Accelerator Safety Audit NLCTA 2006

Thursday, July 13, 2006

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Summary

As a whole, the ESB/NLCTA facility is well managed and in a safe state to occupy and operate. The complex went through extensive scrutiny during the NLCTA Restart Validation early 2005. Most items noted then have been mitigated. The NLCTA staff is knowledgeable about SLAC rules and safety procedures, which are fully implemented in the facility. Of concern are the wealth of programs and small projects, which create an ever-changing environment in the buildings and which pose occupational hazards to the people working there or entering the building. Vigilance to good housekeeping practice is of the essence and in this field the facility has improved greatly.

The most important findings are:

1. Due to recent new orientation of the major programs in ESB the staffing level has decreased, whereas the desire to perform good research has not. This poses a great challenge to the safe planning, preparation and execution of these endeavors to the people working on them, to the oversight committees and to SLAC management. All parties have to share the responsibility for the safe future operation of the facility.

2. The West side shielding wall between ESB and the B-Target room poses an earthquake hazard, which has been known to the SLAC management for many years. With the decision to build SABER in the South Arc, there appears to be no future anticipated usage of the B-Target room for beam operation. It should be considered to remove the shielding wall now, together with the B-target room dump. This will clear up valuable floor space in ESB, so that the many programs could be staged in an easier way, or to make room for new ones.

3. Additional areas in End Station B which require strengthening to meet SLAC's seismic design specification include many of the concrete shielding blocks which close the openings in the north and south walls of the building. The NLCTA housing requires the addition of elements attaching the wall blocks to the End Station B floor and the installation of additional connections from roof blocks to wall blocks.

4. End Station B has been identified as unauthorized for storm water discharges due to their exposure to research activities. A DOE funded infrastructure project has been approved to remove any connection to the storm drain system. Due to unexpected demands on engineering staff to meet LCLS deadlines, the proposed schedule has changed and now has a scheduled completion date of January 2007.

At the time of this audit the E-163 experiment was in its final stages of construction. Separate safety audits are on their way and will be presented to the SOC. No attempt was made to include these into this audit.

In summary, the facility is well managed and safe to operate. The staff is very knowledgeable about safety rules and their implementation. This audit was supported very well by them.

Detailed reports about the different subject matters are following below.

Audit Process

The audit process was conducted mainly during the month of May 2006. It started with a general meeting held between the reviewers and key personnel of ESB/NLCTA. Keith Jobe presented the different experimental programs in the complex, introduced the results of the Restart Validation from 2005 and discussed the open and closed CATS items. After that the members of the review committee asked questions of a general kind in regards to the status and future plans of the facility and we all went on a guided tour. During the following weeks the different members of the review committee organized meetings and additional tours of the facility with Keith Jobe and other key personnel as needed. The chair accompanied a majority of these tours. A draft of this report was prepared and discussed at a final meeting of the members of the review committee and ESB/NLCTA staff, before the report was delivered to the chair of the SOC.

The members of the audit would like to thank the NLCTA staff, particularly Keith Jobe, for their welcoming attitude and their help and support of this audit.

Participants and Area of Responsibilities

Committee Chair	Carsten Hast
Radiation	Hesham Khater
PPS and Operations	Paul Miller
Laser	Gary Bower
Seismic	Scott DeBarger
Pressure and Vacuum Vessels	Richard F. Boyce
Electrical	Perry Anthony
Fire	Bob Reek
Hoisting and Rigging	Linda Knudsen
Environmental	Mike Hug
Occupational	Tom Rizzi
Industrial Hygiene	John Shepardson

ESB/NLCTA Staff	
Keith Jobe	NLCTA Safety Officer
Richard Swent	ESB Building Manager
Mark Ross	Operations Manager
Eric Colby	E-163 representative and systems laser safety officer

Programs at End Station B and NLTCA

X-Band	RF Structure and Device testing in NLCTA tunnel
2 Pack	X-Band standalone power supply, modulator, Klystrons
L-Band	Stand alone power supply, modulator, klystron (future expansion to 3 systems).
E-163	S-Band klystron station for the RF gun cavity with Photocathode, X-Band Accelerators, all in NLCTA tunnel with future beam to E-163 Experimental Hall. Authorization has been given by the NLCTA BAS for RF and beam in the NLCTA tunnel only.
E-163 Lasers	NLCTA tunnel, E-163 Experimental Hall, and E-163 LASER room.

Operations

There has been no NLCTA staff rotation for operations coverage since early April because of budget constraints. No rotation is expected until June, when E-163 operation with beam is planned.

The NLCTA BAS and all Experimental Authorizations are currently expired. A new BAS for RF and beam operation in the NLCTA tunnel only and a concurrent Experimental Authorization for 2-Pack operation are waiting authorization.

The wall plug between the NLCTA tunnel and the E-163 Experiment Hall is currently removed under a Radiation Safety Work Control Form (RSWCF). This is soon to become the point were NLCTA beams are transported into the E-163 Experimental Hall.

