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TITLE
 CONTAMINATION CONTROL
 FOR CONSTRUCTION ACTIVITIES
 DURING BEAM TUBE INSTALLATION
 PRODUCT
 LIGO BEAM TUBE MODULES
 CALIFORNIA INSTITUTE OF TECHNOLOGY

1.0 SCOPE:

This procedure outlines and defines the plan to limit contamination of the Beam Tube Module inner surfaces during construction. The contamination of the Beam Tube inner surfaces is considered to be of three major sources:

- 1) **Particle**, ie:, dust, sand, process emissions (grinding dust, etc.)
- 2) **Moisture**, ie:, rain, snow, process emissions (spray, solvent excess, etc.)
- 3) **Biologic**, ie, insects, birds, varmints, etc.

The two possible means of contamination for the above items are considered *resident* (existing on component surfaces), and *air-born* (contaminants blown or flying onto component surfaces. This procedure provides techniques and equipment to limit exposure to each of these sources during site construction and installation activities.

2.0 PERSONNEL:

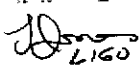

- 2.1 Experienced personnel shall perform and supervise all cleaning in accordance with this planned approach and the cleaning referenced in this plan.
- 2.2 Personnel entering the inspection and cleaning room and/or the controlled area of the beam tube access penetration during final assembly operations shall meet the conditions and clothing requirements of LIGO Procedure, CRWA-1.:
- 2.3 Personnel shall participate in a training course in which this procedure and any referenced procedure is presented by an authorized instructor. The course shall be documented by means of a written examination.

3.0 REFERENCES:

The cleaning methods and parameters are based on the data contained in the following references:

- 1) Summary of concepts and Reference Design for a Laser Gravitational-Wave Observatory, California Institute of Technology (Caltech); Feb-92.
- 2) Project Safety Manual, LIGPSM.

APPROVED

 11/10/95
 11/19/95
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- 3) LIGO Procedure, LIGOCP; "Planned Approach to Cleaning and Cleaning Maintenance for LIGO Project"
- 4) LIGO Procedure, CRTSM; "Clean Room Transporting, Storage and Maintenance Procedure"
- 5) LIGO Procedure, BDF1; "Positive Blower/Dryer/Filtration System (BDF) Installation and Maintenance"
- 6) LIGO Cleaning Procedure, CL4; "Cleaning of Beam Tube Can Sections"
- 7) LIGO Procedure, CRWA-1; "Clean Room Wearing Apparel for Beam Tube Access During Construction and Inspection Activities"
- 8) LIGO Procedure, HMST3N; "Helium Mass Spectrometer Hood Test of Pump Ports with Valve, LN₂ Pump and Blind Flange with RGA Assembly"
- 9) LIGO Procedure, INSTALLSEQ; "Beam Tube Can Section Installation Sequence"
- 10) LIGO Approved Materials Listing for Construction Related Activities (Later)
- 11) LIGO Weld Shelter Specification WSSPEC, Rev 0.
- 12) LIGO Clean Room Specification CRSPEC, Rev 0.

4.0 GENERAL:

Contamination control shall be achieved by a series of techniques described in this section. These are performed to assure that the exposure of the Beam Tube inner surfaces are limited to defined, controlled environments. Beam Tube internals are susceptible to exposure during the construction activities listed below:

- 1) Deleted.
- 2) Access End of Beam Tube after Clean Room connection for removal and re-installation of end Cap.
- 3) Fit-Up End of New Beam Tube Module for connection to Existing/Installed Beam Tube Assembly.
- 4) Fit-Up End of Existing Installed Beam Tube Assembly for connection to New Beam Tube Module.
- 5) Maintenance and cleaning of fit-up equipment, tooling, and enclosure surfaces.
- 6) BDF Connection at Vacuum Pump Port Connection near Mid Station and Vacuum Pump Port Cover Maintenance and Pump Installation.
- 7) Final Beam Tube Assembly Connection to Valve Assembly.



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5.0 EXECUTION:

Each activity associated with beam tube inner surface exposure noted above has specific steps for decontamination of tube surfaces. Each incremental step in the cleaning process is performed to decrease the risk of contamination during the exposure time.

5.1 Resident Particle, Moisture and Biologic Control: The following steps will be used for contamination control prior to and during inner beam tube surface exposure. The surfaces discussed below are considered exterior beam tube surfaces unless noted by the term "*inner surfaces*." The distance of 4 foot from the beam tube end, nozzle and/or exposed areas shall be considered critical for removing resident particles during the construction process. Repairs or other activities requiring inner surface exposure is not considered within the contents of this procedure.

5.1.1 Inspect the current condition of the beam tube, vacuum port nozzle and their protective covers.

5.1.2 **Immediately** correct any noticeable leakage to prevent further contamination. When evidence of loose or open covers, leakage in the form of accumulation of debris near or around cover connection areas or leakage of moisture at the bottom of a cover, follow the sequence listed below:

- 1) Return the tube to the cleaning facility.
- 2) Deleted.
- 3) Clean tube per approved cleaning procedure.
- 4) Deleted.

5.1.3 When beam tube are received on site, clean outside surfaces to reduce the risk of contamination of handling before and exposure.

- 1) Inspect end bags for good seal.
- 2) Water wash areas with low pressure tap water and approved mild detergent.
- 3) Hand dry areas by wiping with approved towels.

5.1.4 Deleted.



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DO NOT APPLY INSECTICIDES

- 5.1.5 Protect cleaned areas by covering (bagging) tube ends with approved covers.
- 5.1.6 Interior walls of the weld shelter shall be wiped clean prior to the installation activity of the new beam tube.
- 5.1.7 Control insect contamination by using high impact measures only (fly swatters).
- 5.1.8 Pre-cleaned the beam tube end in a clean, controlled area within the weld shelter and protected from the weather.
 - 1) Removing the temporary cover (bag) from the beam tube end.
 - 2) Wipe down end using a 1:30 solution of Mirachem and water.
 - 3) Wipe down with a clean, lint free towel.
- 5.1.9 Final-clean the beam tube end in a dust free, controlled area within the weld shelter.
 - 1) Wipe down end using a 1:30 solution of Mirachem and water.
 - 2) Wipe down with a clean, lint free towel.
- 5.2 Airborne Particle, Moisture, and Biologic Control: The following steps are used for air borne contamination control prior to and during inner beam tube surface exposure. The facilities discussed below are areas where the beam tube inner surfaces are exposed to outside air or provide outside make-up air to the inner beam tube chambers.
 - 5.2.1 Deleted.
 - 5.2.2 The weld shelter fit-up room conditioned using a HVAC unit with heating and cooling capabilities. Air is filtered using disposable pre-filters, disposable bag type filters and .3 micron HEPA 100 filters. The fit-up room shall be pressurized above the ante rooms and the outside ambient to provide positive air flow from the critical fit-up room, into the pre-cleaning ante room and outside. The areas around the beam tube ends and the weld shelter rooms shall be sealed using a series of fabric covers fastened to the tubes by means of straps and/or Velcro® fasteners. The areas shall be inspected for insects, birds, etc. and all sightings eliminated before exposing the beam tube inner surface.



