E950063-01-B

	IDENTIFICATION CCP-1			
TITLE CONTAMINATION CONTROL FOR CONSTRUCTION ACTIVITIES DURING BEAM TUBE INSTALLATION PRODUCT LIGO BEAM TUBE MODULES CALIFORNIA INSTITUTE OF TECHNOLOGY	REFERENCE NO. 930212		SHT 1 OF 20	
	OFFICE		REVISION 1	
	MADE BY SDH	CHKD BY KHF	MADE BY SDH	CHKD BY WLR
	DATE 7/25/94	DATE 8/4/94	DATE 5/17/95	DATE 5/19/95

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.

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, LN_2 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 Specification, WSTSM; "Weld Shelter Transporting, Storage and Maintenance Procedure" (Later)

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]:

1) Beam Tube Assembly Receiving Inspection after transportation to Site[2] and/or Beam Tube Assembly on-site Final Inspection before transporting to the installation area[3].
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.

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[1] This procedure begins after final cleaning and sealing of the Beam Tube Assembly.
[2] Based on off-site construction and final testing and cleaning. This activity may be combined with inspection in note #3.
[3] Inspection of cleaning and installation of fit-up plug required before transporting Beam Tube Assembly to installation area.

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.

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 leakage is noted, follow the sequence listed below:

1) Move the beam tube into a clean, controlled facility or erect a temporary facility around the point of exposure.
2) Remove covers and inspect the extent of contamination.
3) Use a cleaning procedure required for the area of contamination found(ie:, localized, full length, weld areas, etc.).
4) Inspect and re-seal area to eliminate the chance of re-contamination due to leakage.

5.1.3 Clean outside surfaces to reduce the risk of contamination of handling before and exposure.

1) Water wash areas with low pressure tap water and approved mild detergent.
2) Hand dry areas by wiping with approved towels.

5.1.4 Protect surfaces from insect contamination by applying an approved insecticide to the areas where the cover is fastened to the beam tube.

DO NOT APPLY INSECTICIDE
OVER THE ENTIRE CLEANED SURFACE

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 Protect surfaces from insect contamination by applying an approved insecticide to the entry areas and where the covers are fastened to the beam tube.

DO NOT APPLY INSECTICIDE
OVER THE ENTIRE AREAS.

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 an approved solvent.
3) Wipe down with approved 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 an approved solvent.
2) Wipe down with approved 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 The controlled inspection area shall be conditioned using a filtered air supply system consisting of pre-filters, high efficiency, 5 micron particle filters and an electrostatic filter for supply air. The facility shall be pressurized above outside ambient to provide positive air flow out of building. An approved, timed insecticide spray will be mounted in the entry point of the controlled areas. The areas shall be inspected for insects, birds, etc. will all sightings eliminated before exposing the beam tube inner surface.

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 and 0.03 micron bag type 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. An approved, timed insecticide spray will be mounted in the entry point of the controlled areas. The areas shall be inspected for insects, birds, etc. will all sightings eliminated before exposing the beam tube inner surface.

5.2.3 The Clean Room is conditioned using a HVAC unit with heating and cooling capabilities. Air is filtered using disposable pre-filters and 0.03 micron bag type 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. An approved, timed insecticide spray will be mounted in the entry point of the controlled areas. The areas shall be inspected for insects, birds, etc. will all sightings eliminated before exposing the beam tube inner surface.

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.

5.3 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) Table 5.3a; "Receiving and Final Inspection Prior to Installation"
2) Table 5.3b[4]; "Site Installation of Access End of Beam Tube Assembly"
3) Table 5.3c[4]; "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"
6) Listing; "Frame by frame description of the cleaning process detailing the specific steps in both the clean room and the weld/test shelter"

[4] Activity detail of the steps for beam tube contamination control is included as sheets 12 thru 20 and marked "LIGO ASSEMBLY SEQUENCE AT WELD SHELTER.

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TABLE 5.3.a

- RESIDENT PARTICLE/MOISTURE/BIOLOGICAL -
CONTAMINATION CONTROL

Receiving and Final Inspection Prior to Installation

Step No.	Description	Location	Process Materials
1	Inspect End Caps for Leaks	Receiving Yard	N/A
2	Detergent Wash/Water Rinse Beam Tube Ends and End Caps.	Receiving Yard	Approved Detergent & Low Pressure Tap Water
3	Solvent wipe Tube Ends and End Caps. Wipe Dry	Receiving Enclosure	Approved Solvent & Lint Free Wiping Cloth
4	Remove End Caps and Inspect Tube Surfaces. Wipe Areas near openings clean as required.	Receiving Enclosure	Approved Solvent & Lint Free Wiping Cloth
5	Clean End Cap and replace on Beam Tube Access End.	Receiving Enclosure	Approved Solvent & Lint Free Wiping Cloth
6	Install Internal Plug Assembly at Beam Tube Fit-Up End.	Receiving Enclosure	Internal Plug Assembly Lint Free Wiping Cloth
7	Clean End Cap and replace on Beam Tube Fit-Up End.	Receiving Enclosure	Approved Solvent & Lint Free Wiping Cloth
8	Cover End Cap and Beam Tube to first Stiffener with disposable Plastic Bag.	Receiving Enclosure	Approved Plastic Cover(bag) and tape.

TABLE 5.3b

- RESIDENT PARTICLE/MOISTURE/BIOLOGICAL -
CONTAMINATION CONTROL

Site Installation of Access End of Beam Tube Assembly

Step No.	Description	Location	Process Materials
1	Wash Down Concrete Pad at Installation Area.	Installation Area @ Clean Room Annex	Pressurized Water Spray System
2	Upon Delivery of Beam Tube to Site, Remove Plastic Bag Cover & Inspect End Cap for Leaks	Installation Area @ Clean Room	N/A
3	Solvent wipe Access Tube End and End Cap. Wipe Dry	Installation Area @ Clean Room.	Approved Solvent & Lint Free Wiping Cloth
4	Move Clean Room Over Beam Tube Access End & Seal.	Installation Area @ Clean Room.	Pressurized Inflatable Seal(s).
5	Remove End Cap and Inspect Tube Surfaces.	Clean Room	N/A
6	Solvent wipe Access Tube End Inner and Outer surfaces exposed in the Clean Room.	Clean Room	Approved Solvent & Lint Free Wiping Cloth
7	After Welding & Testing, Remove Purge Equipment and Complete Final Inspection of Inner Surfaces	Clean Room	Approved Solvent & 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.

