THIS PROCEDURE

Name CARTER, HARRY ID # 3236
Last, First

Name _____ ID # _____.
Last, First

Name _____ ID # _____.
Last, First

Name _____ ID # _____.
Last, First

Name _____ ID # _____.
Last, First

LIST OF AUTHORIZED INSTRUCTORS FOR THIS PROCEDURE

Name SHOVAN, ROBERT ID # 851 .
Last, First

Name LUKENS, PAT ID # 9382
Last, First

Name _____ ID # _____. _____ Last, First

Name _____ ID # _____.
Last, First

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Last, First

Name _____ ID # _____.
Last, First

6.0 Training Materials.

None at this time

7.0 List of Trained People for this procedure.

The most current copy of this training list must be kept with the controlled copies of this movement procedure, in the CDF Department Office and CDF (B-0) Office Complex, Room 171i. If the individual's name is not on the controlled copy list, then that individual is NOT authorized to perform the specified function.

7.1 Task Leader:

See "Training Attendance Forms," with Controlled Copy of procedure held in CDF (B-O) Office Complex, Room 171i.

7.2 Hydraulic Pump Operator

See "Training Attendance Forms," with Controlled Copy of procedure held in CDF (B-O) Office Complex, Room 171i.

7.3 Motor Drive Controller Operators:

See "Training Attendance Forms," with Controlled Copy of procedure held in CDF (B-O) Office Complex, Room 171i.

7.4 Watcher

See "Training Attendance Forms," with Controlled Copy of procedure held in CDF (B-O) Office Complex, Room 171i.

8.0 References and Supporting Documentation.

None at this time.