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5.2.3 The Clean Room is conditioned using a HVAC unit with heating and cooling capabilities. Air is filtered using disposable pre-filters, disposable bag type filters and .3 micron HEPA 100 filters. The working clean area shall be pressurized above the ante room, the change room and the outside ambient to provide positive air flow from the critical clean area, into the ante room, change room and finally the outside. The beam tube is sealed to the clean room using an inflatable seal. The area around the beam tube where controlled pre-cleaning is performed shall be sealed using a fabric cover fastened to the tube by means of straps and/or Velcro® fasteners. The areas shall be inspected for insects, birds, etc. and all sightings will be eliminated before exposing the beam tube inner surface.

5.2.3.1 A Clean Room Ante Room (shelter) is attached to the clean room inflatable seal end for pre-cleaning the beam tube before entry into the clean room. The Ante Room consist of a shelter from the weather to allow cleaning of the outside beam tube surface and remove the protective plastic bag.

5.2.4 The beam tube is supplied with conditioned make-up air which consists of a 750cfm flow of dry, filtered air at constant temperature. This unit is at the Blower/Dryer/Filter (BDF System) and located at the mid stations. It has a redundant back-up system and operates during beam tube internal access activities.

5.2.5 The Beam Tube openings in the Clean Room, Clean Room Ante Room, Weld Shelter Ante Rooms and the Weld Shelter Fit-up Room shall be covered during times where installation activities are not in progress to decrease the possibility of contamination and decrease the amount of work involved in preparing the rooms for use.

5.3 Activity Check lists shall be maintained during the beam tube installation activities. This will prevent the omission of steps required to achieve a high confidence level in control and eliminate the risk of unnecessary contamination. The following is a listing and tables of control activities required to meet the intent of this procedure.

- 1) Deleted.
- 2) Table 5.3b, "Site Installation of Access End of Beam Tube Assembly"
- 3) Table 5.3c, "Site Installation of Fit-Up End of Beam Tube Assembly"
- 4) Table 5.3d; "Site Cleaning of Existing, Installed End of Beam Tube Assembly"
- 5) Table 5.3e; "Cleaning of Installation Equipment & Fit-up Tooling"

5.4 Listing; "Frame by frame description of the cleaning process detailing the specific steps in both the clean room and the weld/test shelter."

TABLE 5.3.a Deleted.



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TABLE 5.3b

<u>- RESIDENT PARTICLE/MOISTURE/BIOLOGICAL -</u> <u>CONTAMINATION CONTROL</u> <u>Site Installation of Access End of Beam Tube Assembly</u>			
Step No.	Description	Location	Process Materials
1	Wash Down Concrete Pad at Installation Area.	Installation Area @ Clean Room Annex	Pressurized Water Spray System
2	Deleted.		
3	Dry wipe Access Tube End and End Cap. Wipe Dry	Installation Area @ Clean Room.	Lint Free Wiping Cloth
4	Move Clean Room Ante Room Over Tube Access End & Seal.	Installation Area @ Clean Room.	Plastic Protective Bag
5	Move Clean Room over End of Tube Remove End Cap and Inspect Tube Surfaces.	Clean Room	Pressurize seal
6	Deleted		
7	After Welding & Testing, Remove Purge Equipment and Complete Final Inspection of Inner Surfaces	Clean Room	Lint Free Wiping Cloth
8	When Testing is Complete, Install End Cap and Cover the Beam Tube with disposable Plastic Bag.	Clean Room	Approved Plastic Cover(bag) and tape.



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TABLE 5.3c

**- RESIDENT PARTICLE/MOISTURE/BIOLOGICAL -
 CONTAMINATION CONTROL**

Site Installation of Fit-Up End of Beam Tube Assembly

Step No.	Description	Location	Process Materials
1	Wash Down Concrete Pad at Installation Area.	Installation Area @ Weld Shelter	Pressurized Water Spray System
2	Upon Delivery of Beam Tube to Site, Orient Beam Tube and Install on Fit-up Jack Stands.	Installation Area @ Weld Shelter.	N/A
3	Move Beam Tube Fit-Up End into Weld Shelter Ante Room	Weld Shelter Fit-up Ante Room	N/A
4	Remove Plastic Bag Cover and discard. Inspect End Cap for Leaks.	Weld Shelter Fit-up Ante Room	N/A
5	1:30 Mirachem to water wipe Weld Tube End and End Cap. Wipe Dry	Weld Shelter Fit-up Ante Room	Mirachem & Water Solution Lint Free Wiping Cloth
6	Move Beam Tube Fit-Up End into Weld Shelter Fit-up Room	Weld Shelter Fit-up Weld Room.	N/A
7	Mirachem & Water Solution Fit-up Tube End & End Cap. Wipe Dry.	Weld Shelter Fit-up Weld Room.	Mirachem & Water Solution Lint Free Wiping Cloth
8	Remove End Cap & Fit-Up Tube End to Installed Pre-Cleaned Tube End.	Weld Shelter Fit-up Weld Room.	N/A