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	Pressurized Inflatable Seal(s).
4	Remove Plastic Bag Cover and discard.Inspect End Cap for Leaks.	Weld Shelter Fit-up Ante Room	N/A
5	Solvent wipe Access Tube End and End Cap. Wipe Dry	Weld Shelter Fit-up Ante Room	Approved Solvent & 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	Solvent wipe Fit-up Tube End & End Cap. Wipe Dry.	Weld Shelter Fit-up-Weld Room.	Approved Solvent 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

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	Solvent wipe Access Tube End and End Cap. Wipe Dry	Weld Shelter Fit-up Ante Room	Approved Solvent & 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	*Solvent wipe Existing, Installed* Tube End & End Cap. Wipe Dry.	Weld Shelter Fit-up-Weld Room.	Approved Solvent 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

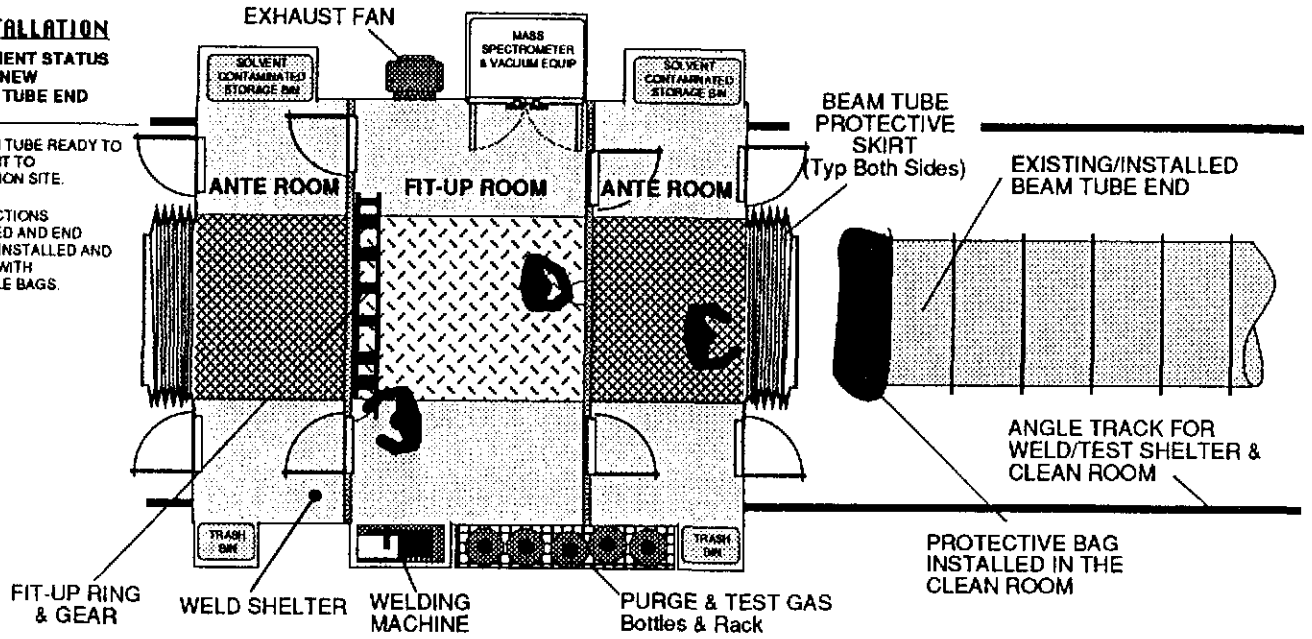
- RESIDENT PARTICLE/MOISTURE/BIOLOGICAL -
CONTAMINATION CONTROL

Cleaning of Installation Equipment & Fit-up Tooling

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 Solvent and dry cloth.	Weld Shelter	Approved Solvent & Lint Free Wiping Cloth
3	Prior to delivery of the next New Beam Tube, the Clean Room Annex shall be wiped down with Solvent and wiped dry.	Clean Room Annex *Note: Clean Room* Maintenance per Proc. CR1TSM.	Approved Solvent & *Lint Free Wiping Cloth*
4	Solvent wipe Fit-Up Gear, Tools and Handling Equipment.	Weld Shelter Fit-up & Ante Room	Approved Solvent & Lint Free Wiping Cloth
5	Solvent wipe Portable Jacking and Temporary Support Stands.	Installation Areas	Approved Solvent & 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

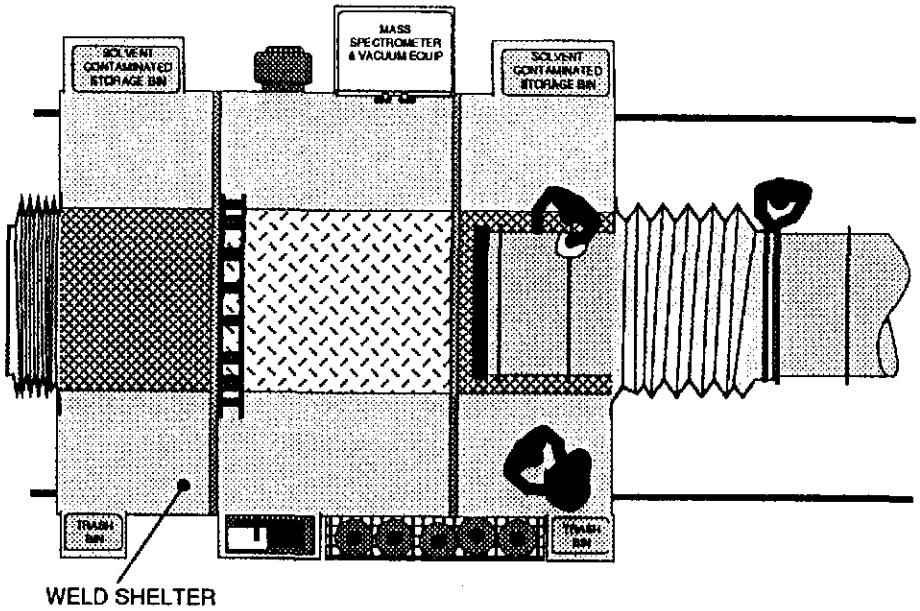
STEP #1 -PREPARE FOR NEW BEAM TUBE INSTALLATION

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 WIPED DOWN. CLEAN & INSPECT ALL FABRIC COVERS AND CURTIANS AND REPAIR AS REQUIRED. CLEAN FIT-UP GEAR AND TOOLS WITH SOLVENT WIPE AND DRY WITH LINT FREE CLOTH. APPLY INSECTICIDE TO SURFACES. SPRAY FLYING INSCETICIDE IN ANTE ROOMS AND FIT-UP ROOM. AIR MOVING EQUIPMENT IS ON AND PURGING FIT-UP ROOM WITH CLEAN, CONDITIONED AIR.	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.



