

"Moving the End Plugs inside the Collision Hall"

This procedure outlines the procedure to be used to move the plugs inside the Collision Hall.

Due to the weight and cost of an End Plug, 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 The Procedure.

STEP 1: Identify Key Personnel and their Responsibilities

2.0.1: Objective: To identify the responsibilities of each individual involved in the movement of the Plug in the Collision Hall.

2.0.2 Responsibilities:

a). **Co-Ordinator:** will oversee the movement operation from a distance great enough to easily see all personnel and equipment involved in the move and to watch for over-head obstructions. He will report any developing or potential problems to the task leader. At no time will the co-ordinator take over for the task leader. The co-ordinator is there to assist and insure that overall safety is being maintained.

b). **Responsible Engineer:** may be called on to function as the co-ordinator. He will be a structural or mechanical engineer designated by CDF.

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

d). **Workers:** will install all equipment and will insure that the equipment is serviceable and free from defects. They will keep the area clean and free from obstructions and will follow all directions from the task leader.

e). **Motor Drive Controller Operator:** will be designated by the task leader and will be qualified to operate the equipment used to push and pull the End Plug. He will insure that his equipment is serviceable. He will follow all directions from the task leader.

f). **Unified Jacking System Pump Operator:** will be designated by the task leader and will be qualified to operate the equipment used to put tension on or take tension off of swing bolts. He will follow all directions from the task leader.

2.0.3 Minimum personnel requirements for moving End Plugs inside of CDF Collision Hall.

a). Co-Ordinator (1 required)

- b). Task Leader, Responsible Engineer or Qualified Instructor (1 required)
- c). Unified Jacking System Pump Operator and Motor Control Operator (should be the same person, if qualified for both functions) (1 required).
- d). Seven (7) Workers -- need not be trained, but must follow directions of Task Leader.

STEP 2: Area Preparation

CAUTION! Rolling an End Plug over loose debris could cause the Hilman Rollers to bind or stop suddenly. This could cause damage to the Hilman Rollers.

2.0.4: Objective: To provide a safe working environment for the safety of the personnel as well as the End Plug.

2.0.5: Procedure: The rails on which the End Plug will be moved, will have all obstacles moved clear of the area and will have the area around them completely clear of debris. During the move, the workers will continuously verify that no objects are lying in the movement area of the Hilman Rollers.

STEP 3: Key Equipment/Inspection of Equipment

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

2.0.7: Equipment:

- a). Unified Jacking System Hydraulic Pump: will be inspected for leaks, cracks or other defects.
- b). Hilman Rollers: will be free from defects and will roll easily.
- c). Motor Drive Controller: will be inspected before each use for proper electrical connections and proper hook up.

STEP 4: Placement of Equipment / Personnel

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

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

- b). The Unified Jacking System 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 Hilman Rollers, clearances and interferences. They will be located by the End Plug and in a personnel lift, on each side, at Hilman Roller elevation.

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

- e). The co-ordinator will stay at such a distance to allow himself a clear view of all workers and the entire End Plug. Overall safety is his key concern. He may be located on a personnel lift, if this provides the best view. To avoid confusion among the workers, the co-ordinator communicates to the task leader only.

2.1 Operating procedures for moving East and West End Plugs in and out of the CDF Detector inside the CDF Collision Hall.

The following procedures for moving the East and West End Plug into and out of the CDF Detector in the CDF Collision Hall will be followed with the strictest adherence to each step and each step will be verified by the task leader.

NOTE: Use either 2.2 "Opening Procedure," or 2.3 "Closing Procedure."

2.2 Opening Procedure

2.2.1 Objective: To reposition an End Plug in a slow, controlled manner so that safety to personnel and equipment is maintained.

STEP 5 Starting / Stopping the move:

CAUTION! A very fast start / stop or impact into another object could cause damage to the End Plug, Hilman Rollers and / or Screw Drive.

2.2.2 A controlled, very slow move of the End Plug is critical for maintaining accuracy in the location of the End Plug and more importantly, the safety of the workers.

STEP 6: Points to check before beginning End Plug move.

WARNING! These items **MUST** be checked and confirmed before any moving operation is performed on the End Plug.

2.2.3 Complete Checklist under 3.0.1.

STEP 7: Positioning Rail Extensions.

WARNING! Hands and fingers should never be placed between flanges of support rail extensions. Crushing of extremities could result.