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TABLE 5.3d

- RESIDENT PARTICLE/MOISTURE/BIOLOGICAL -
CONTAMINATION CONTROL

Site Cleaning of Existing, Installed End of Beam Tube Assembly

Step No.	Description	Location	Process Materials
1	Wash Down Concrete Pad at Installation Area.	Installation Area @ Weld Shelter	Pressurized Water Spray System
2	Move Weld Shelter Ante Room Over end of Existing, Installed Beam Tube End.	Weld Shelter Fit-up Ante Room	N/A
3	Remove Plastic Bag Cover and discard. Inspect End Cap for Leaks.	Weld Shelter Fit-up Ante Room	N/A
4	Solution wipe Access Tube End and End Cap. Wipe Dry	Weld Shelter Fit-up Ante Room	1:30 Mirachem/water & Lint Free Wiping Cloth
5	Move Weld Shelter over Existing, Installed Fit-up end into Weld Shelter Fit-up/Weld Room.	Weld Shelter Fit-up-Weld Room.	N/A
6	Solution wipe Existing, Installed Tube End & End Cap. Wipe Dry.	Weld Shelter Fit-up-Weld Room.	1:30 Mirachem/water & Lint Free Wiping Cloth
7	Remove End Cap & Fit-Up Existing, Installed Tube End to Pre-Cleaned New Fit-Up End of New Beam Tube.	Weld Shelter Fit-up-Weld Room.	N/A



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TABLE 5.3e

- RESIDENT PARTICLE/MOISTURE/BIOLOGICAL - CONTAMINATION CONTROL <u>Cleaning of Installation Equipment & Fit-up Tooling</u>			
Step No.	Description	Location	Process Materials
1	Prior to delivery of the next New Beam Tube, all disposable materials shall be disposed of by means of collection containers marked for recycling and/or re-cleaning.	Installation Areas, Clean Room & Weld Shelter.	Approved Containers
2	Prior to delivery of the next New Beam Tube, the Weld Shelter Internal surfaces shall be Wiped Down with Solution and dry cloth.	Weld Shelter	1:30 Mirachem/water & Lint Free Wiping Cloth
3	Prior to delivery of the next New Beam Tube, the Clean Room Ante room shall be wiped down with Solution and wiped dry.	Clean Room Annex Note: Clean Room	1:30 Mirachem/water & Lint Free Wiping Cloth
4	Solution wipe Fit-Up Gear, Tools and Handling Equipment.	Weld Shelter Fit-up & Ante Room	1:30 Mirachem/water & Lint Free Wiping Cloth
5	Solution wipe Portable Jacking and Temporary Support Stands.	Installation Areas	1:30 Mirachem/water & Lint Free Wiping Cloth
6	Inspect, Repair and/or Replace Door Seals, Hoods, and Skirts used for Weather Protection.	Installation Areas, Clean Room & Weld Shelter	Approved Repair Materials



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STEP #1

STEP #1 - PREPARE FOR NEW BEAM TUBE INSTALLATION

EQUIPMENT STATUS WELD SHELTER MAINTENANCE	COMPONENT STATUS EXISTING/INSTALLED BEAM TUBE END	COMPONENT STATUS NEW BEAM TUBE END
ALL INSIDE SURFACES OF THE WELD SHELTER WIRED DOWN. CLEAN & INSPECT ALL FABRIC COVERS AND CURTAINS AND REPAIR AS REQUIRED. CLEAN FIT-UP GEAR AND TOOLS WITH SOLVENT WIPER AND DRY WITH LINT FREE CLOTH. DELETED DELETED AIR MOVING EQUIPMENT IS ON AND PURGING FIT-UP ROOM WITH CLEAN, CONDITIONED AIR. DOOR CURTAINS ARE IN PLACE AND FASTENED TO SHELTER FRAMING.	BEAM TUBE END CAP IS IN PLACE AND SEALED. A DISPOSABLE PLASTIC BAG IS COVERING THE BEAM TUBE SURFACES NEAR THE END. EXISTING BEAM TUBE IS MOUNTED ON TEMPORARY SUPPORT FRAME. EXISTING/INSTALLED BEAM TUBE WITH BAG COVER INSTALLED OVER END DURING THE CLEAN ROOM FINAL REMOVAL.	NEW BEAM TUBE READY TO TRANSPORT TO INSTALLATION SITE. ALL INSPECTIONS PERFORMED AND END CAPS ARE INSTALLED AND COVERED WITH DISPOSABLE BAGS.

STEP #2

STEP #2 - PRE-CLEAN EXISTING/INSTALLED BEAM TUBE

EQUIPMENT STATUS WELD SHELTER MAINTENANCE	COMPONENT STATUS EXISTING/INSTALLED BEAM TUBE END	COMPONENT STATUS NEW BEAM TUBE END
MOVE WELD SHELTER OVER END OF EXISTING/INSTALLED BEAM TUBE TO THE ANTE ROOM. WELD SHELTER AIR MOVING EQUIPMENT IS ON AND PURGING FIT-UP ROOM WITH CLEAN, CONDITIONED AIR. REMOVE EXTERIOR DOOR CURTAIN ON EXISTING BEAM TUBE SIDE AND STORE.	BEAM TUBE END CAP IS IN PLACE AND SEALED. CLOSE END OF WELD SHELTER AND GINCH PROTECTIVE SKIRT AROUND BEAM TUBE. EXISTING BEAM TUBE END BAG IS REMOVED AND DISCARDED INTO WASTE CONTAINER. WIPE SURFACES WITH MILD DETERGENT SOLUTION OF 1:30 AMRACHEM 500 AND WATER. WATER RINSE AND DRY WITH LINT FREE CLOTH. STORE CONTAMINATED WIPING CLOTHS IN MARKED CONTAINERS FOR SALVAGE.	BEAM TUBE READY TO TRANSPORT TO INSTALLATION SITE. ALL INSPECTIONS PERFORMED AND END CAPS ARE INSTALLED AND COVERED WITH DISPOSABLE BAGS.



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STEP #3

STEP #3 - MOVE FIT-UP ROOM OVER PRE-CLEANED EXISTING/INSTALLED BEAM TUBE END

EQUIPMENT STATUS WELD SHELTER MAINTENANCE	COMPONENT STATUS EXISTING/INSTALLED BEAM TUBE END	COMPONENT STATUS NEW BEAM TUBE END
MOVE WELD SHELTER OVER END OF EXISTING/INSTALLED BEAM TUBE TO THE FIT-UP ROOM. NOTE THAT PROTECTIVE SKIRT WILL COLLAPSE AS REQUIRED. SEAL EXISTING/INSTALLED TUBE END USING CURTAIN AND VELCRO® FASTENERS. WELD SHELTER AIR MOVING EQUIPMENT IS ON AND PURGING FIT-UP ROOM WITH CLEAN, CONDITIONED AIR.	BEAM TUBE END CAP IS IN PLACE AND SEALED. PERFORM A FINAL 1:30 MIRACIEM 500/WATER WIPE OF SURFACES, WATER RINSE AND DRY WITH LINT FREE CLOTH. STORE CONTAMINATED WIPING CLOTHS OUTSIDE FIT-UP ROOM IN MARKED CONTAINERS FOR SALVAGE.	BEAM TUBE READY TO TRANSPORT TO INSTALLATION SITE. ALL INSPECTIONS PERFORMED AND END GAPS ARE INSTALLED AND COVERED WITH DISPOSABLE BAGS.