The new Personnel Protection System (PPS) and Laser Safety System (LSS) for E-163 Experimental Hall are currently being installed and tested.

For the L-Band program the initial run up of the klystron requires an Experimental Authorization. R. Swent (Area Manager) and others are the operators.

X-Band RF only operations have been run by Chris Adolphsen (qualified operator, usually unattended operation).

The E-163 program is supported by NLCTA operators and Laser operators (currently two separate groups). For operations, E-163 has two intended control rooms, NLCTA control rooms in B128 and B225. The E-163 Laser room also could have a beam operator inside with non laser operators restricted from entering; leaving the other two control rooms unattended in appearance.

E-163 needs a Readiness Review from SOC directed citizens committees.

Operations Schedule

Plans for E-163 beam from NLCTA tunnel to E-163 Experimental Hall:

The current plan is to run E-163 within NLCTA for four weeks in June 2006. E-163 is scheduled OFF in July and will then run again from August to September 2006 with beam likely to the Experimental Hall.

L-Band station and 2-pack are waiting for the next set of experimental authorizations.

X-band operation is waiting for the authorization of the next NLCTA BAS.

NLCTA Personnel

Qualified operators of NLCTA:

Under ILC, Tor Raubenheimer:

Doug McCormick

Janice Nelson

Tonee Smith

Keith Jobe (Trains Operators & Authorizes NLCTA programs, NLCTA Safety Officer)

Chris Adolphsen

Marc Ross (Trains Operators & Authorizes NLCTA programs)

Richard Swent (Area Manager, NLCTA operation w/o Beam, L-Band operation)

Under AARD, Robert Siemann:

Eric Colby – not yet authorized to operate alone as Engineering-Operator-In-Charge (EOIC)

Laser operators for E-163 (qualified to operate Lasers in NLCTA tunnel, E-163 Laser room and E-163 Experimental Hall)

Bob Noble (and 5-6 others)

Discussion

With the original mission of the NLCTA now discontinued, End Station B continues to host an ever expanding array of programs and "small projects" that require local oversight. Many of these programs have multiple facets that require frequent tear down and build up activities in different parts of the facility. These programs and projects all have their own unique hazards that have to be managed while work and operations go on side by side in one facility.

A compromise is being made between past management practice and future management of operations. Daily operations oversight and daily authorization meetings have been replaced with a once weekly meeting for authorization. Individual operator oversight is on an as needed basis for operation of programs such as X-band RF only running (warm structure tests, usually unattended operation), E-163 LASER and gun tests, L-band power supply and modulator testing. Added to this will be the expansion of E-163 beam operations that may use part or all of the accelerator enclosures at End Station B.

This mode of conduct is decentralizing the operations of these various programs and their safety oversight. The personnel most familiar with NLCTA and its programs are increasingly diverted because of budget constraints and reassignment to other projects at SLAC and elsewhere.

SLAC Security continues to do surveillance tours of End Station B to enhance safety oversight. To improve the value of these visits, the Area Manager for the facility should periodically inform SLAC security of physical changes to the facility and review the nature of hazards present in and around the end station.

The coverage of Beam Shutoff Ion Chambers at NLCTA is being expanded to cover RF testing and E-163. The number and causes of BSOIC trips at NLCTA should be reviewed to make sure they are understood and are acceptable.

Conclusions

NLCTA operations are under pressure to carry out a diverse set of programs with the same or fewer personnel resources as in the past. Personnel, scheduling and budget constraints are putting negative pressure on the operational oversight that NLCTA used to maintain. This will continue to be a challenge for maintaining safety at NLCTA.

PPS

The NLCTA PPS system is undergoing a series of phased in modifications and additions to include changes for the E-163 program. The existing NLCTA tunnel now has a new S-band RF gun with photocathode with an adjacent (E-163) Laser room. The NLCTA tunnel can now be operated as an accelerator and as a Laser room to allow laser light from the E-163 Laser room into the NLCTA tunnel. A new PPS is being installed for the E-163 Experimental Hall so that it can be a beam enclosure for beams from the NLCTA tunnel and also be operated as a laser room with light from the E-163 Laser room.

The PPS provides access control for accelerator operations with RF and beam in the NLCTA tunnel. It will soon provide access control for beam operations in the E-163 Experimental Hall in addition to acting as a Laser Safety System for Laser operations in both these areas and the E-163 Laser room.

Each change to the existing NLCTA PPS, the addition of the E-163 Laser Safety System (LSS) and the new E-163 Experimental Hall PPS have been technically reviewed and approved by a review committee of SME. The Review Committee is usually the head of the PPS group, an ADSO representative, representatives of E-163, the NLCTA Safety Officer and other CPE department members that have applicable technical expertise.

The modifications to the NLCTA tunnel PPS and the new E-163 Experimental Hall PPS have also been reviewed by the RSC and the RSO.

The Laser Safety Systems for the E-163 Laser room, E-163 Experimental Hall and NLCTA tunnel have been reviewed and approved separately by the LSO.

As the installations for changing or building each new PPS and LSS is completed, an Initial Acceptance Test is completed to test the functioning of these systems before returning the facility back to operations.