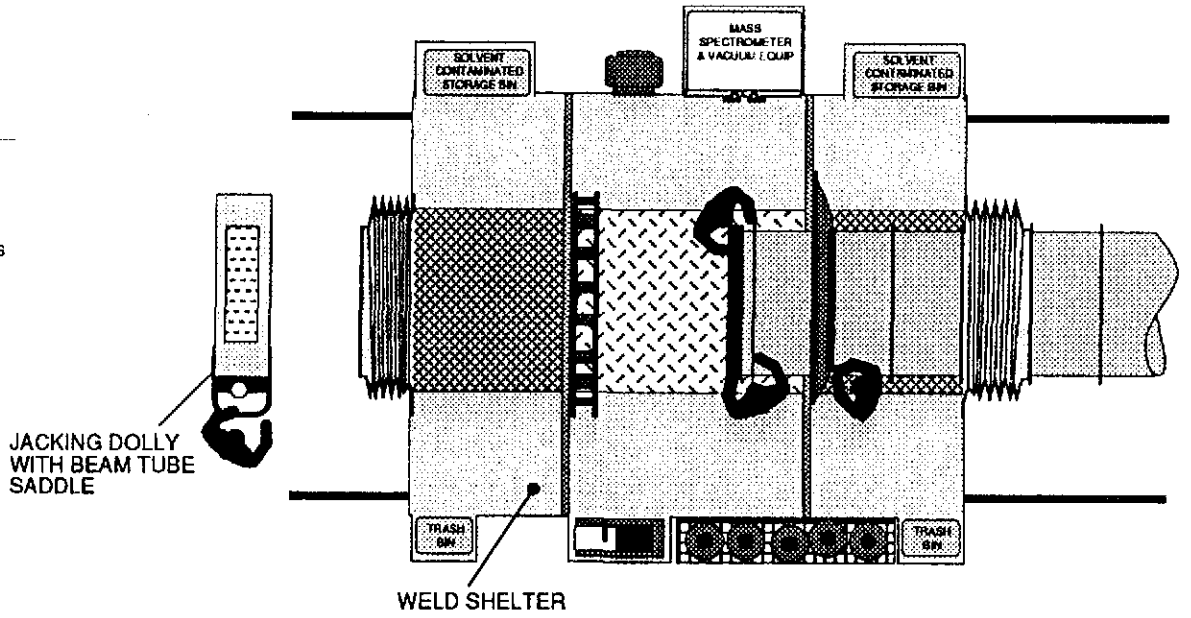
STEP #2 -PRE-CLEAN EXISTING/INSTALLED BEAM TUBE

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.	BEAM TUBE END CAP IS IN PLACE AND SEALED. CLOSE END OF WELD SHELTER AND CINCH PROTECTIVE SKIRT *AROUND* BEAM TUBE. EXISTING BEAM TUBE END BAG IS REMOVED AND DISCARDED INTO WASTE CONTAINER. SOLVENT WIPE SURFACES 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.



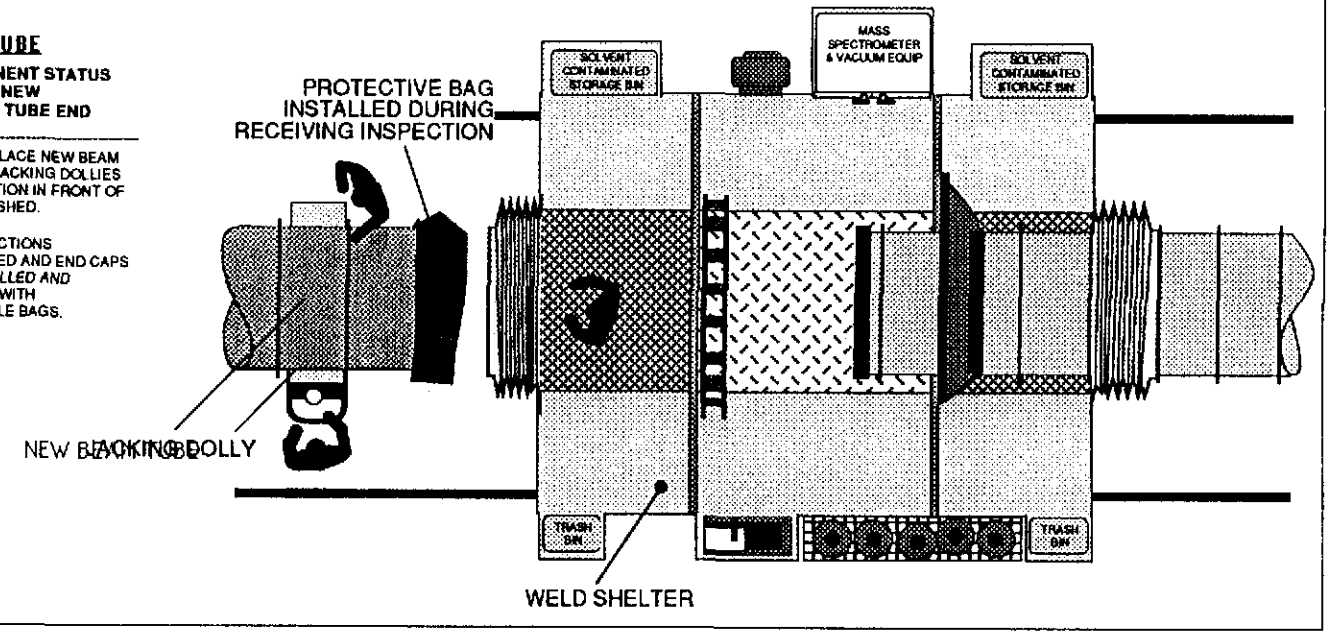
STEP #3 -MOVE FIT-UP ROOM OVER PRE-CLEANED EXISTING/INSTALLED BEAM TUBE END

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 CURTIAN 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 SOLVENT WIPE OF SURFACES 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 CAPS ARE INSTALLED AND COVERED WITH *DISPOSABLE BAGS.*



