



<b>TITLE</b> CLEAN ROOM WEARING APPAREL FOR BEAM TUBE ACCESS DURING CONSTRUCTION & INSPECTION ACTIVITIES		IDENTIFICATION <b>CRWA-1</b> LIGO-E950065-01-B			
		REFERENCE NO. <b>930212</b>		SHT <b>1</b> OF <b>6</b>	
<b>PRODUCT</b> LIGO BEAM TUBE MODULES CALIFORNIA INSTITUTE OF TECHNOLOGY		OFFICE <b>CHG</b>		REVISION <b>1</b>	
		MADE BY <b>SDH</b>	CHKD BY <b>KHF</b>	MADE BY <b>SDH</b>	CHKD BY <b>SWP</b>
		DATE <b>3/3/94</b>	DATE <b>3/3/94</b>	DATE <b>10/23/95</b>	DATE <b>10/23/95</b>

**1.0 SCOPE:**

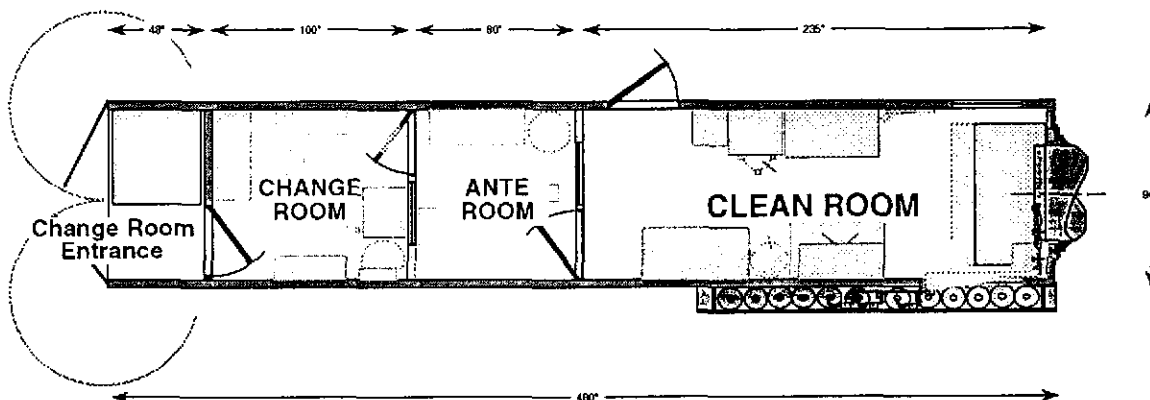
This procedure protective wearing apparel for Beam Tube Access through the Clean Room. All personnel entering the beyond the Change Room into the Ante and Clean Room shall be properly clothed and protected as noted in the following instructions.

All personnel entering the clean room and beam tube shall be instructed in control of body perspiration, oral intake, ie.: eating, chewing gum, and any drink will not be allowed; body fluid discharge ie.: spitting, running nose, etc.; and airborne control of coughing, sneezing and running nose. None of the above will be tolerated during the execution of the LIGO Beam Tube contract.

**2.0 PURPOSE:**

2.1 The foremost importance of CBI's work is the personal safety of its employees. Standard safety precautions including eye protection, head & foot protection, and limited access procedures will be followed during these activities. In addition, proper personnel protection is required when handling solutions during the cleaning process affiliated with the LIGO final spot cleaning activity.

2.2 The LIGO project's success is based on the ability to meet high vacuum requirements inside the beam tube. This requirement could be compromised with a finger print or scuff mark left on a beam tube inner surface.



**FIGURE 1.1**

APPROVED  
*M. Jellalain* 11/10/95  
 CBI 11/10/95



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2.3 It is critical for the personnel entering the beam tubes to take every precaution in avoiding contamination. These instructions are provided to assure all body surfaces be covered, with the possible exception of clean shaven face, in order to prevent contact with the inner beam tube surfaces. The temperature of the clean room shall be maintained in a low area to minimize the introduction of body perspiration.