2.2.4 Objective: To provide a safe support system for the End Plug move.

2.2.5 Positioning Procedures

- a) The task leader will inspect the mating surfaces to see that they are clear of debris.
- b) Swing rail extensions into position.
- c) Insert and assemble (6) 1-1/2"-6 UNC, Grade 8 bolts, lock washers and nuts in each set of support rail flanges (2 sets per End Plug).
- d) Using a calibrated Torque Wrench, tighten bolt and nut assemblies to 600 ft-lbs.

STEP 8: Installing Rail Stops

WARNING! Hands and fingers should never be placed between flanges of support rails and rail stops.

NOTE! Rail Stops are labeled as to what corner of the Detector they are to be placed.

2.2.6 Installing Rail Stops

- a) Place rail stops into position
- b) Install bolts and tighten.
- c) Using a calibrated Torque Wrench, tighten bolts to 100 ft-lbs.

STEP 9: Remove Tension from Swing Bolts

CAUTION! Keep out of line of swing bolts, when bolts are under pressure. A broken bolt could result in severe injury.

2.2.7 Remove tension from Swing Bolts

a) The task leader will inspect the area around the End Plug, to insure that there are no obstructions to its removal.

b) Install tensioning hardware on Swing Bolts (12 sets).

c) Attach hydraulic hoses to center-hole cylinders.

NOTE! Hydraulic hoses for center-hole cylinders should be hooked up in four (4) manifolds. The manifolds should be hooked up as four (4) bottom cylinders, four (4) top cylinders, two (2) left cylinders and two (2) right cylinders.

d) From the Unified Jacking System Hydraulic Pump, hook-up four (4) hydraulic hoses. Hook-up one (1) to each manifold.

NOTE! No return hose is required.

e) Employing Unified Jacking System Hydraulic Pump (using pressurize jacks), pressurize jacks to 2000 PSI.

f) Check jacks and pressurize (using manual adjust) to 4000 PSI.

g) Employing Unified Jacking System Hydraulic Pump (using manual adjust), raise pressure to 6000 PSI.

NOTE! It is permissible to raise pressure to 6500 PSI to release a stuck swing bolt nut. **THIS IS MAXIMUM ALLOWABLE WORKING PRESSURE.**

h) Back off nuts on Swing Bolts at least two (2) turns.

i) Release all pressure on jacks.

NOTE! After pressure is released on jacks, confirm that nuts are loose. If ALL nuts are not loose, you will have to repeat steps e, f and g.

i) Disconnect, clean and properly store all hydraulic hoses.

j) Remove all tensioning hardware and properly store.

- k) Remove and properly store all nuts from Swing Bolts.

NOTE! Tie wrap Swing Bolts on upper half of the End Plug away from the End Plug.

STEP 10: Open End Plug

2.2.8 Preparation to open End Plug

NOTE! Check aperture and all areas around End Plug for interferences and clearances

- a) Move collar on Beam-Beam Counter toward Forward Calorimeter to give enough room for extraction of End Plug.
- b) Plug DC Drive Motor Control Panel (2 cords) into End Plug
- c) Plug in counter cord.
- d) Station watchers to monitor clearances and prevent damage

1) One (1) watcher stationed at center of End Plug, at top
NOTE: use one (1) person Genie Lift

2) Two (2) watchers stationed at each rail of End Plug. Total of four (4) watchers. **NOTE:** use one (1) person Genie Lift.

3) One (1) person on floor in front of End Plug.

4) One (1) person in 10 degree hole of End Plug. **NOTE:** person must have Oxygen Monitor.

5) Task Leader will be free to watch overall operation

2.2.9 Open End Plug

- a) Using DC Drive Motor Controller - move End Plug out at a very slow rate (approximate setting of 4). Controller has a range of 1 to 10. Move out about 4 counts (approximately 1/2") and check all clearances.

NOTE! After first move (4 counts), confirm that the drive motors are running in the same direction.

NOTE! After each movement of the End Plug, confirm that distance from pads to detector are equal. Use 2nd pad on either side of center on bottom on End Plug. This will determine if you are coming out parallel. If you are not parallel, adjust position to make parallel.

b) Using DC Drive Motor Controller - move End Plug out in about 16 count (approximately 1") increments, until PEM (Plug Electromagnetic Shower Calorimeter) is clear of aperture.

c) After PEM has cleared aperture, increase speed (approximate setting of 6) and move End Plug out about 48 counts (approximately 3") each time.

d) Move End Plug out in 48 count (approximately 3") increments until End Plug is out as far as required.

2.3 Closing Procedure

2.3.1 Objective: To reposition an End Plug in a slow, controlled manner so that safety to personnel and equipment is maintained.

STEP 5: Starting / Stopping the move:

CAUTION! A very fast start / stop or impact into another object could cause damage to the End Plug, Hillman Rollers and / or Screw Drive.