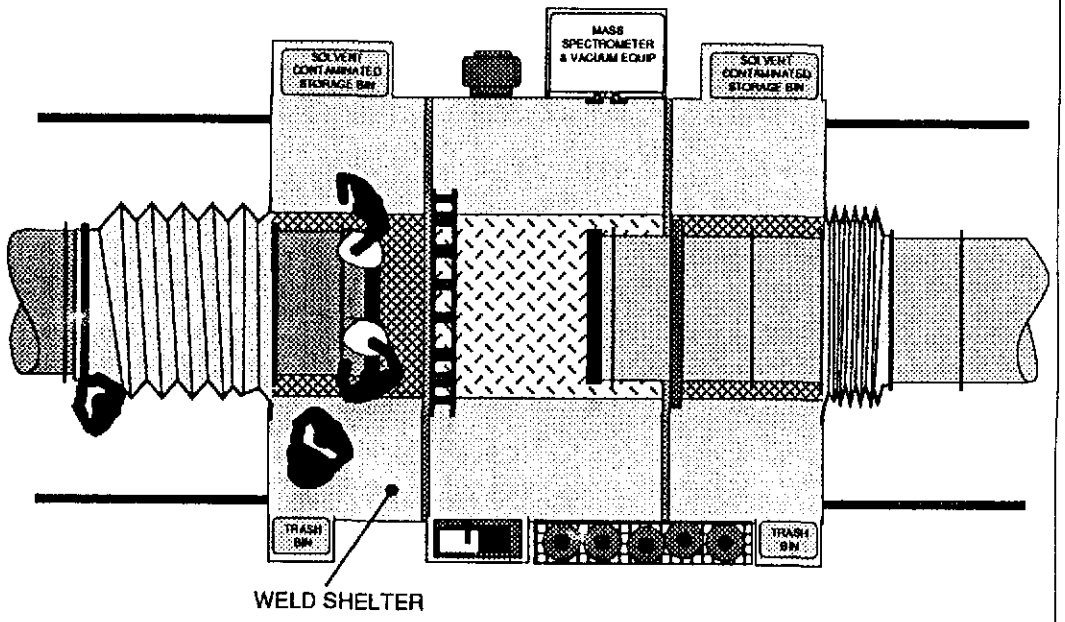
STEP #4 -RIG AND PLACE NEW BEAM TUBE

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 CAPS *ARE INSTALLED AND* COVERED WITH DISPOSABLE BAGS.



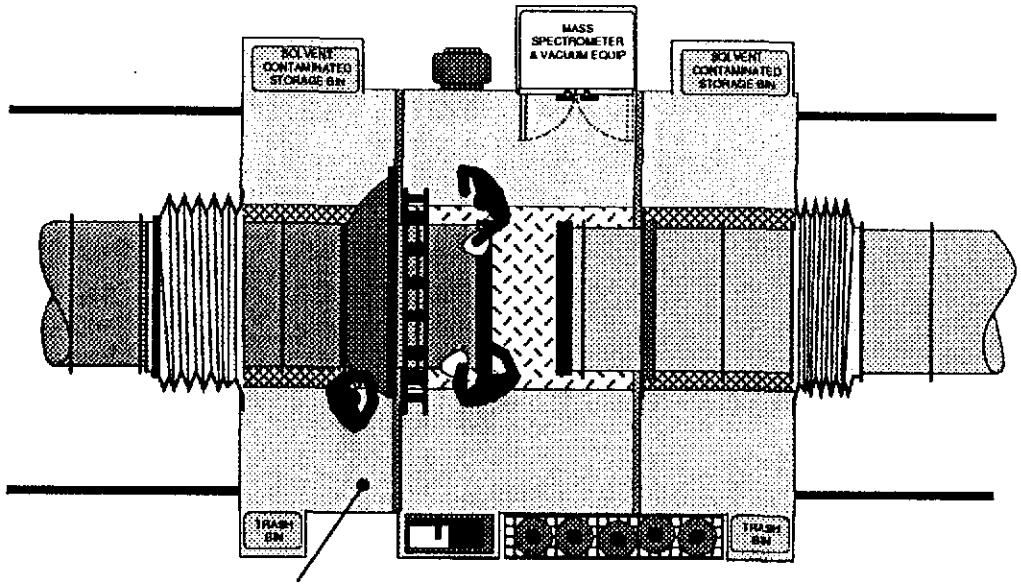
STEP #5 -MOVE NEW BEAM TUBE INTO SHELTER ANTE ROOM AND PRE-CLEAN

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.	MOVE NEW BEAM TUBE, USING JACKING DOLLIES, INTO WELD SHELTER ANTE ROOM FOR CLEANING. CLOSE END OF WELD SHELTER AND CINCH PROTECTIVE SKIRT AROUND BEAM TUBE. REMOVE PLASTIC BAG FROM END AND DISCARD. SOLVENT WIPE SURFACES AND DRY WITH LINT FREE CLOTH. STORE CONTAMINATED WIPING CLOTHS IN MARKED CONTAINERS FOR SALVAGE. BEAM TUBE END CAP IS IN PLACE AND SEALED.



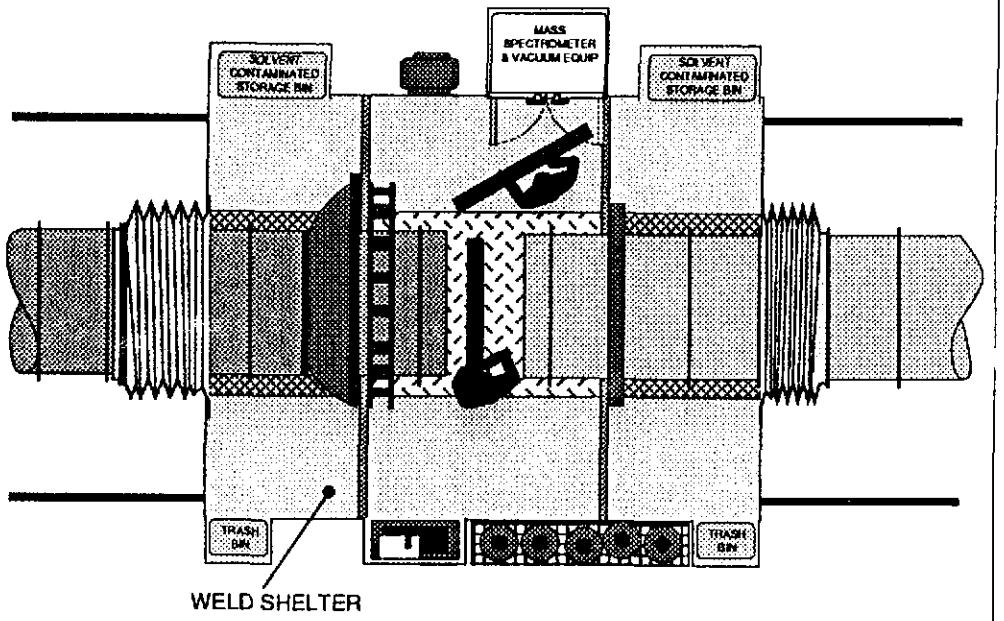
STEP #6 -MOVE PRE-CLEANED BEAM TUBE END INTO SHELTER FIT-UP ROOM

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.	MOVE NEW BEAM TUBE, USING JACKING DOLLIES, INTO WELD SHELTER FIT-UP ROOM FOR CLEANING. FINAL SOLVENT WIPE SURFACES AND DRY WITH LINT FREE CLOTH. STORE CONTAMINATED WIPING CLOTHS IN MARKED CONTAINERS FOR SALVAGE. BEAM TUBE END CAP IS IN PLACE AND SEALED. SEAL NEWLY INSTALLED TUBE END USING CURTIAN AND VELCRO® FASTENERS.