Conclusions

NLCTA engineered safety systems are expanding in number. Where the NLCTA previously had only one PPS for the NLCTA tunnel, now there will be two PPS systems, NLCTA tunnel and E-163 Experimental Hall, that need to interact with one another in addition to LSS systems that overlay these same areas. So far these systems have been adequately reviewed and are being tested by the PPS group before they are brought into operation.

The NLCTA staff will need to expand their training and safety documents to include these new safety systems such as search procedures, interlock checklists, safety inspections, access control logging, management of keys, etc. They will need time to gain experience and demonstrate the effectiveness of these new systems.

Radiation

All areas of radiation safety for current operation were well covered in the NLCTA validation report (reference below). The radiation safety team reviewed the restart plans for the NLCTA, the Safety Analysis Document (SAD), dosimetry reports, and minutes of the Radiation Safety Committee reviews. They conducted interviews with the NLCTA Safety Officer and staff and reviewed various procedures as listed in this report. A walkthrough of the NLCTA facility was also conducted.

The nature of operation of NLCTA has changed from what is described in the original NLCTA SAD. The changes have not been updated since the SAD was released on 4/24/1996. The changes in the NLCTA radiation safety systems, which have been reviewed by the Safety Committee (RSC) and/or Radiation Safety Officer, are the operation of the klystrons and modulators in unattended (r.f. only) mode, the connection of 4 new XL-4 klystrons (8-Pack klystrons) to power four 60-cm structures in the NLCTA tunnel and the operation of a new L-band klystron in support of the ILC program. The radiation safety team concluded that the changes to the NLCTA have been analyzed, documented, reviewed independently and approved properly per SLAC internal radiation safety guidelines. The NLCTA operations to date have been conducted safely within their established Accelerator Safety Envelopes. During 2005 a new gun was installed to replace the original NLCTA gun. The new gun will also be used to generate electron beam for the E-163 experiment. During 2006, a major installation of new hardware for the E-163 experiment will be completed.

The major issue that was identified in the post-start action list and has not yet been completed is the update of the SAD. This item will be completed upon conclusion of the E-163 hardware installation which is scheduled for completion by the end of 2006.

Reference: Hesham Khater, et al., "Review of NLCTA Safety Readiness for Return of Operation," RP-TN-05-10, May 10, 2005.

Lasers

The E-163 experiment has installed a Ti:Sapphire laser system for generating electrons from a photocathode gun, and for powering the laser accelerator structures that will be tested. The Class IV Ti:Sapphire lasers (one oscillator (1 W) and two regenerative amplifiers, providing (2.25 W and 1.0 W)) are pumped in the green by three high-powered doubled solid-state lasers. These are the 5 W Class IV Millenia laser, the 20 W Class IV Evolution laser, and the 10 W Class IV Merlin laser. In the next year the system will be expanded to include an Optical Parametric Amplifier that provides Class IV radiation in the 1-2 micron range with powers up to 100 mW.

The E-163 laser system at NLCTA has been in development the past few years and has undergone a series of laser safety reviews. It was most recently reviewed and approved for continued operation on November 7, 2005 and will undergo another review in the near future to permit laser light to enter the experimental hall. No additional reviews are necessary for the purposes of the NLCTA safety audit.

Finding:
The Laser SOP should be available from the NLCTA documents page.

Seismic

Structure

End Station B is a heavily reinforced concrete structure. Seismic loads are transmitted by concrete shear walls. The NLCTA housing is composed of pre-cast concrete blocks arranged to form walls and a roof. Both structures were evaluated in 2002 and found not to meet the SLAC "Specification for Seismic Design of Buildings, Structures, Equipment and Systems at the Stanford Linear Accelerator Center" (SLAC-I-720-0A24E-002). Some seismic strengthening of the NLCTA housing was performed in the period from 2004-2005.

Roland Sharpe, Consulting Structural Engineer, prepared a report titled "Status of Seismic Upgrades for Building 062 – End Station B and NLCTA Structure, April 2006." This report details the condition of the End Station B and NLCTA structures, identifies deficiencies and recommends actions to address these deficiencies:

1. Of particular concern is the Beam Port Shielding. This stack of concrete and steel does not have any positive seismic restraints. Collapse of this shielding in a seismic event is a life-threatening risk to persons occupying the space adjacent to the shielding. At this time, an exclusion area has been established to reduce occupancy in the area adjacent to the shielding. Better solutions would be to remove the shielding (as there is currently no programmatic need for the shielding), to install bracing and connections between the shielding elements, or to combine partial removal of the shielding with installation of bracing and connections between the remaining shielding elements. Removal costs of the shield wall and cleaning of the B-Target Room are estimated to be $ 150,000.

2. Additional areas in End Station B which require strengthening, to meet SLAC's seismic design specification, include many of the concrete shielding blocks which close the openings in the north and south walls of the building. The cost for this project is estimated to be $ 175,000.

3. The NLCTA housing requires the addition of elements attaching the wall blocks to the End Station B floor and the installation of additional connections from roof blocks to wall blocks. The cost for this project is estimated to be $ 240,000.