STEP #4

STEP #4 - RIG AND PLACE NEW BEAM TUBE

EQUIPMENT STATUS WELD SHELTER MAINTENANCE	COMPONENT STATUS EXISTING/INSTALLED BEAM TUBE END	COMPONENT STATUS NEW BEAM TUBE END
WELD SHELTER AIR MOVING EQUIPMENT IS ON AND PURGING FIT-UP ROOM WITH CLEAN, CONDITIONED AIR.	BEAM TUBE END CAP IS IN PLACE AND SEALED.	RIG AND PLACE NEW BEAM TUBE ON JACKING DOLLIES AND POSITION IN FRONT OF WELDING SHED. ALL INSPECTIONS PERFORMED AND END GAPS ARE INSTALLED AND COVERED WITH DISPOSABLE BAGS.



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STEP #5

STEP #5 - MOVE NEW BEAM TUBE INTO SHELTER ANTE ROOM AND PRE-CLEAN

EQUIPMENT STATUS WELD SHELTER MAINTENANCE	COMPONENT STATUS EXISTING/INSTALLED BEAM TUBE END	COMPONENT STATUS NEW BEAM TUBE END
WELD SHELTER AIR MOVING EQUIPMENT IS ON AND PURGING FIT-UP ROOM WITH CLEAN, CONDITIONED AIR.	BEAM TUBE END CAP IS IN PLACE AND SEALED.	<p>MOVE NEW BEAM TUBE USING JACKING DOLLIES INTO WELD SHELTER ANTE ROOM FOR CLEANING.</p> <p>CLOSE END OF WELD SHELTER AND CINCH PROTECTIVE SKIRT AROUND BEAM TUBE.</p> <p>REMOVE PLASTIC BAG FROM END AND DISCARD. 1:30 MIRACHEM WATER WIPE SURFACES, WATER RINSE AND DRY WITH LINT FREE CLOTH. STORE CONTAMINATED WIPING CLOTHS IN MARKED CONTAINERS FOR SALVAGE.</p> <p>BEAM TUBE END CAP IS IN PLACE AND SEALED.</p>

STEP #6

STEP #6 - MOVE PRE-CLEANED BEAM TUBE END INTO SHELTER FIT-UP ROOM

EQUIPMENT STATUS WELD SHELTER MAINTENANCE	COMPONENT STATUS EXISTING/INSTALLED BEAM TUBE END	COMPONENT STATUS NEW BEAM TUBE END
WELD SHELTER AIR MOVING EQUIPMENT IS ON AND PURGING FIT-UP ROOM WITH CLEAN, CONDITIONED AIR.	BEAM TUBE END CAP IS IN PLACE AND SEALED.	<p>MOVE NEW BEAM TUBE USING JACKING DOLLIES INTO WELD SHELTER FIT-UP ROOM FOR CLEANING.</p> <p>FINAL 1:30 MIRACHEM WATER WIPE SURFACES, WATER RINSE AND DRY WITH LINT FREE CLOTH. STORE CONTAMINATED WIPING CLOTHS IN MARKED CONTAINERS FOR SALVAGE.</p> <p>BEAM TUBE END CAP IS IN PLACE AND SEALED.</p> <p>SEAL NEWLY INSTALLED TUBE END USING CURTIAN AND VELCRO® FASTENERS.</p>



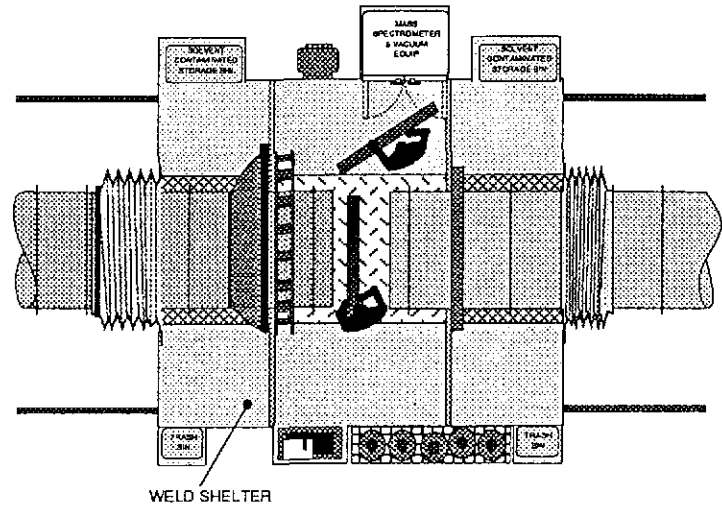
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STEP #7

STEP #7 - FINAL CLEAN BEAM TUBE ENDS AND REMOVE END CAPS

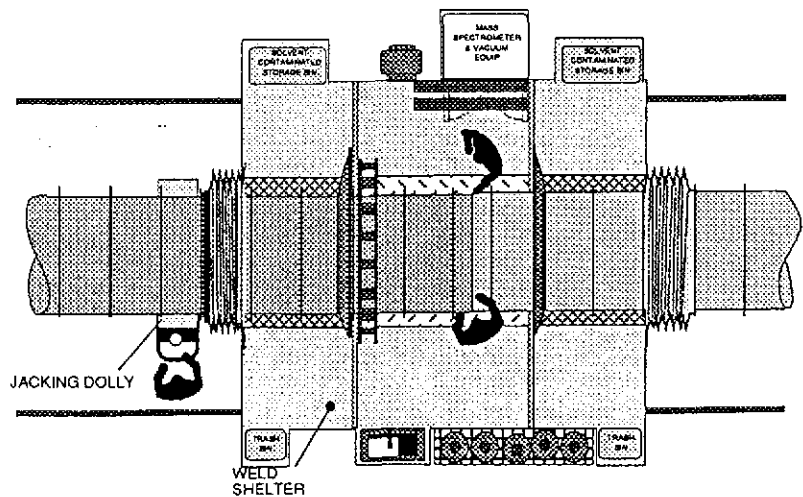
EQUIPMENT STATUS WELD SHELTER MAINTENANCE	COMPONENT STATUS EXISTING/INSTALLED BEAM TUBE END	COMPONENT STATUS NEW BEAM TUBE END
ADJUST WELD SHELTER AIR MOVING EQUIPMENT TO 'LOW AIR' SETTING DURING FIT-UP AND WELDING PROCESS. LOCK WELD SHELTER FIT-UP ROOM DOOR TO DISCOURAGE ACCESS DURING FIT-UP ACTIVITY.	REMOVE AND STORE BEAM TUBE END CAP.	REMOVE AND STORE BEAM TUBE END CAP.