**3.0 REFERENCES:**

The alignment maintenance procedures for the Beam Tube Module are based on the following references:

- 3.1 Summary of concepts and Reference Design for a Laser Gravitational-Wave Observatory, CAL TECH; Feb-92.
- 3.2 Chicago Bridge & Iron Safety Manual for L.I.G.O. Project.
- 3.3 CBI Cleaning and Clean Room Procedures.

**4.0 EQUIPMENT & MATERIALS:**

The following is a listing of Safety Equipment and Wearing Apparel required for access into the Clean Room and final access into the Beam Tube.

- 1) CBI Hard Hat meeting the CBI Safety Standards.
- 2) Disposable Hard Hat Protective Cover.
- 3) CBI supplied Safety Glasses with side Shields meeting CBI Safety Standards.
- 4) Elastic Head Band for securing Safety Glasses to the technician.
- 5) Disposable Hood for hair capture. Color to be white.
- 6) Washable Coverall meeting Clean Room Class 100 specifications. All pockets shall be removed or permanently sewn closed. Zipper front and elastic, cinch, or Velcro® closures on sleeves, neck and pant legs. Color to be white. Vent panels and other features may be added to the coveralls to reduce body heat build-up and decrease the threat of perspiration.
- 7) Solvent Protection, Re-usable PVA Gloves.
- 8) Cloth, Lint-free gloves. Color shall be white.
- 9) Soft Sole, Steel Toe Shoes rated for ANSI Z41, PT83FC-71 1-75 and CBI Safety Standards. Shoes shall be high or low top athletic style. Color shall be white.
- 10) Disposable Boot length Shoe Covers. Color shall be white.
- 11) Delete.

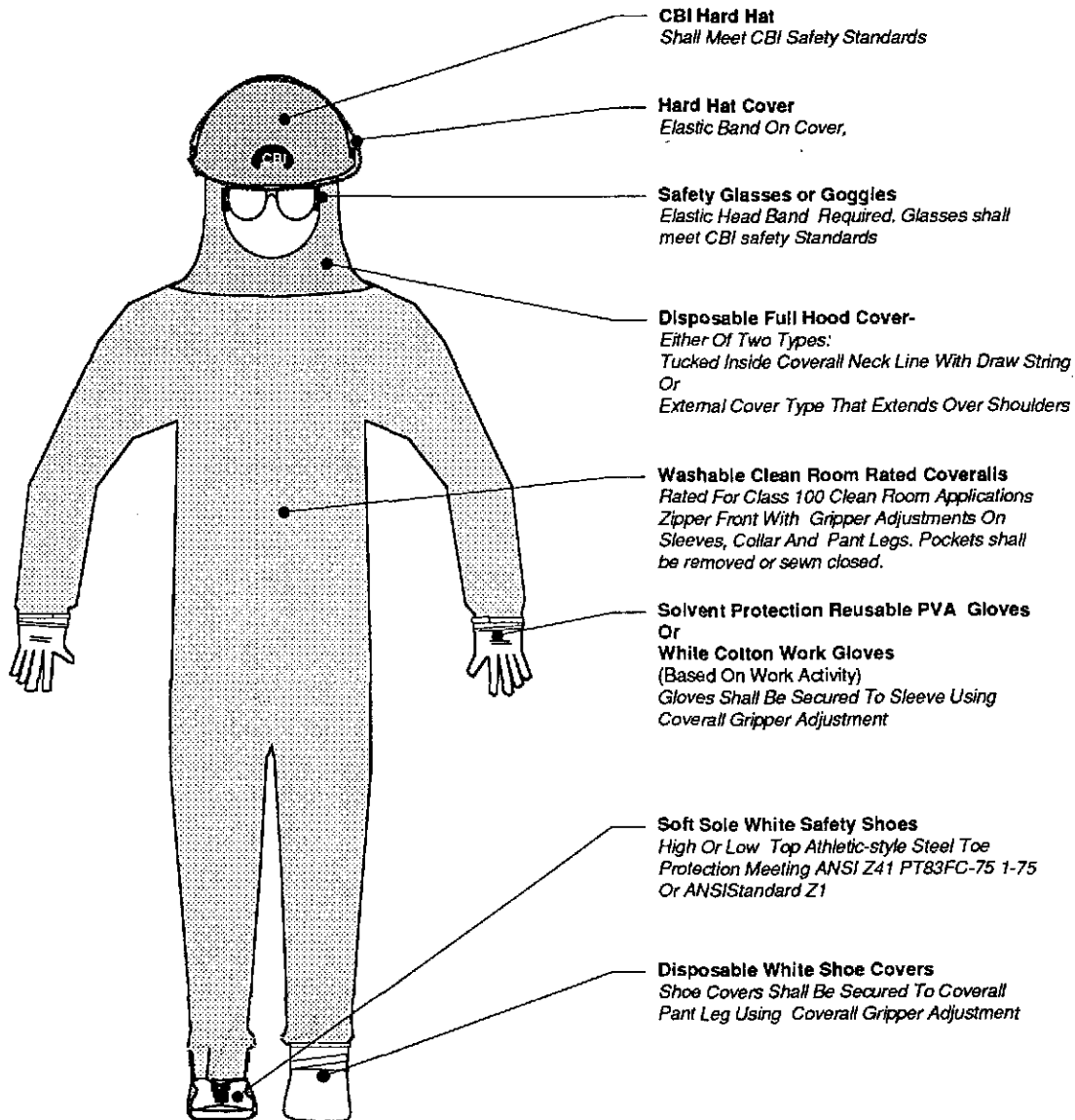
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See the following detail(Figure 4.1) for information.