Addressing structural issues in End Station B and the NLCTA housing will require a significant commitment of laboratory resources and is managed with SLAC's risk management tools.

Experimental Equipment

In general, experimental equipment housed within End Station B appears to meet SLAC's "Specification for Seismic Design of Buildings, Structures, Equipment and Systems at the Stanford Linear Accelerator Center" (SLAC-I-720-0A24E-002). Most items are properly anchored; tanks and cylinders are secured in an appropriate manner. Shelves and storage cabinets

are generally properly anchored to the floor and/or walls. Major equipment for the NLCTA 8-Pack and E-163 projects has been reviewed and approved by the SLAC Earthquake Safety Committee.

The following items are not properly anchored and should be remedied as soon as possible:

1. Cabinet inside entry to E-163 area
2. Rack on casters inside entry to E-163 area
3. Power supply for L-Band Klystron
4. Air handling unit for clean room in center of End Station B
5. Electronic racks 1 through 28
6. Electrical power racks 40 through 65

Pressure and Vacuum Vessels

An audit of the NLCTA Facility and End Station B for pressure and vacuum vessels did not find any problems. There was one vessel which was a SLAC registered vacuum vessel. There were two vessels which have been added to the SLAC registration. There were three vessels which do not need to be registered. There were the usual waveguides and light pipes, which are considered to be vacuum pipes and do not require registration. And there were various commercial vessels, gas bottles, nitrogen dewars and fire protection gas bottles which are regulated by outside agencies.

Appendix B holds a detailed list of items which were inspected.

Electrical

Electrical Safety of the NLCTA Facility was extensively reviewed during the Restart Validation Review Process in 2005. All issues requiring resolution before restart were completed and the facility allowed to resume operations. For this review, the status of the post restart items were reviewed and a walk-through of the facility was conducted. Note that the Electrical Safety Committee is conducting separate reviews of the E-163 facility and that facility is not included in this review.

All post restart items have been addressed. There is a marked improvement in the overall electrical safety aspect of the facility since the restart reviews in 2005. Attention has been given to the protection of temporary power cables, and the replacement of temporary power cables with permanent wiring for those facilities that have become "permanent" in B62 (e.g. clean room huts).

During the walk-through, only 4 items were specifically identified:

1. Rack B062-114: Improperly made SJO cord to Rack B062-116

2. Power cord not protected where it goes through the floor below the rack (grommet needed).

3. On top of the NLCTA beam enclosure, the 110VAC power cord to a BSOIC is not protected from damage where it crosses the walkway and where it is pulled over the guard rail kick plate (note this was identified during the restart validation review and partially addressed).

4. Building 485: Requires connection to building ground grid.

The general impression from the walk-through is that more attention is needed to housekeeping-type issues, for example, the power cord in Rack B062-116 identified above may need to be replaced with permanent wiring given its purpose (providing 208VAC power to a different location), and examples of extension cords across walkways without protection were identified during the walk-through (and immediately corrected). Aside from these housekeeping issues, the facility's attention to implementation of and compliance with SLAC's electrical safety program is markedly improved from the conditions observed during the restart validation review.

Fire

Special notice:

1. CO2 fire protection system for NLCTA modulators needs service in June.
2. Spare bottles were weighed and new tags were not placed on cylinders.
3. CO2 system located on North East wall near exit has activation device positioned so that it may not be functional. This was either caused by the fire technicians who just recently serviced the system, or they didn't notice the problem and correct it. Call Hope Johnson at ES&H to have service request sent to service people ASAP.

Minor Concerns:

4. Access path blocked to North West side fire alarm pull station. Keep clear at all times.
5. Fire extinguisher located on top of NLCTA enclosure needs service. Contact Hope Johnson at ES&H for service request.
6. E-163 enclosure access and egress door clear height is 6'6", should be 6'8". This was later found to be acceptable for an experimental area with low occupancy.
7. Remove unnecessary fire extinguisher from north exterior wall. Call Hope Johnson for service request to remove.
8. Remove Nitrogen cylinder from above tunnel access on north exterior side of End Station B.
9. Fire extinguishers shall be checked monthly and back of the service tag signed by inspector. Building manager shall appoint someone to complete this task in Bldgs. 225, 485 and at the south entrance to the NLCTA tunnel.

Hoisting & Rigging

Hoisting and Rigging activities are only performed with the knowledge of the crane custodian and safety officer Keith Jobe. ESB has a lift plan approval process in place. Inspection of rigging gear and below the hook lifting devices is current. The 50-ton crane has been recently inspected and a Plate V certification has been issued, though a few minor defects were noted. The preventive maintenance is overdue by 3 month due to fall protection issues. The access to the crane and the crane bridge has been greatly improved over recent weeks and is now to OSHA standards. An ESWP exists for crane access. PM is scheduled for early June during which the remaining issues from the crane inspection will be addressed.