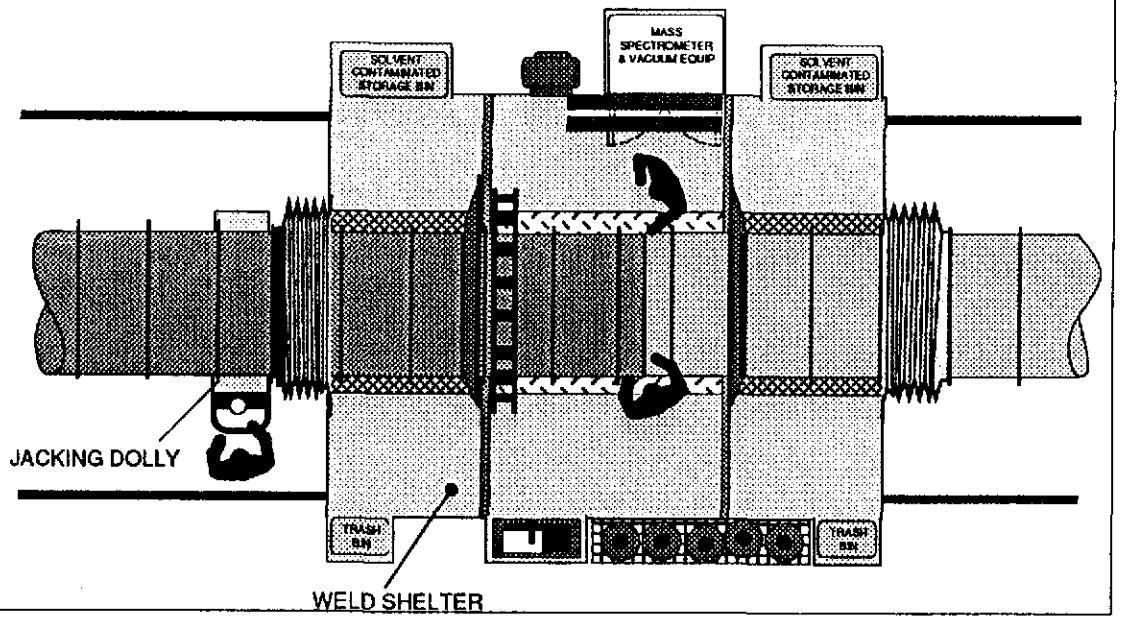
STEP #7 -FINAL CLEAN BEAM TUBE ENDS AND REMOVE END CAPS

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.



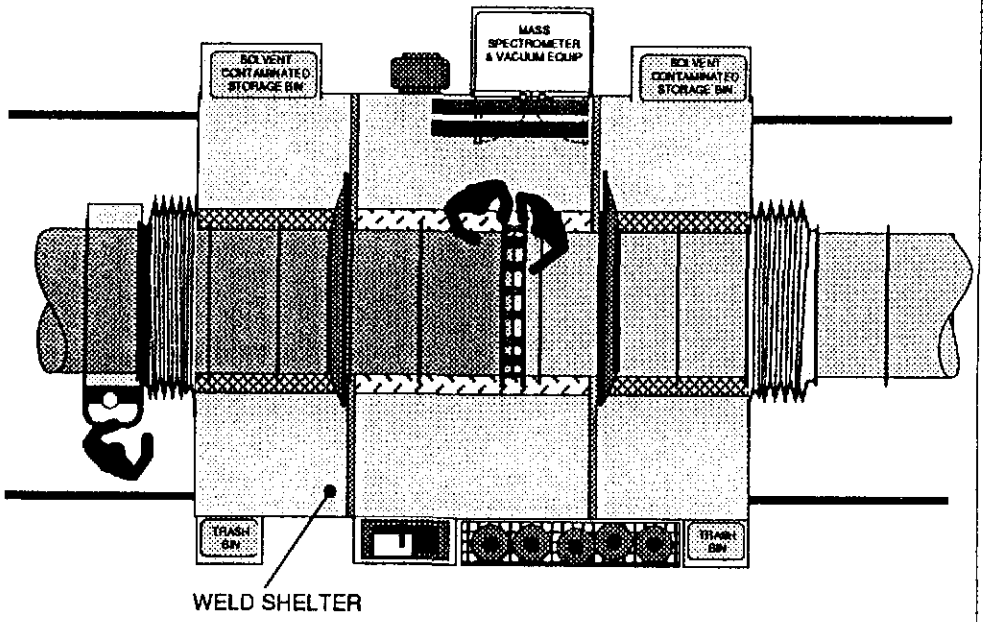
STEP #8 -FIT-UP NEW BEAM TUBE END TO EXISTING/INSTALLED BEAM TUBE END

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 INPLACE AT A DISTANCE OF 6" 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 REQIURED.



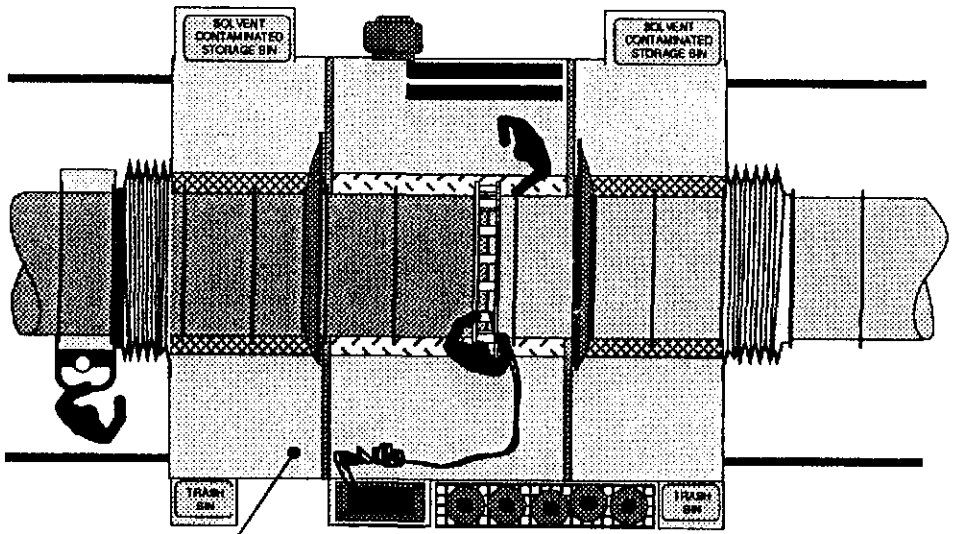
STEP #9 -INSTALL FIT-UP FIXTURE AND PURGE DAM AT WELD JOINT

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. LOCK WELD SHELTER FIT-UP ROOM DOOR TO DISCOURAGE ACCESS DURING FIT-UP ACTIVITY.	PUSH BEAM TUBE PLUG A DISTANCE OF 12" UP-STREAM OF OPENING.	INSTALL FIT-UP FIXTURE AND ALIGN SEAM FOR WELDING. AFTER FIT-UP JIG INSTALLED AND ADJUSTED, PERSONNAL TO MOVE DOWN INSIDE TUBE TO FIT-UP JOINT AND INSTALL INFLATABLE PURGE DAM.