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**CLEAN ROOM PERSONNEL APPAREL**

**FIGURE 4.1**



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**5.0 APPAREL INSTRUCTIONS REQUIRED FOR CLEAN ROOM ENTRY**

Clean Room access procedures are described in the procedure CL3N. The following is a detailed set of instruction for wearing clean room compatible clothing.

- 5.1 Personnel shall remove street shoes when inside the Change Room and put on disposable shoe coverings over their sock feet. A lockable compartment(locker) is available for storing personal affects.
- 5.2 Personnel shall remove street cloths in the Change Room and suit up with CBI provided coveralls. Coveralls shall be clean and in good repair. All soiled garments shall be stored in a designated soiled storage bin and forwarded to the cleaning service for cleaning. Damaged garments shall be tagged with a description of the location and extent of tears, wearing or if necessary removal from service.
- 5.3 Put on safety glasses and head band. Check that head band is secure to glasses and that all screws and shields are tight each time the glasses are removed.
- 5.4 Personnel shall install hood. If hood type is tucked into coverall collar, do so, and tighten gripper or draw string on coverall. If hood type is shoulder canopy type assure coverall collar is drawn before installing hood. Do not allow hair to extend outside face opening.
- 5.5 When the above steps are complete, personnel shall move into Ante Room for final dress-out. Assure outer door is closed when inside the Ante room.
- 5.6 Remove disposable shoe covers and if un-soiled, store in designated location. If soiled, place in designated waste Put on CBI supplied soft sole work shoes. Install NEW shoe covers and tuck covers into coverall pant legs. Tighten legs using coverall gripper and fasten velcro strap at each pant leg.
- 5.7 All hard hats shall be pre-cleaned with solvent and a new liner installed for each clean room technician. These hats shall be designated for clean room use only and stored in the Ante Room. Each entry requires the hard hat and cover be inspected for rips, scuffs, dirt, etc. When necessary, remove cover and install new disposable cover and secure with white cloth tape. Install the Hard Hat before entering the Clean Room.
- 5.8 Gloves required for clean room access shall be disposable, white, lint-free cloth gloves that are installed inside the coverall sleeve cuff, cinched tight using the sleeve gripper or Velcro®.
- 5.9 Solvent Protection Gloves are stored in the Flammable Materials Cabinet inside the Clean Room. These gloves may be installed in the Clean Room over the white cloth gloves with the glove cuff over the coverall sleeve, or the white cloth gloves may be removed provided the solvent gloves are tucked into the sleeve of the coverall in a similar manner as the cloth gloves and secured by cinching the sleeve gripper or Velcro®.