Findings:

1. The small manual hoist in ESB experimental room is missing a weight capacity sticker on the east side of the support cross-member (OSHA & DOE requirement). **Action**: Place an appropriate hoist capacity sticker on the cross-member.
2. There is no crane log book for the newly installed hoist in the ESB experimental room. **Action**: Start a crane log book for this hoist. Currently a recommendation only. This may become a requirement based on the release of the new ESH Chapter 41 – Hoisting and Rigging.

Environmental

The apparatus for the experiments at ESB include a significant amount of oil, mostly in modulators, Klystrons, reservoirs, etc. In 2005, a fire erupted in a modulator in ESB. Based on that incident and subsequent reviews, several corrective actions were completed and the system is in good shape. Subsequent improvements have included:

- Drilling holes in the secondary containment to allow water from a sprinkler system to drain, instead of modulator oil that may have been released.
- Placement of mats on the top of the oil-filled tank to divert all sprinkler system water away from the secondary containment of the oil-filled equipment.

1. Storm Water

End Station B (as well as ESA and the beam housing) have been identified as unauthorized for storm water discharges due to their exposure to research activities. A DOE funded infrastructure project has been approved to remove any connection to the storm drain system. Due to unexpected demands on engineering staff to meet LCLS deadlines the proposed schedule has changed as shown below:

ESA/ESB Project Schedule:	Start	Complete
Engineering/PM	04/05	11/06
Procurement	03/06	06/06
Construction	06/06	10/06
Testing	10/06	10/06
Beneficial use	11/06	
Project completion		01/07

The potential risk to storm water quality within ESB and ESA is from spills. Measures to mitigate this risk have been implemented and include alarmed level indicators and secondary containment of waste oils. In addition, employees on all shifts and the on-site Fire Department have been made aware of the situation through various means including storm water pollution prevention training, job and area hazard analysis plans, and the vigilant adherence to spill prevention and response program elements.

2. Secondary Containment Outside in the North West Corner of ESB

The containment is not in use. However, rainwater has accumulated in the containment. Given the concerns with the West Niles virus, it is recommended that the containment be modified to eliminate the standing water. A CEF service request exists to breach or fill in the containment during the 2006 summer downtime.

3. Outdoor Housekeeping

The area outside, around the ESB is fairly clean. However, some pallets, debris and Styrofoam peanuts were noted around the building. Continued housekeeping is advised.

Occupational

In general the facility is well maintained. A conscious effort has been made to ensure that safety is taken seriously in this facility and that safety items are corrected as noted with or without prompting from sources outside of this facility. Keith Jobe has corrected numerous items from both the OSHA audit and the 2005 NCLTA Restart Audit.

Of particular note are housekeeping and fall protection. The buildings, compared to last year, have much less equipment and tools stored on the ground or in areas where people could walk into them or trip over them. The large overhead crane also has some significant safety improvements. The bridge access ladder has been modified, improving safety while accessing the bridge. The bridge itself has been improved with the addition of gates at the ends to prevent employees from inadvertently falling from the ends of the crane.

The safety of NLCTA continues to improve. This is no easy task considering the size and complexity of this area.

ESB

1. There is a small plastic bucket that is used to transfer oil from a larger 55 gallon drum of oil. There was approximately ½ cup of oil in the bucket. This bucket was not labeled. **Action**: The bucket must be labeled with chemical name and the appropriate hazard warnings.

2. The double-tank CO_2 fire extinguisher with an extinguisher hose on a coil adjacent to the north wall of ESB was obstructed by a metal plate and a mop and mop bucket, making access difficult. The metal plate was removed at the time of the finding. **Action**: move the mop and mop bucket to a different location.
3. The gate located on top roof of the accelerator enclosure has a bungee cord used as an automatic gate closure. **Action:** Suggestion only – replace the bungee cord with a spring or other appropriate closure.
4. There is an extension cord daisy-chained on the roof of the accelerator enclosure. This extension cord is used on occasion to power heaters. At the time of the walk through it was not hooked up. **Action:** Remove the daisy-chained cord.
5. Lock out Tag out locks in place and electricians not present. **Action:** Follow lock out tag out rule.

Building 128

1. There is a fixed ladder (FL159) on the outside of the building. There is a chain at the top of the ladder that is used to help prevent someone from inadvertently falling down the ladder. This is acceptable provided that the chain is in the down position when nobody is on the roof and in the up or blocked position when someone is on the roof. A best practice would be to install a self closing gate that opens out toward the roof. **Action**: Suggestion only – place an appropriate gate at the top of this ladder.

Building 485 (Sea Train)

1. The belt sander was missing a protective guard. **Action**: A guard must be placed on the sander.
2. The flammable cabinet has a damaged lock. **Action**: the lock must be replaced or repaired.

Building 486 (Sea Train)

1. There is a cable (BNC or other signal cable) run along conduit on the outside of the building. This cable interferes with the opening of the door into this sea train. **Action**: Re-mount the cable on the unistrut (not the conduit) and ensure the cable does not interfere with the door operation of building 486.
2. The ceiling panels are warped from moisture and are becoming detached from the ceiling. This situation poses a bump hazard and falling object hazard. **Action**: Suggestion only – The panels should be removed and discarded.