2.3.2 A controlled, very slow move of the End Plug is critical for maintaining accuracy in the location of the End Plug and more importantly the safety of the workers.

STEP 6: Points to check before beginning End Plug move.

CAUTION! These items MUST be checked and confirmed before any moving operation is performed on the End Plug.

2.3.3 Complete Checklist under 3.0.3

STEP 7: Close End Plug

2.3.4 Preparation to close End Plug

NOTE! Check cylindrical aperture (smallest area where PEM engages in Solenoid) and all areas around End Plug for interferences and clearances.

a) Plug DC Drive Motor Control Panel (2 cords) into End Plug.

- b) Plug in counter cable.
- c) Station watchers to monitor clearances and prevent damage.
 - 1) One (1) watcher stationed at center of End Plug, at top.
NOTE: use one (1) person Genie Lift
 - 2) Two (2) watcher stationed at each rail of End Plug. Total of four (4) watchers. **NOTE:** use one (1) person Genie Lift.
 - 3) One (1) on floor in front of End Plug
 - 4) One person in 10 degree hole of End Plug. **NOTE:** person must have Oxygen Monitor.
 - 5) Task Leader will be free to watch overall operation

2.3.5 Close End Plug

- a) Using DC Drive Motor Controller - move End Plug in at a very slow rate (approximate setting of 4). Controller has a range of 1 to 10. Move in about 4 counts (approximately 1/2") and check all clearances.

NOTE! After first move (4 counts), confirm that the drive motors are running in the same direction.

NOTE! After each movement of the End Plug, confirm that distance from pads to detector is equal. Use 2nd pad on either side of center on bottom of End Plug. This will determine if you are going in parallel. If you are not parallel, adjust position to make parallel.

- b) Using DC Drive Motor Controller - move End Plug in (approximate speed setting of 6), in about 48 count (approximately 3") increments, until PEM is close to the aperture of the Detector.

NOTE! Use either 2.3.6 "Final Closing of West End Plug ," or 2.3.7 "Final Closing of East End Plug."

2.3.6 Final Closing of West End Plug

NOTE! Keep a constant check of the clearances, as the End Plug enters into the aperture of the Detector.

NOTE! Exercise extreme caution as End Plug nears aperture of Detector. Move very slowly (approximately 4). Keep a constant check of clearances.

NOTE! Keep a constant eye on the swing bolts as they enter the yoke, for interference.

a) Using DC Drive Motor controller - move West End Plug in at a very slow rate (approximately setting of 4). Move in about 8 counts (approximately 1/2") and check all clearances. Repeat this procedure until the top of the End Plug touches the pads at the top.

NOTE! When the West End Plug touches at the top, the top should have about a 1/8" opening.

b) Install tensioning hardware on Swing Bolts (12 sets).

c) Attach hydraulic hoses to center-hole cylinders

NOTE! Hydraulic hoses for center-hole cylinders should be hooked up in four (4) manifolds. The manifolds should be hooked up as four (4) bottom cylinders, four (4) top cylinders, two (2) left cylinders and two (2) right cylinders.

d) From the Unified Jacking System Hydraulic Pump, hook-up four (4) hydraulic hoses. Hook-up one (1) to each manifold

NOTE! No return hose is required.

e) Employing Unified Jacking System Hydraulic Pump (using pressurize jacks), pressurize four (4) bottom (2 each side of 6 o'clock) center hole hydraulic cylinders to 2000 PSI.

f) Employing Unified Jacking System Hydraulic Pump (using manual adjust) and bottom four (4) center hole hydraulic cylinders, close End Plug. Between 2000 PSI and 4000 PSI will close.

NOTE! Have a person stationed at the bottom of the End Plug to confirm that the End Plug has closed.

g) Seat four (4) bottom nuts, to lock End Plug in position.

h) Release pressure on four (4) bottom tensioning swing bolts.

- i) Employing Unified Jacking System Hydraulic Pump (using pressurize jacks), pressurize all twelve (12) jacks to 2000 PSI.
- j) Employing Unified Jacking System Hydraulic Pump (using manual adjust) raise pressure to a maximum of 6000 PSI to seat End Plug.

NOTE! Have watchers stationed at top, bottom and both sides to confirm that the End Plug is closed.

NOTE! Confirm with the Cryogenics Department that Micro switches are made up, showing that the End Plug is closed.

- k) Seat all locking nuts, to lock End Plug in position.
- l) Release pressure on all jacks

NOTE! Confirm that all nuts are tight.

- m) Disconnect, clean and properly store all hydraulic hoses.
- n) Remove all tensioning hardware and properly store.