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5.10 Respirators shall be stored in the Clean Room and available as required. Care and cleaning shall conform the the CBI Safety requirements.

**6.0 INSTRUCTIONS REQUIRED FOR CLEAN ROOM EXIT**

Clean Room exit procedures are described in the procedure CL3N. The following is a detailed set of instruction for the removing, storing and cleaning of clean room compatible clothing and equipment.

- 6.1 When exiting the Clean Room, personnel shall remove Solvent Protection Gloves before entering the Ante Room. The gloves shall be inspected, cleaned and dried. If gloves are soiled or torn and cannot be re-used then dispose of gloves in the flammable waste container. Clean and dry gloves shall be stored in the Flammable Materials Cabinet for re-use.
- 6.2 Enter Ante Room and remove white cloth gloves, hard hat and shoes. Inspect each item of disposable apparel and determine if it can be re-used again. If not, dispose in waste container. If re-usable, place the item in the designated "Used" container.
- 6.3 Personnel are to leave hard hats, soft sole shoes and disposable items in the Ante Room. Install "Used"(if any) shoe covers on sock feet and proceed into the Change Room.
- 6.4 Personnel shall remove the disposable hood and discard it into the designated waste container.
- 6.5 Personnel shall remove the shoe covers and coveralls and dress into street clothes.
- 6.6 Personnel shall inspect the coveralls for rips, soiled areas and general cleanliness. If coveralls are acceptable, install in personal locker for reuse the following day. If there is to be more than a one day delay in returning to the clean room duty(weekend, holiday, etc.), dispose the coverall into the soiled storage bin.

**7.0 LAUNDRY SERVICE**

Laundry service for clean room coveralls and shoes shall follow the routine noted below:

- 7.1 CBI shall purchase or lease, independently or through the Laundry Service, a quantity of specified coveralls estimated based on CBI/Laundry Service agreed delivery and pick-up schedules. This quantity will be estimated based on a six(6) technician crew size.
- 7.2 The Laundry service shall stitch closed all pockets and close any "thru the suit" openings to assure no objects may be stored inside the coveralls.



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- 7.3 Repairs required during this service shall be made by the Laundry Service. CBI will inspect and tag areas requiring repair. If damage is caused by the Laundry service, they shall repair or replace coveralls at their expense.
- 7.4 Laundry shall deliver and pick-up coveralls at a designated location on the construction site. Access schedules will be limited and an escort will be required for on site travel.
- 7.5 Cleaning shall be performed using minimum amounts of detergent to avoid contamination of clean room and beam tube surfaces. An inspection of the laundry facilities by CBI will be required before contract award.
- 7.6 Periodic testing of coverall materials including detergents and bleach concentrations shall be performed by CBI. Any deviations from agreed upon amounts shall be corrected by the laundry service.
- 7.7 The laundry service shall notify CBI of any changes in detergents or cleaning processes. CBI will have the right to review and accept or reject changes.
- 7.8 At the end of the job, all coveralls found to be in satisfactory condition shall be delivered to CBI at the site, cleaned, packaged, and boxed for shipment.
- 7.9 CBI and the Laundry Service will determine the best method of cleaning soft soled shoes. At periods not exceeding 6 months, the shoes shall be cleaned over a CBI "down" period (weekend, holiday, work stoppage, etc.).