Outside of Buildings

1. Outside of ESB on the north side blocks, conduit, wire, piping and general debris are stored on the ground and poses a trip hazard. **Action**: The above listed items and any other items stored in this area that pose a trip hazard should be removed.
2. Outside of ESB on the north side a large (15 to 20 foot tall) white plastic tank was not labeled as to its contents. Action: This tank must be labeled with the name of the chemical it contains and hazard class for this chemical.
3. There were two large liquid helium dewars that were empty. The labels are faded and barely legible. **Action:** ESH will label the containers as empty. However, if these dewars are put back into service they will need to have the faded labels replaced and the tanks will need to be seismically secured.
4. Metal shavings from the machine shop (Bldg. 485) were outside the sea train on the ground. **Action**: These shavings must be cleaned up to prevent them from entering the storm drain.
5. On the south side, outside of NLCTA, two chained liquid nitrogen tanks had only one chain to secure them. **Action**: A second chain must be added to these tanks.

Industrial Hygiene

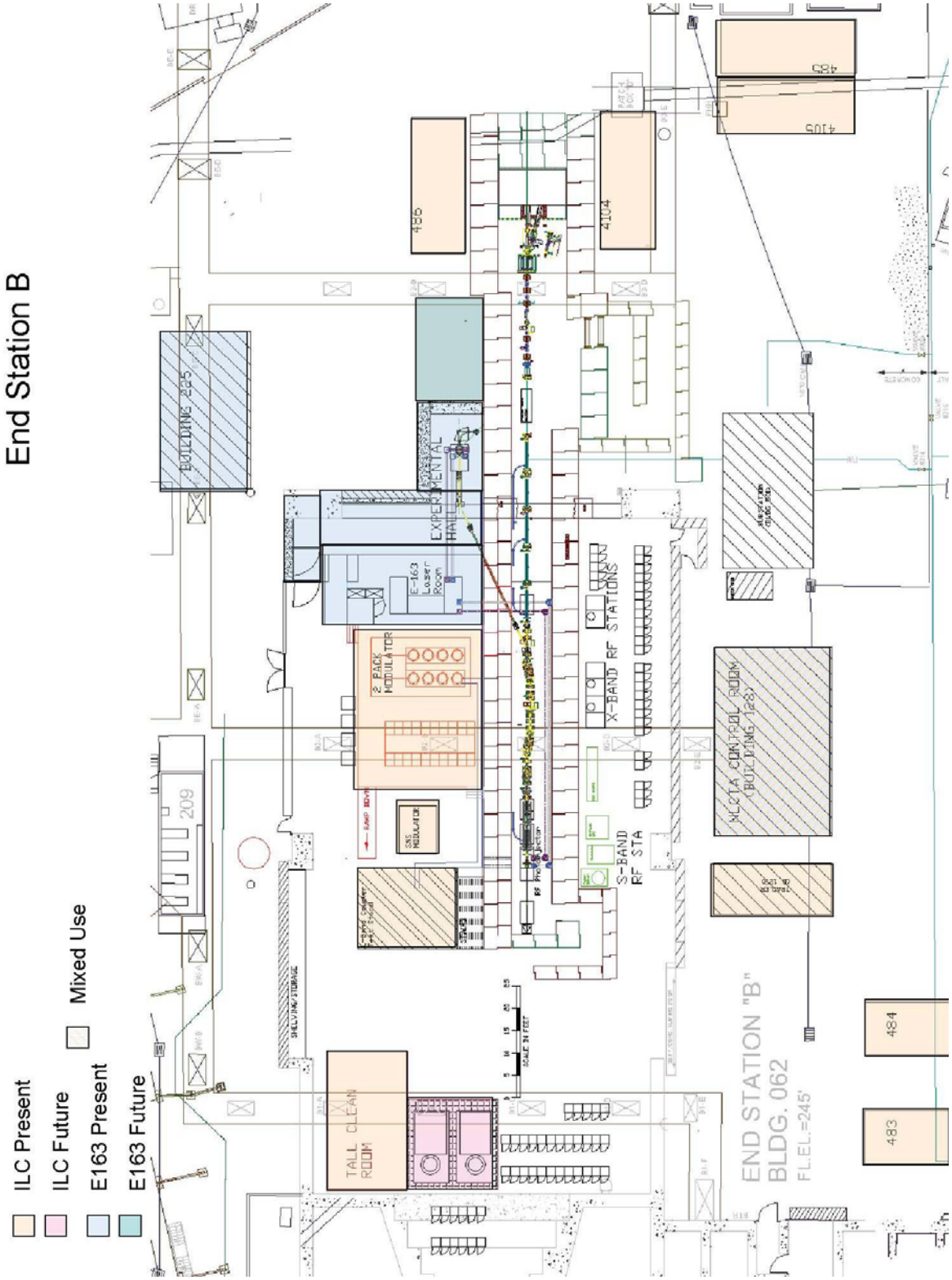
1. There should be a beryllium warning sign on the E-163 gun modulator cabinet due to electrical arcing, which has been shown to produce beryllium dust. The sign can be similar to the one already attached to the 2 Pack cabinet. **Action:** Place sign.