STEP #8

STEP #8 - FIT-UP NEW BEAM TUBE END TO EXISTING/INSTALLED BEAM TUBE END

EQUIPMENT STATUS WELD SHELTER MAINTENANCE	COMPONENT STATUS EXISTING/INSTALLED BEAM TUBE END	COMPONENT STATUS NEW BEAM TUBE END
WELD SHELTER AIR MOVING EQUIPMENT SET TO 'LOW AIR' SETTING DURING FIT-UP AND WELDING PROCESS. LOCK WELD SHELTER FIT-UP ROOM DOOR TO DISCOURAGE ACCESS DURING FIT-UP ACTIVITY.	BEAM TUBE PLUG IS IN PLACE AT A DISTANCE UP-STREAM OF OPENING.	MOVE NEW BEAM TUBE INTO POSITION AND FIT-UP TO EXISTING/INSTALLED BEAM TUBE END. INSTALL JACKING STANDS TO TUBE ENDS AND CENTER AS REQUIRED.





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TITLE
 CONTAMINATION CONTROL
 FOR CONSTRUCTION ACTIVITIES
 DURING BEAM TUBE INSTALLATION

PRODUCT
 LIGO BEAM TUBE MODULES
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STEP #9

STEP #9 - INSTALL FIT-UP FIXTURE AND PURGE ARM AT WELD JOINT

EQUIPMENT STATUS WELD SHELTER MAINTENANCE	COMPONENT STATUS EXISTING/INSTALLED BEAM TUBE END	COMPONENT STATUS NEW BEAM TUBE END
WELD SHELTER AIR MOVING EQUIPMENT SET TO "LOW AIR" SETTING DURING FIT-UP AND WELDING PROCESS.	PUSH BEAM TUBE PLUG A DISTANCE OF 12" UP STREAM OF OPENING.	INSTALL FIT-UP FIXTURE AND ALIGN SEAM FOR WELDING. DELETED
LOCK WELD SHELTER FIT-UP ROOM DOOR TO DISCOURAGE ACCESS DURING FIT-UP ACTIVITY.		

STEP #10

STEP #10 - PREPARE NEW BEAM TUBE END FOR INSERTION INTO CLEAN ROOM

EQUIPMENT STATUS CLEAN ROOM	COMPONENT STATUS EXISTING/INSTALLED BEAM TUBE END	OPPOSITE END OF NEW TUBE @ CLEAN ROOM
BEAM TUBE END CAP AT CLEAN ROOM END OF BEAM TUBE IS STILL IN PLACE. MOVE CLEAN ROOM ANTE ROOM OVER BEAM TUBE END. CLOSE END OF CLEAN RM ANTE ROOM AND CINCH PROTECTIVE SKIRT AROUND BEAM TUBE.	NEW BEAM TUBE FIT UP END IS SECURED TO EXISTING BEAM TUBE MODULE WITH FIT-UP JOG. WELD SHELTER AIR MOVING EQUIPMENT SET TO "LOW AIR" SETTING DURING FIT-UP AND WELDING PROCESS. NO WELDING IS TAKING AT THIS TIME. LOCK WELD SHELTER FIT-UP ROOM DOOR TO DISCOURAGE ACCESS DURING FIT-UP ACTIVITY.	REMOVE PLASTIC BAG, DISPOSE OF PLASTIC BAG IN APPROVED CONTAINER. PRE-CLEAN BEAM TUBE EXTERIOR SURFACES USING A 1:30 SOLUTION OF MURCHER 500 & WATER. WATER RINSE AND WIPE DRY. RELEASE CLEAN ROOM INFLATABLE SEAL AND REMOVE EXTERIOR PLUG.



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STEP #11

STEP #11 - INSERTION OF BEAM TUBE END INTO CLEAN ROOM

EQUIPMENT STATUS CLEAN ROOM	COMPONENT STATUS EXISTING/INSTALLED BEAM TUBE END	OPPOSITE END OF NEW TUBE @ CLEAN ROOM
MOVE CLEAN ROOM OVER BEAM TUBE END PRESSURIZE INFLATABLE SEAL. OPEN PLEXIGLASS SEAL DOOR INSIDE CLEAN ROOM AND INSPECT FOR INSECTS, DUST OR DEBRIS WHICH MAY HAVE ENTERED WITH THE BEAM TUBE. OPEN THE SCREEN COVER DOORS AND REMOVE ANY INSECTS AND WIPE DOWN SURFACES USING A CLEAN, DRY LINT-FREE CLOTH.	BEAM TUBE PLUGS ARE IN PLACE AT A DISTANCE UP-STREAM OF OPENING. WELD SHELTER AIR MOVING EQUIPMENT SET TO "LOW AIR" SETTING DURING FIT-UP AND WELDING PROCESS. WELD SHELTER FIT-UP ROOM DOOR LOCKED TO DISCOURAGE ACCESS DURING FIT-UP ACTIVITY.	REMOVE THE NEW BEAM TUBE PLUG AND STORE. TEST AIR OF BEAM TUBE PER CONFINED SPACE REQUIREMENTS AND COMPLETE ALL CHECK LISTS BEFORE ENTERING BEAM TUBE. MOVE UP BEAM TUBE AND INSTALL INFLATABLE PURGE DAM AND INFLATE DAM SCREEN COVER DOORS SHALL REMAIN CLOSED AT ALL TIMES WHEN BEAM TUBE IS OPEN TO CLEAN ROOM.