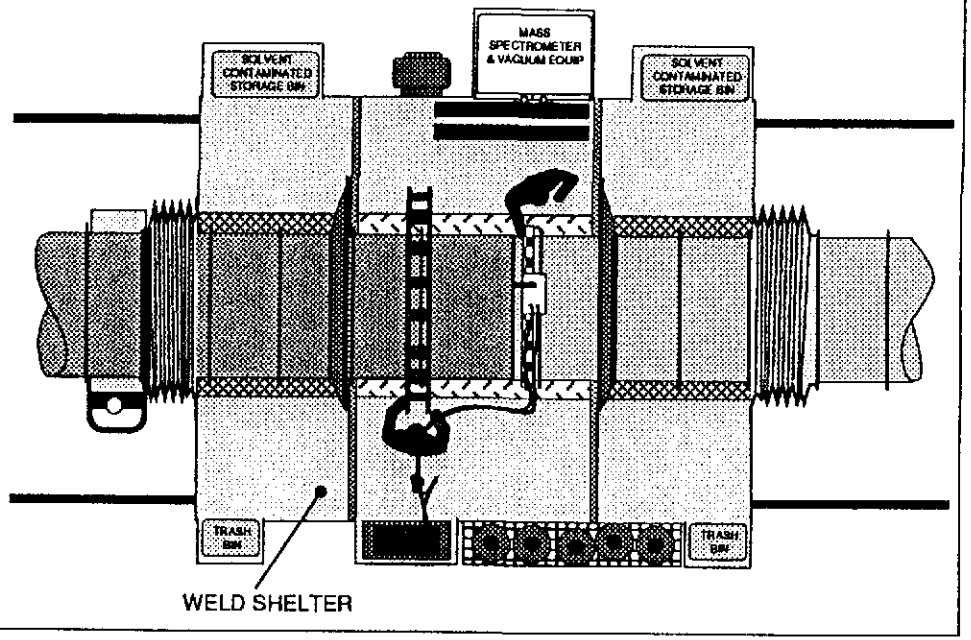
STEP #10 -TACK JOINT FOR FINAL WELDING

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 INPLACE AT A DISTANCE OF 6" UP-STREAM OF PURGE DAM	AFTER PURGE DAM INSTALLED AND INFLATED, PRESSUREIZE WITH APPROVED COVER GAS. TACK WELD BEAM TUBES TOGETHER FOR AUTOMATIC WELDING PER APPROVED PROCEDURE.



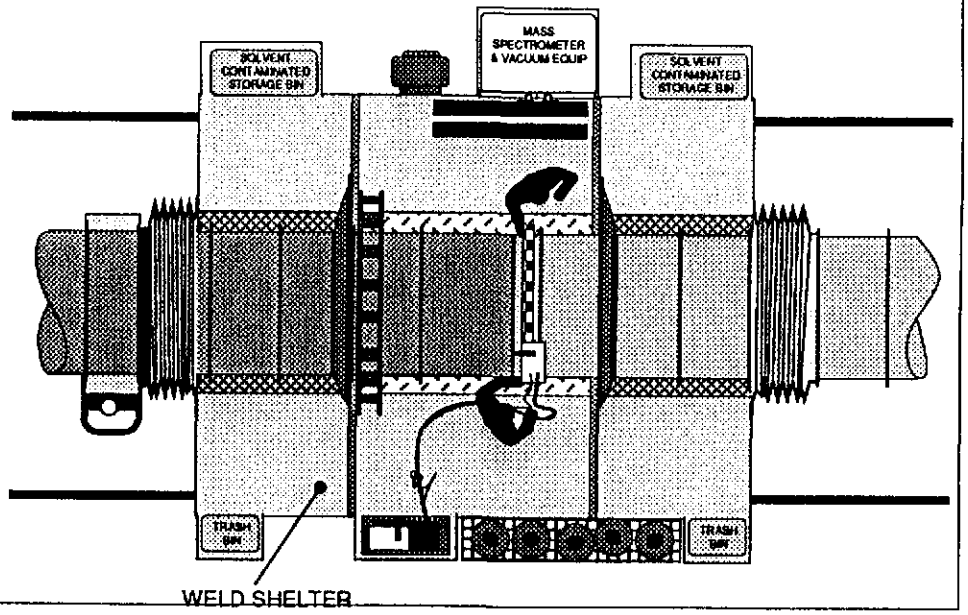
STEP #11 -REMOVE FIT-UP FIXTURE AND INSTALL AUTOMATIC WELDER

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 INPLACE AT A DISTANCE OF 6" 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.



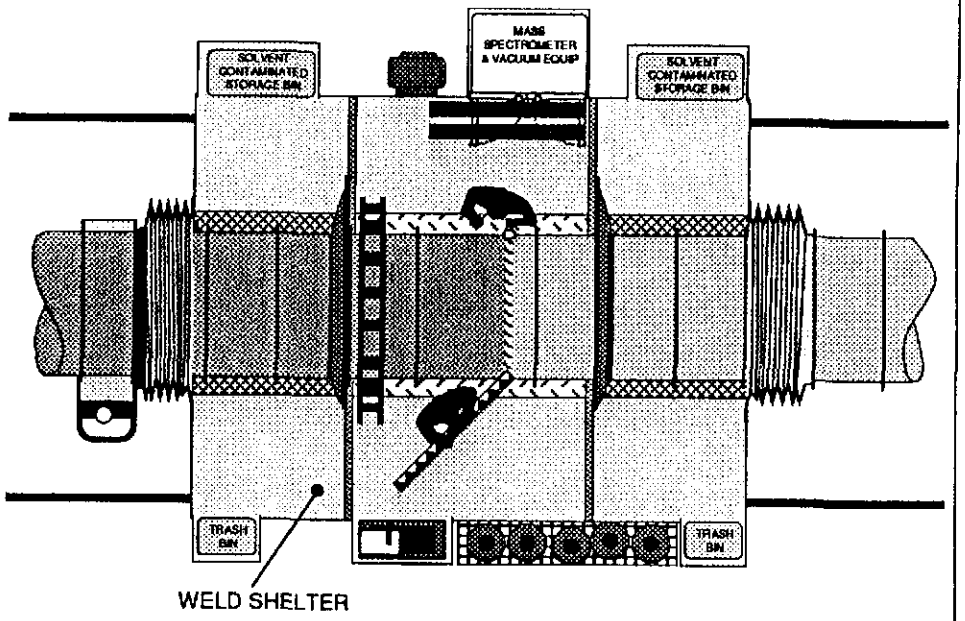
STEP #12 -WELD BEAM TUBE JOINT

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 INPLACE AT A DISTANCE OF 6" 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.