2. The Spallation Neutron Source Modulator cabinet (or room) needs to be routinely inspected for contact band damage. This is because the contact band contains 2% beryllium, and showed signs of arc damage when SLAC received it. John Shepardson spoke with Craig Burkhart about this and he was not aware of the survey John Shepardson conducted in 2005. This survey is attached in Appendix C. **Action:** Set up a regular inspection schedule in close cooperation with ES&H and monitor the results.

3. In 2005, SLAC hired a consultant to survey ESB for asbestos. They found no asbestos inside the building, but the roof was not surveyed, and is assumed to contain asbestos in the event that any roofing work is done. **Action:** This information should be displayed on a sign so that personnel who work on the roof will be aware of this.

4. There were two types of laser safety goggles at the entry to the laser room. I was told that one was a newer type which is required for laser work, and the older type was no longer used. **Action:** Remove the older style of laser goggles to prevent them from being used by accident.

Appendix A: ESB Layout



Appendix B: Pressure and Vacuum Vessels

Klystron pulse tank made to SLAC drawing number AD-238-231-00-R7, MESI-253.214. This tank can be evacuated as part of the oil filling process.

Figure 1 Klystron Pulse Tank

A commercial vacuum test chamber at the west end of End Station B. This chamber just meets the registration requirement of 1 cu.ft. times 1 atm. The only concern would be on pressurizing, there was no pressure relief valve. MESI-376 was given to the device, which is presently not in service.

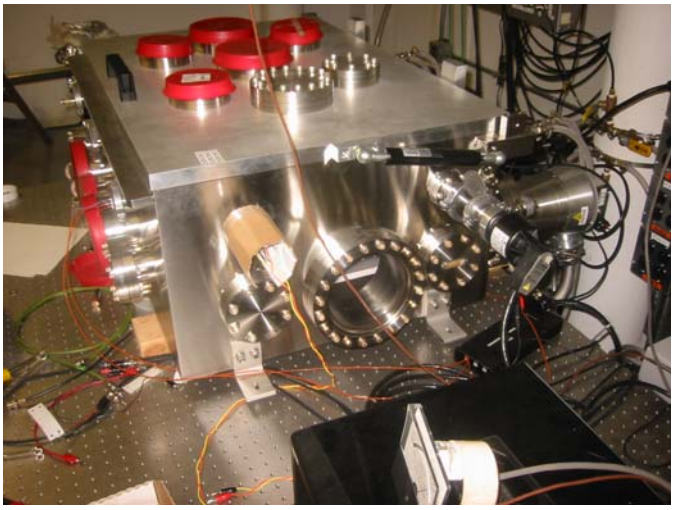
Figure 2 NLC Inertia Sensor Chamber

A shipping tank, about 1 foot in diameter and 8 feet long. This tank has valves and fitting and no pressure relief valve. This tank does not belong to SLAC and is labeled "Out of Service".

Figure 3 Accelerator Shipping Container

A chamber for a collimator prototype test. This is no long being used and is safe in its present state.

Figure 4 NLC Collimator Test Chamber

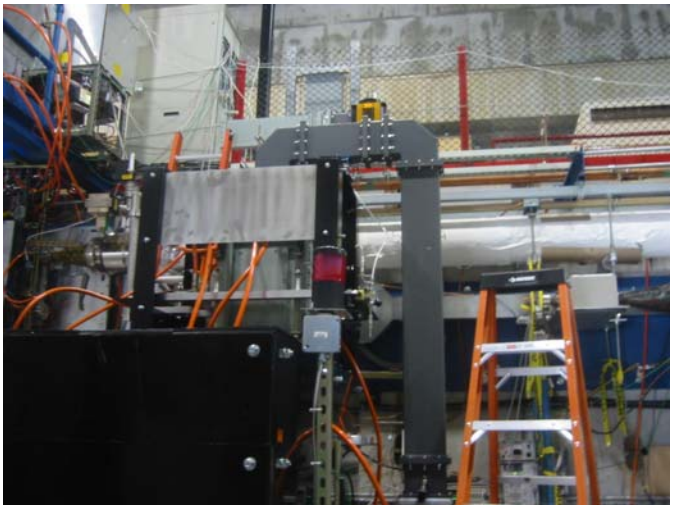


A rectangular chamber from Stanford campus is being used for E-163. It has been registered as MESI-375.

Figure 5 E-163 Chamber

The laser light pipe in the E-163 experimental hut is considered to be a dispersed energy storage and does not need a SLAC registration. It might be advisable to put a pressure relief valve on it.