STEP #12

STEP #12 - TACK JOINT FOR FINAL WELDING

EQUIPMENT STATUS WELD SHELTER MAINTENANCE	COMPONENT STATUS EXISTING/INSTALLED BEAM TUBE END	COMPONENT STATUS NEW BEAM TUBE END
WELD SHELTER AIR MOVING EQUIPMENT SET TO "LOW AIR" SETTING DURING FIT-UP AND WELDING PROCESS. LOCK WELD SHELTER FIT-UP ROOM DOOR TO DISCOURAGE ACCESS DURING FIT-UP ACTIVITY.	BEAM TUBE PLUG IS IN PLACE AT A DISTANCE UP-STREAM OF PURGE DAM.	AFTER PURGE DAM INSTALLED AND INFLATED, PRESSURIZE WITH APPROVED COVER GAS. TACK WELD BEAM TUBES TOGETHER FOR AUTOMATIC WELDING PER APPROVED PROCEDURE.



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STEP #13

STEP #13 - REMOVE FIT-UP FIXTURE AND INSTALL AUTOMATIC WELDER

EQUIPMENT STATUS WELD SHELTER MAINTENANCE	COMPONENT STATUS EXISTING/INSTALLED BEAM TUBE END	COMPONENT STATUS NEW BEAM TUBE END
WELD SHELTER AIR MOVING EQUIPMENT SET TO "LOW AIR" SETTING DURING FIT-UP AND WELDING PROCESS.	BEAM TUBE PLUG IS IN PLACE AT A DISTANCE UP-STREAM OF PURGE DAM.	AFTER PURGE DAM INSTALLED AND INFLATED, PRESSUREIZE WITH APPROVED COVER GAS.
LOCK WELD SHELTER FIT-UP ROOM DOOR FROM INSIDE TO DISCOURAGE ACCESS DURING FIT & WELD ACTIVITY.	TACK WELDING COMPLETE. REMOVE FIT-UP RING AND STORE ON WALL MOUNT.	TACK WELDING COMPLETE. REMOVE FIT-UP RING AND STORE ON WALL MOUNT.
	INSTALL AUTOMATIC WELDER TRACK AND HEAD.	INSTALL AUTOMATIC WELDER TRACK AND HEAD.

STEP #14

STEP #14 - WELD BEAM TUBE JOINT

EQUIPMENT STATUS WELD SHELTER MAINTENANCE	COMPONENT STATUS EXISTING/INSTALLED BEAM TUBE END	COMPONENT STATUS NEW BEAM TUBE END
WELD SHELTER AIR MOVING EQUIPMENT SET TO "LOW AIR" SETTING DURING FIT-UP AND WELDING PROCESS.	BEAM TUBE PLUG IS IN PLACE AT A DISTANCE UP-STREAM OF PURGE DAM.	CONTINUE PURGE WITH APPROVED COVER GAS.
LOCK WELD SHELTER FIT-UP ROOM DOOR FROM INSIDE TO DISCOURAGE ACCESS DURING WELDING ACTIVITY.	COMPLETE WELDING OPERATION AND VISUAL INSPECT WELD.	COMPLETE WELDING OPERATION AND VISUAL INSPECT WELD.



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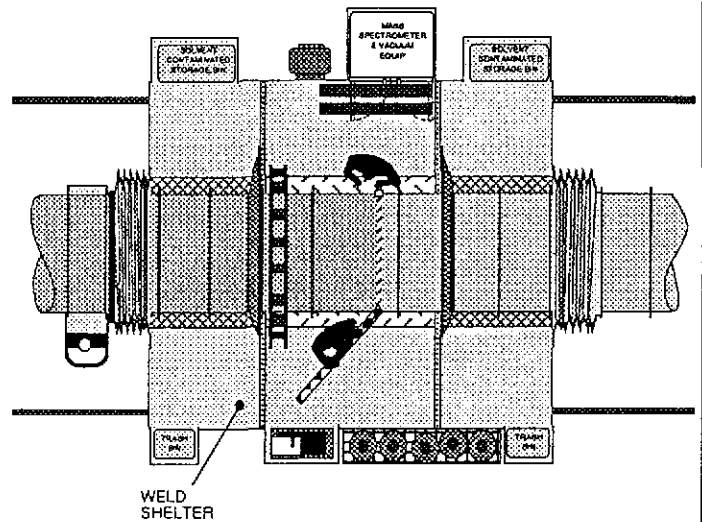
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STEP #15

STEP #15 - INSPECT BEAM TUBE JOINT WELD AND REMOVE WELDING EQUIPMENT FROM TUBE ASSEMBLY

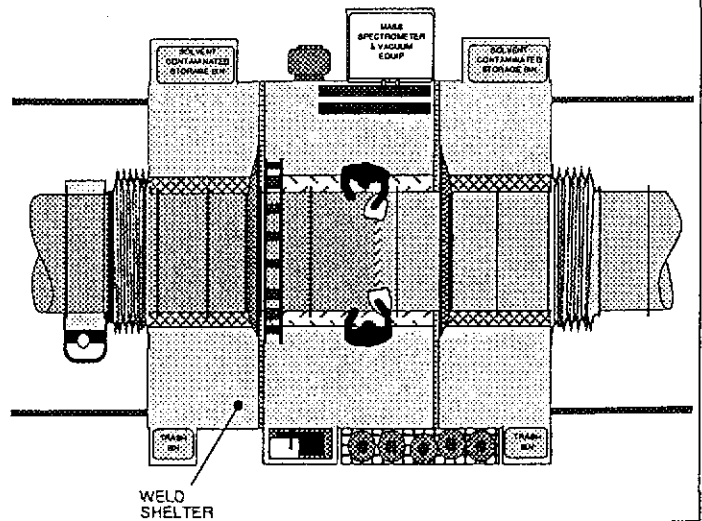
EQUIPMENT STATUS WELD SHELTER MAINTENANCE	COMPONENT STATUS EXISTING/INSTALLED BEAM TUBE END	COMPONENT STATUS NEW BEAM TUBE END
WELD SHELTER AIR MOVING EQUIPMENT SET TO "LOW AIR" SETTING DURING FIT-UP AND WELDING PROCESS.	BEAM TUBE PLUG IS IN PLACE AT A DISTANCE UP-STREAM OF PURGE DAM	REMOVE WELDING EQUIPMENT AND STORE. SHUT DOWN PURGE COVER GAS AFTER INSPECTION.
UNLOCK WELD SHELTER FIT-UP ROOM DOOR AFTER WELDING ACTIVITY.	REMOVE WELDING EQUIPMENT AND SECURE IN PROPER STORAGE AREA. SHUT DOWN PURGE COVER GAS AFTER INSPECTION.	REMOVE PURGE FROM INNER SURFACES AND INSPECT WELD SEAM.