2.3.7 Final Closing of East End Plug

NOTE! Keep a constant check of the clearances, as the End Plug enters into the aperture of the Detector.

NOTE! Exercise extreme caution as End Plug nears aperture of Detector. Move very slowly (approximately 4). Keep a constant check of clearances.

NOTE! Keep a constant eye on the swing bolts as they enter the yoke, for interference.

- a) Using DC Drive Motor controller - move East End Plug in at a very slow rate (approximately setting of 4). Move in about 8 counts (approximately 1/2") and check all clearances. Repeat this procedure until the bottom of the End Plug touches the pads at the bottom.

NOTE! When the East End Plug touches at the bottom, the top should have about a 1/8" opening.

- b) Install tensioning hardware on Swing Bolts (12 sets).
- c) Attach hydraulic hoses to center-hole cylinders

NOTE! Hydraulic hoses for center-hole cylinders should be hooked up in four (4) manifolds. The manifolds should be hooked up as four (4) bottom cylinders, four (4) top cylinders, two (2) left cylinders and two (2) right cylinders.

d) From the Unified Jacking System Hydraulic Pump, hook-up four (4) hydraulic hoses. Hook-up one (1) to each manifold

NOTE! No return hose is required.

e) Employing Unified Jacking System Hydraulic Pump (using pressurize jacks), pressurize four (4) top (2 each side of 12 o'clock) center hole hydraulic cylinders to 2000 PSI.

f) Employing Unified Jacking System Hydraulic Pump (using manual adjust) and top four (4) center hole hydraulic cylinders, close End Plug. Between 2000 PSI and 4000 PSI will close.

NOTE! Have a person stationed at the top of the End Plug to confirm that the End Plug has closed.

g) Seat four (4) bottom nuts, to lock End Plug in position.

h) Release pressure on four (4) top tensioning swing bolts.

i) Employing Unified Jacking System Hydraulic Pump (using pressurize jacks), pressurize all twelve (12) jacks to 2000 PSI.

j) Employing Unified Jacking System Hydraulic Pump (using manual adjust) raise pressure to a maximum of 6000 PSI to seat End Plug.

NOTE! Have watchers stationed at top, bottom and both sides to confirm that the End Plug is closed.

NOTE! Confirm with the Cryogenics Department that Micro switches are made up, showing that the End Plug is closed.

k) Seat all locking nuts, to lock End Plug in position.

;) Release pressure on all jacks

NOTE! Confirm that all nuts are tight.

m) Disconnect, clean and properly store all hydraulic hoses.

- n) Remove all tensioning hardware and properly store.

Signature	Date	Time	Cables on CTC / VTX / SVX / CDT / CTC are OK
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4.0 Deviations from the Procedure

Must be approved by Responsible Engineer or Co-Ordinator.

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 Co-Ordinator: the individual must have a number of years of experience in the rigging field or have been trained by the "Authorized Instructors," in this procedure. The qualifications of this individual are evaluated by the Responsible Engineer or Authorized Instructor.

5.0.4 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.

5.0.5: 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.

5.0.6 To operate Unified Jacking System Hydraulic System: 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.

LIST OF RESPONSIBLE ENGINEERS FOR THIS PROCEDURE

Name GRIMSON, JOHN ID # 330
Last, First

Name ID #
Last, First

Name ID #

Last, First

LIST OF AUTHORIZED INSTRUCTORS FOR THIS PROCEDURE

Name GRIMSON, JOHN ID # 330 .

Last, First

Name SHOVAN, ROBERT ID # 851 .

Last, First

Name ID # .

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. The controlled copies are maintained in the CDF Department Office and the CDF (B-0) Assembly Building Room 101. If the trained individual's name is not on the controlled copy list, then that individual is NOT authorized to operate the specified equipment.

7.1 Authorized Co-Ordinators:

ALL AUTHORIZED INSTRUCTORS ARE AUTHORIZED CO-ORDINATORS

name, ID#	date	expires
signature: _____ . approved by: _____ .		

name, ID#	date	expires
signature: _____ . approved by: _____ .		

name, ID#	date	expires
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name, ID#	date	expires
signature: _____ . approved by: _____ .		

name, ID#	date	expires
signature: _____ . approved by: _____ .		

7.2 Task Leader:

name, ID# _____ date _____ expires _____

signature: _____ . approved by: _____ .

name, ID# _____ date _____ expires _____

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7.3 Unified Jacking System Pump Operator

name, ID# _____ date _____ expires _____
signature: _____ . approved by: _____ .

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7.4 Motor Drive Controller Operator:

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8.0 References and Supporting Documentation.

None at this time.