Figure 6 Laser Light Pipe

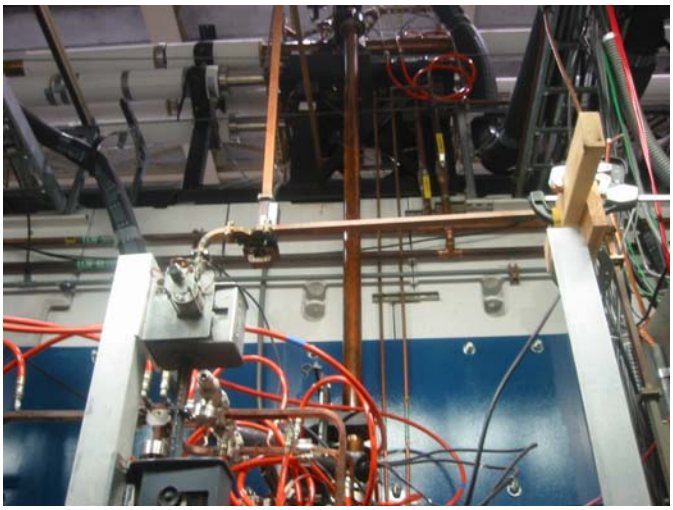


There is a rectangular waveguide by the 8-Pack stand. It is considered to be a dispersed energy storage and does not need a SLAC registration. It does have pressure relief valves.

Figure 7 Large Rectangular Waveguide

There is a large round waveguide delay line above the NLCTA bunker. It is considered to be dispersed energy storage and does not need a SLAC registration.

Figure 8 Large Round Waveguide Delay Line



The small round and rectangular wave guide are considered to be dispersed energy storage and do not need SLAC registration.

Figure 9 Small Round and Rectangular Waveguide

There were commercial gas bottles and commercial dewars in End Station B. They are inspected by another agency and do not require SLAC registration as pressure vessels.

Figure 10 Commercial Gas Bottles and Commercial Dewars

There were fire protection gas bottles in End Station B. They are inspected by another agency and do not require SLAC registration as pressure vessels.

Figure 11 Commercial Fire Protection Gas Bottles

There was a small vacuum chamber being stored on a pallet in End Station B, which is below the size required for SLAC registration.

Figure 12 Stored Small Vacuum Chamber

Appendix C: Industrial Hygiene

SLAC MEMORANDUM (slightly reformatted to fit this document)

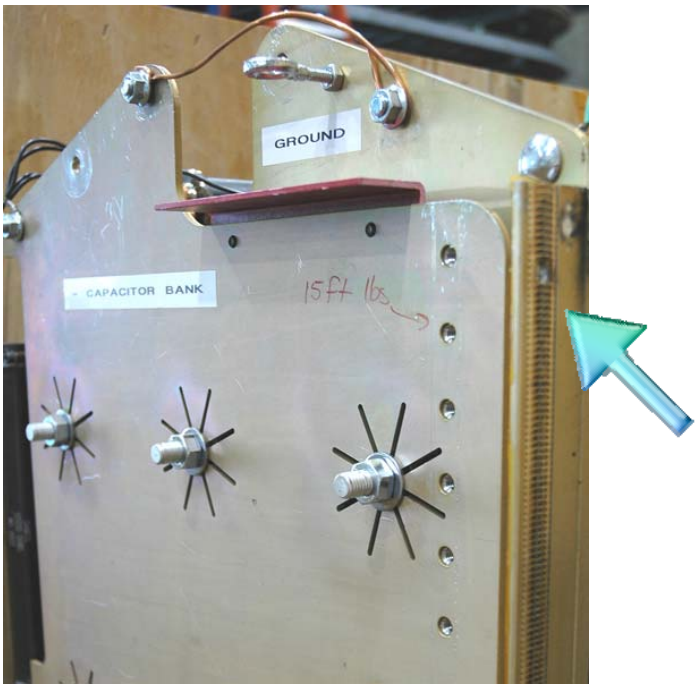
To: Keith Jobe, m/s 66

Date: June 20, 2005

From: John Shepardson

Subject: New Modulator System from Los Alamos Laboratory

Thank you kindly for your prompt attention to the new modulator equipment at NLCTA. As you suspected, the slightly worn (apparently arc-damaged) beryllium copper connector on one of the cabinets was a source of Beryllium dust. There were levels of Beryllium that exceeded the DOE housekeeping standard on that cabinet (but not on the second cabinet which did not have damaged connectors).



The connector strip showed signs of arc damage at the top.

The DOE standard for surface contamination during non operational periods and transfer within DOE facilities is 3 micrograms per 100 square centimeters. The results of two surface samples on the above connector strip were 7 and 12 micrograms per 100 square centimeters

There was visible dust on the wood container that housed the same modulator cabinet. A sample here recorded 15 micrograms per 100 square centimeters.

Readings at other locations on the 2nd cabinet as well as the top of the modulator tank and the connector strips in the box of cables detected no surface contamination.

I cleaned the connector strip and bottom of the cabinet as well as I could. Please let me know when you remove the cabinet from the wood box so that I can inspect it prior to disposal, or storage.

I request that you forward a copy of this report to the originators of this equipment at the Los Alamos Lab to let them know of this beryllium contamination problem.

cc Richard Cassel, m/s 49
Butch Byers, m/s 84