STEP #16

STEP #16 - CLEAN WELD JOINT AREA AND PREPARE FOR TESTING

EQUIPMENT STATUS WELD SHELTER MAINTENANCE	COMPONENT STATUS EXISTING/INSTALLED BEAM TUBE END	COMPONENT STATUS NEW BEAM TUBE END
WELD SHELTER AIR MOVING EQUIPMENT SET TO "NORMAL AIR" SETTING DURING TESTING ACTIVITY.	BEAM TUBE PLUG IS IN PLACE AT A DISTANCE UP-STREAM OF PURGE DAM	RE-INSTALL PURGE RING ON INSIDE OF BEAM TUBE. PRESSURIZE WITH APPROVED TEST GAS.
	EVACUATE PURGE AREA AND PRESSURIZE WITH APPROVED TEST GAS. WIPE AREAS WHERE TEST EQUIPMENT SEATS ON THE BEAM TUBE SURFACES WITH CLEAN LINT-FREE CLOTHS.	USING MILD DETERGENT SOLUTION OF 1:20 MIRACIL M 226/WATER, WATER RINSE AND WIPE DRY AREAS WHERE TEST EQUIPMENT SEATS ON THE BEAM TUBE EXTERIOR SURFACES.





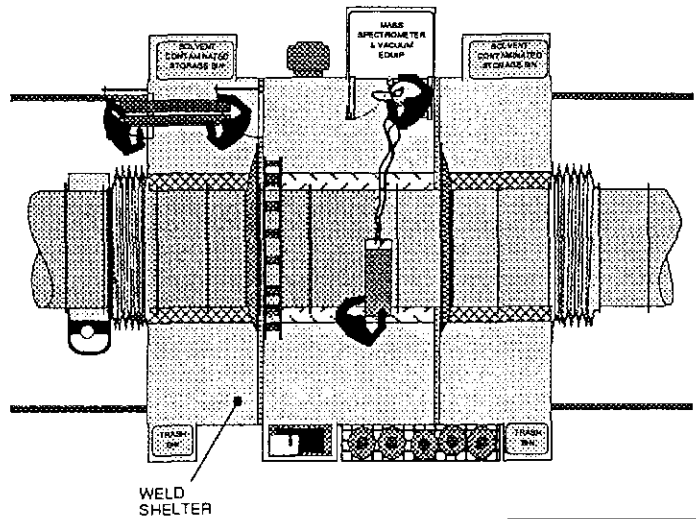
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STEP #17

STEP #17 - LEAK TEST BEAM TUBE WELD JOINT

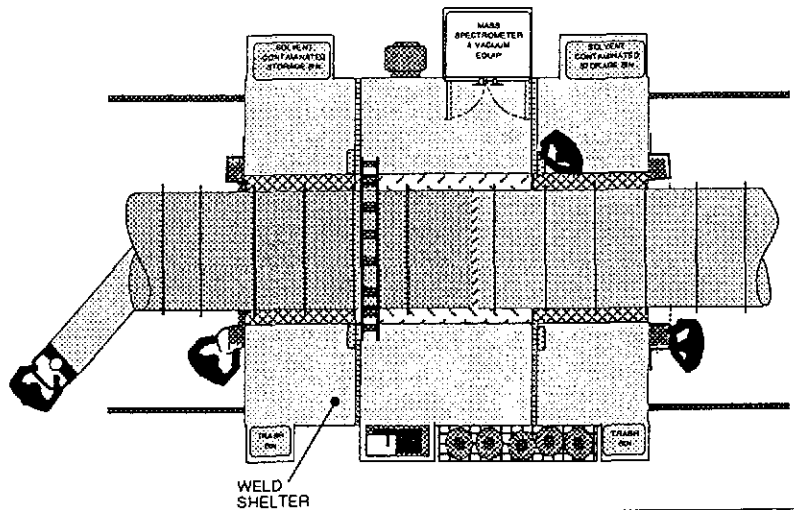
EQUIPMENT STATUS WELD SHELTER MAINTENANCE	COMPONENT STATUS EXISTING/INSTALLED BEAM TUBE END	COMPONENT STATUS NEW BEAM TUBE END
WELD SHELTER AIR MOVING EQUIPMENT - SET TO "NORMAL AIR" SETTING DURING TEST ACTIVITY.	BEAM TUBE PLUG IS IN PLACE AT A DISTANCE UP-STREAM OF PURGE DAM	SET UP TEST EQUIPMENT AND MASS SPECTROMETER.
WRAP AND BAG BEAM TUBE END CAPS AND REMOVE FROM THE WELD SHELTER	SET UP TEST EQUIPMENT AND MASS SPECTROMETER.	CONTINUE PURGE WITH APPROVED TEST GAS.
	CONTINUE PURGE WITH APPROVED TEST GAS.	PERFORM MAS SPEC TEST PER THE APPROVED PROCEDURE.
	PERFORM MAS SPEC TEST PER THE APPROVED PROCEDURE.	PERFORM REPAIRS AND FINAL SURFACE INSPECTIONS TO ACHIEVE A SUCCESSFUL TEST RESULT.