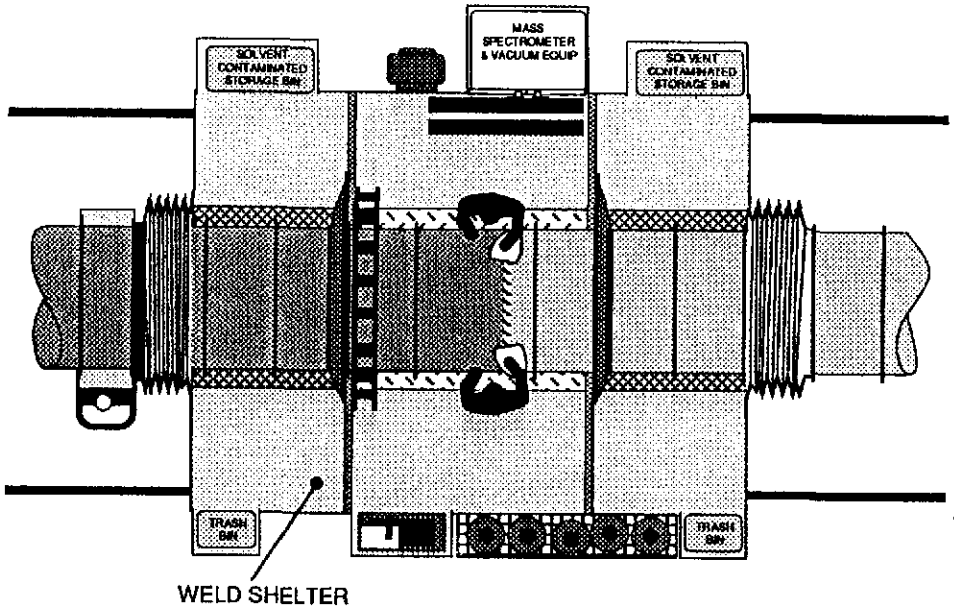
STEP #13 -INSPECT BEAM TUBE JOINT WELD AND REMOVE WELDING EQUIPMENT FROM TUBE ASSEMBLY

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. UNLOCK WELD SHELTER FIT-UP ROOM DOOR AFTER WELDING ACTIVITY.	BEAM TUBE PLUG IS INPLACE AT A DISTANCE OF 6" UP-STREAM OF PURGE DAM REMOVE WELDING EQUIPMENT AND SECURE IN PROPER STORAGE AREA. SHUT DOWN PURGE COVER GAS AFTER INSPECTION.	REMOVE WELDING EQUIPMENT AND STORE. SHUT DOWN PURGE COVER GAS AFTER INSPECTION.



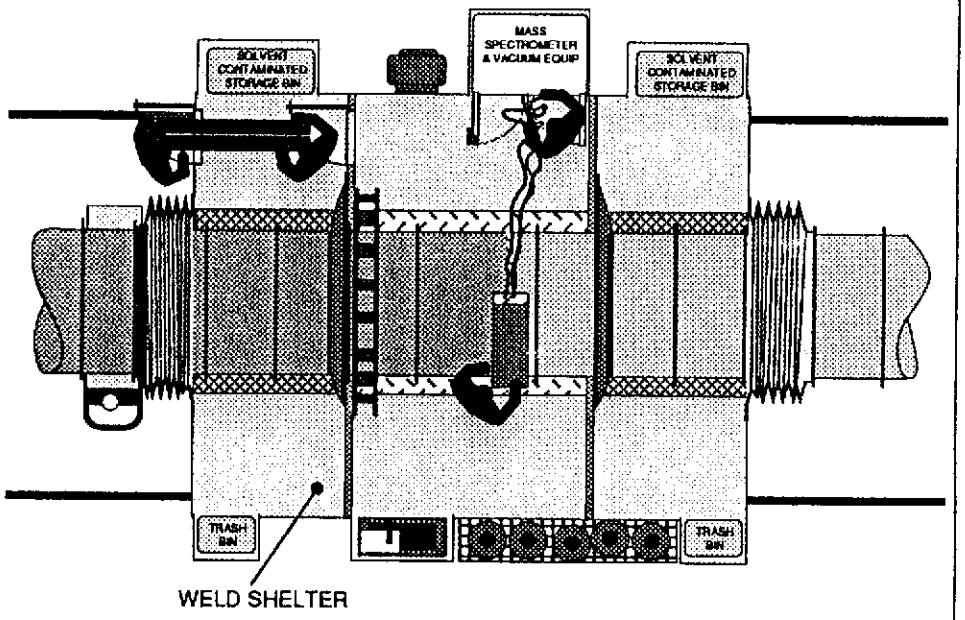
STEP #14 -CLEAN WELD JOINT AREA AND PREPARE FOR TESTING

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 INPLACE AT A DISTANCE OF 6" UP-STREAM OF PURGE DAM EVACUATE PURGE AREA AND PRESSURIZE WITH APPROVED TEST GAS. SOLVENT WIPE AREAS WHERE TEST EQUIPMENT SEATS ON THE BEAM TUBE SURFACES.	EVACUATE PURGE AREA AND PRESSURIZE WITH APPROVED TEST GAS. SOLVENT WIPE AREAS WHERE TEST EQUIPMENT SEATS ON THE BEAM TUBE SURFACES.