STEP #18

STEP #18 - PREPARE TO MOVE WELD SHELTER

EQUIPMENT STATUS WELD SHELTER MAINTENANCE	COMPONENT STATUS EXISTING/INSTALLED BEAM TUBE END	COMPONENT STATUS NEW BEAM TUBE END
SHUT DOWN HVAC UNIT.	BEAM TUBE PLUG IS IN PLACE AT A DISTANCE UP-STREAM OF PURGE DAM	REMOVE INNER BOOT FROM BEAM TUBE OUTER SURFACES. STORE AND/OR SECURE AS REQUIRED.
DISCONNECT ALL ELECTRICAL PLUGS AND COIL CABLE. STORE AT PROPER LOCATIONS.	REMOVE INNER BOOT FROM BEAM TUBE OUTER SURFACES. STORE AND/OR TIE BACK AS INDICATED IN THE WELD SHED PROCEDURE.	REMOVE OUTER SKIRT FROM BEAM TUBE SURFACES. STORE AND/OR TIE BACK AS INDICATED IN THE WELD SHED PROCEDURE.
LENGTHEN TRACK TO ACCOMMODATE MOVING CLEAN ROOM FORWARD (AN ESTIMATED 80' FROM ITS PRESENT POSITION).	REMOVE OUTER SKIRT FROM BEAM TUBE SURFACES. STORE AND/OR TIE BACK AS INDICATED IN THE WELD SHED PROCEDURE.	
RELEASE BRAKES AND PREPARE TO MOVE WELD SHELTER BEYOND END OF NEWLY INSTALLED BEAM TUBE.		





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STEP #19

STEP #19 - PREPARE FOR NEW BEAM TUBE INSTALLATION

EQUIPMENT STATUS WELD SHELTER MAINTENANCE	COMPONENT STATUS EXISTING/INSTALLED BEAM TUBE END	COMPONENT STATUS NEW BEAM TUBE END
INSPECT THAT ALL WIRING IS DISCONNECTED.	THE NEWLY INSTALLED BEAM TUBE BECOMES THE EXISTING/INSTALLED BEAM TUBE.	DELETED
ASSURE THE FABRIC SKIRTS, COVERS AND FIT-UP GEAR IS CLEAR OF THE BEAM TUBE.	EXISTING BEAM TUBE IS MOUNTED ON TEMPORARY SUPPORT FRAME.	REMOVE INFLATABLE PURGE RING FROM INSIDE BEAM TUBE
TAKE UP THE FLOORING OF THE WELD SHELTER AND STACK AGAINST WALLS IN ORDER TO CLEAR THE TEMPORARY BEAM TUBE SUPPORTS.	EXISTING/INSTALLED BEAM TUBE WITH BAG COVER IS INSTALLED OVER END DURING THE CLEAN ROOM FINAL REMOVAL.	
TOW WELD SHELTER TO A POSITION OF 20 FEET BEYOND THE END OF THE NEWLY INSTALLED BEAM TUBE.		

STEP #20

STEP #20 - SECURE BEAM TUBE END AND SEAL CLEAN ROOM

EQUIPMENT STATUS CLEAN ROOM	COMPONENT STATUS EXISTING/INSTALLED BEAM TUBE END	OPPOSITE END OF NEW TUBE @ CLEAN ROOM
CLOSE SCREEN COVER DOOR INSIDE CLEAN ROOM AND SECURE	WELD SHELTER IS BEING PREPARED FOR MOVING TO NEXT NEW INSTALLATION	COMPLETE ALL INSPECTIONS AND REPAIRS AS NECESSARY
CLOSE PLEXIGLASS SEAL DOOR INSIDE CLEAN ROOM AND SECURE		REMOVE ALL EQUIPMENT FROM BEAM TUBE.
DE-FLATE CLEAN ROOM SEAL AND RELEASE BEAM TUBE END		REMOVE INNER PLUG FROM UP-STREAM OF WELD SEAM FOR INSTALLATION AT END OF NEW BEAM TUBE END
MOVE CLEAN ROOM AWAY FROM BEAM TUBE MODULE END SO THAT END IS NOW IN THE CLEAN RM ANTE ROOM		INSTALL BEAM TUBE INTERNAL PLUG A DISTANCE INTO THE BEAM TUBE.
		SECURE BEAM TUBE PLUG TO WHAT IS NOW EXISTING BEAM TUBE MODULE END



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STEP #21

STEP #21 - REMOVE END FROM CLEAN ANTE ROOM AND BAG END

EQUIPMENT STATUS CLEAN ROOM	COMPONENT STATUS EXISTING/INSTALLED BEAM TUBE END	OPPOSITE END OF NEW TUBE @ CLEAN ROOM
CLEAN AND INSTALL STORAGE PLUG INTO THE INFLATABLE SEAL AND INFLATE TO SECURE OPENING. REMOVE PROTECTIVE SKIRT AND STORE ON ANTE ROOM. MOVE CLEAN ROOM AWAY FROM BEAM TUBE MODULE END A MINIMUM DISTANCE OF 20 METERS.	WELD SHELTER IS BEING PREPARED FOR MOVING TO NEXT NEW INSTALLATION.	INSTALL A DISPOSABLE BAG OVER EXISTING BEAM TUBE MODULE END AND SECURE.

STEP #22

STEP #22 - PREPARE FOR NEW BEAM TUBE INSTALLATION

EQUIPMENT STATUS WELD SHELTER MAINTENANCE	COMPONENT STATUS EXISTING/INSTALLED BEAM TUBE END	COMPONENT STATUS NEW BEAM TUBE END
INSTALL FABRIC DOOR COVERS TO PROTECT THE WELD SHELTER FROM OUTSIDE CONTAMINATION. WIPE DOWN ALL INSIDE SURFACES OF THE WELD SHELTER. REMOVE TRASH FROM RECEPTACLS AND RECYCLE WIPING CLOTHS. CLEAN & INSPECT ALL FABRIC SKIRTS, COVERS AND CURTAINS AND REPAIR AS REQUIRED. CLEAN FIT-UP GEAR AND TOOLS AND DRY WITH LINT FREE CLOTH. DELETED. DELETED. AIR MOVING EQUIPMENT IS ON AND PULPING FIT-UP ROOM WITH CLEAN, CONDITIONED AIR. INSPECT AIR FILTERS AND DOOR SEALS AND CLEAN/REPLACE AS NECESSARY.	BEAM TUBE END CAP IS IN PLACE AND SEALED. A DISPOSABLE PLASTIC BAG IS COVERING THE BEAM TUBE SURFACES NEAR THE END. EXISTING BEAM TUBE IS MOUNTED ON TEMPORARY SUPPORT FRAME. EXISTING/INSTALLED BEAM TUBE WITH BAG COVER, INSTALLED OVER END; DURING THE CLEAN ROOM FINAL REMOVAL.	NEW BEAM TUBE READY TO TRANSPORT TO INSTALLATION SITE. ALL INSPECTIONS PERFORMED AND END CAPS ARE INSTALLED AND COVERED WITH DISPOSABLE BAGS.