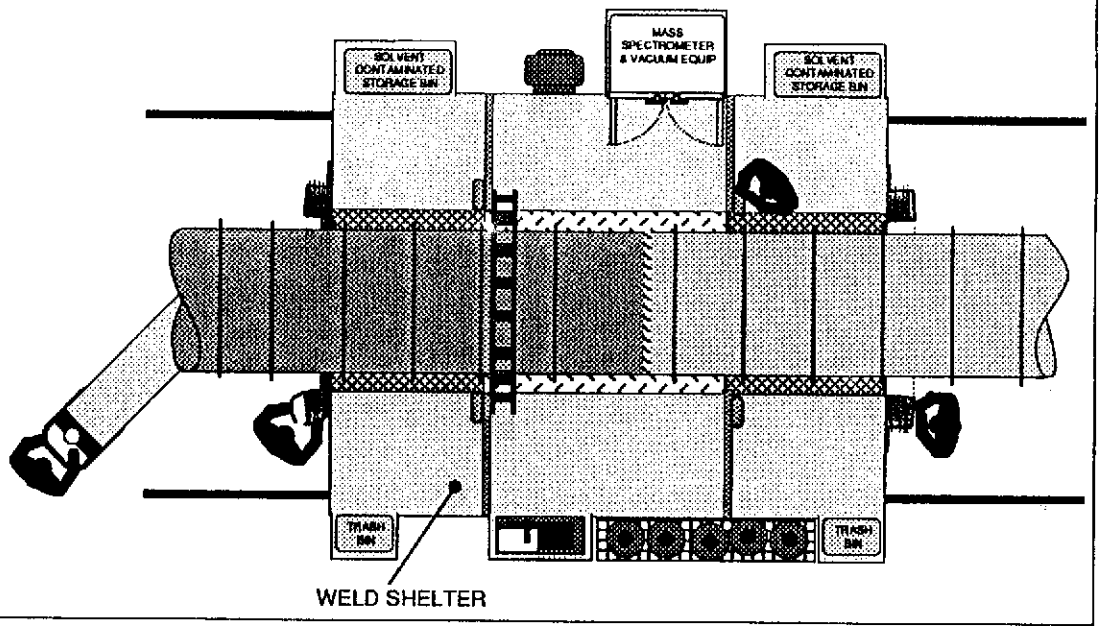
STEP #15 -LEAK TEST BEAM TUBE WELD JOINT

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. WRAP AND BAG BEAM TUBE END CAPS AND REMOVE FROM THE WELD SHELTER.	BEAM TUBE PLUG IS INPLACE AT A DISTANCE OF 6" UP-STREAM OF PURGE DAM SET-UP TEST EQUIPMENT AND MASS SPECTROMETER. CONTINUE PURGE WITH APPROVED TEST GAS. PERFORM MAS SPEC TEST PER THE APPROVED PROCEDURE.	SET-UP TEST EQUIPMENT AND MASS SPECTROMETER. CONTINUE PURGE WITH APPROVED TEST GAS. PERFORM MAS SPEC TEST PER THE APPROVED PROCEDURE.



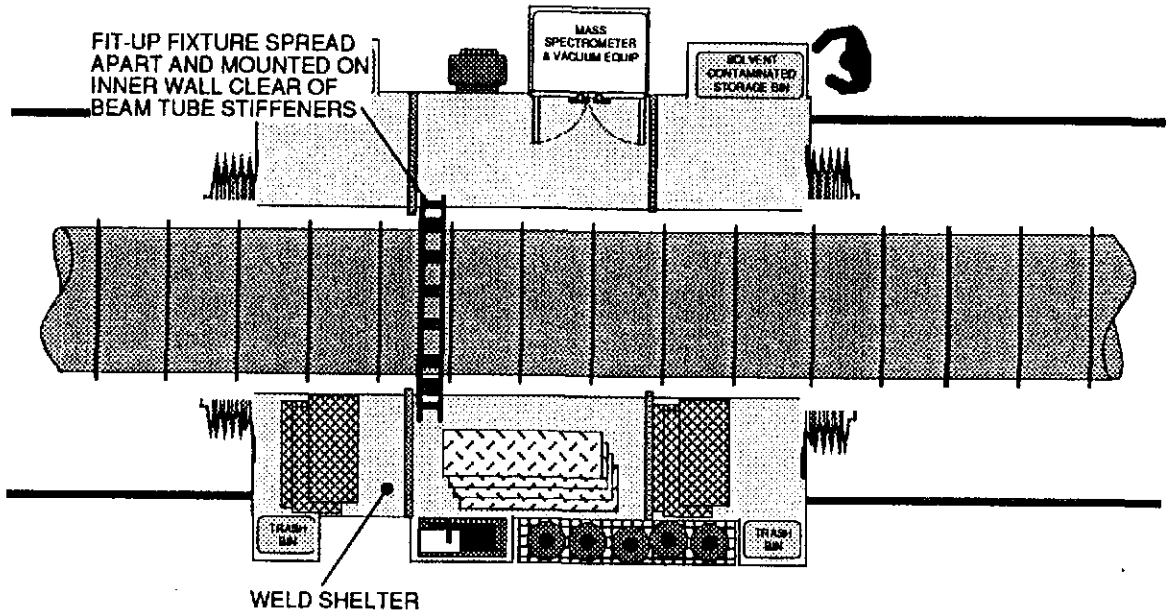
STEP #16 -PREPARE TO MOVE WELD SHELTER

EQUIPMENT STATUS WELD SHELTER MAINTENANCE	COMPONENT STATUS EXISTING/INSTALLED BEAM TUBE END	COMPONENT STATUS NEW BEAM TUBE END
SHUT DOWN HVAC UNIT. DISCONNECT ALL ELECTRICAL PLUGS AND COIL CABLE. STORE AT PROPER LOCATIONS. LENGTHEN TRACK TO A MINIMUM OF 70 FEET BEYOND THE END OF THE NEWLY INSTALLED BEAM TUBE. RELEASE BRAKES AND PREPARE TO MOVE WELD SHELTER BEYOND END OF NEWLY INSTALLED BEAM TUBE.	BEAM TUBE PLUG IS INPLACE AT A DISTANCE OF 5" UP-STREAM OF PURGE DAM 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.	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.



STEP #17 -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. ASSURE THE FABRIC SKIRTS, COVERS AND FIT-UP GEAR IS CLEAR OF THE BEAM TUBE. TAKE UP THE FLOORING OF THE WELD SHELTER AND STACK AGAINST WALLS IN ORDER TO CLEAR THE TEMPORARY BEAM TUBE SUPPORTS. TOW WELD SHELTER TO A POSITION OF 20 FEET BEYOND THE END OF THE NEWLY INSTALLED BEAM TUBE.	THE NEWLY INSTALLED BEAM TUBE BECOMS THE EXISTING/INSTALLED BEAM TUBE. 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 #18 -PREPARE FOR NEW BEAM TUBE INSTALLATION

EQUIPMENT STATUS WELD SHELTER MAINTENANCE	COMPONENT STATUS EXISTING/INSTALLED BEAM TUBE END	COMPONENT STATUS NEW BEAM TUBE END
WIPE DOWN ALL INSIDE SURFACES OF THE WELD SHELTER REMOVE TRASH FROM RECEPTICALS AND RECYCLE WIPING CLOTHS. CLEAN & INSPECT ALL FABRIC SKIRTS, COVERS AND CURTIANS AND REPAIR AS REQUIRED. CLEAN FIT-UP GEAR AND TOOLS WITH SOLVENT WIPE AND DRY WITH LINT FREE CLOTH. APPLY INSECTICIDE TO SURFACES. SPRAY FLYING INSCETICIDE IN ANTE ROOMS AND FIT-UP ROOM. AIR MOVING EQUIPMENT IS ON AND PURGING 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.