Stanford Linear Accelerator Center

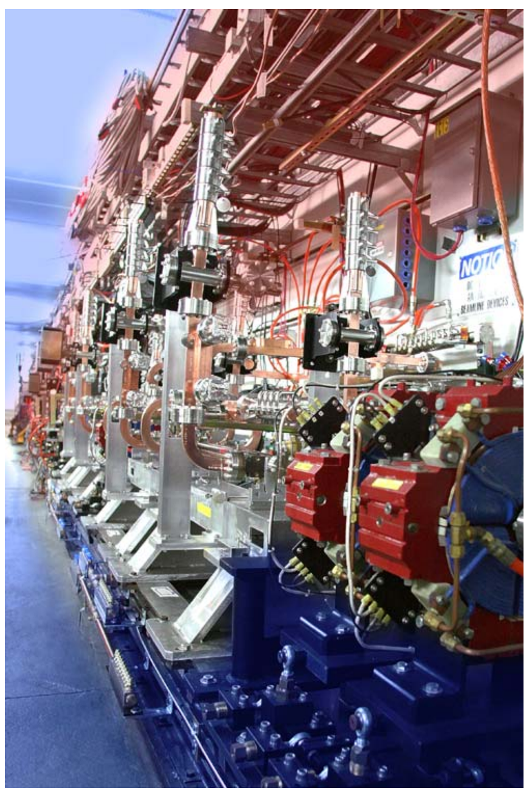
Report of the

Validation Review

of the

NLCTA Restart Plan

May 2005



Cover Photo: The NLCTA linac.

NLCTA Restart Validation Report - Validation Team Members' concurrence with the conclusions of this report:

Perry Anthony, Electrical Safety Officer, Director's Office	Date
Tom Rizzi, Chemical and General Safety, ES&H Division	Date
Mike Grissom, Assistant Associate Director, ES&H Division	Date
Mike Saleski, Safety Officer, Accelerator Department	Date
Saul Gold, Klystron Department	Date
Fred Asiri, Earthquake Safety Committee	Date
Sayed Rokni, Radiation Safety Officer, Radiation Protection, ES&H Division	Date
Ted Fieguth, Laser Safety Officer, Director's Office	Date
	Date
Submitted By:	
Steve Williams, Assistant to the Director & Validation Team Leader	Date

Executive Summary

A Stanford Linear Accelerator Center validation review of the restart plan for the NLCTA facility was conducted at SLAC from April 6 through May 6, 2005, at the direction of the SLAC Director. The purpose of the review was to evaluate the readiness of the NLCTA facility to resume research operations following the shut down of all Laboratory operations by the Director in order to reevaluate its general safety protocols. Special emphasis during the review was given to evaluating how effectively the facility is communicating elements of electrical safety, hoisting and rigging work requirements, and Integrated Safety Management criteria.

In general, this facility is well managed in accordance with SLAC environment, safety, and health policy and incorporates the elements of Integrated Safety Management. Subject to the listed pre-restart and post-restart recommendations in this report, the Validation Team recommends the restart of the NLCTA facility.

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1 Introduction

1.1 Background

On October 11, 2004, the SLAC Director ordered that all accelerators be turned off in response to an electrical arc flash accident, which subsequently triggered a Department of Energy Type A Accident Investigation. At the time of the accident, the linac, damping rings, positron production systems, and beam switch yard facilities (Figure 1-1) were poised to resume operations, following a scheduled 12-week maintenance shutdown that had ended on October 1, 2004. All accelerator systems had been checked and were functioning. The Beam Authorization Sheets for these areas had been completed and signed off in accordance with well established practices. The NLCTA had a valid BAS and was running RF beam only.

Following the accelerator shut-down, the SLAC Director issued his “Safety Comes First” memo delineating actions to be taken by SLAC employees to strengthen their understanding and commitment to safety. In addition, the department heads were asked to conduct overall assessments of safety within their respective organizations and to take corrective actions where opportunities for improvement were identified.

The Technical Division and the Operations Manager of the NLCTA have submitted their Restart Plan and requested approval from the Director to restart their facilities.

To assure himself that the facility is in fact ready to resume safe operations the SLAC Director decreed that the operational readiness of each accelerator facility would be validated prior to its re-start by a panel of accelerator, technical and safety management experts. This report reflects the assessment results of the review of NLCTA Facility.

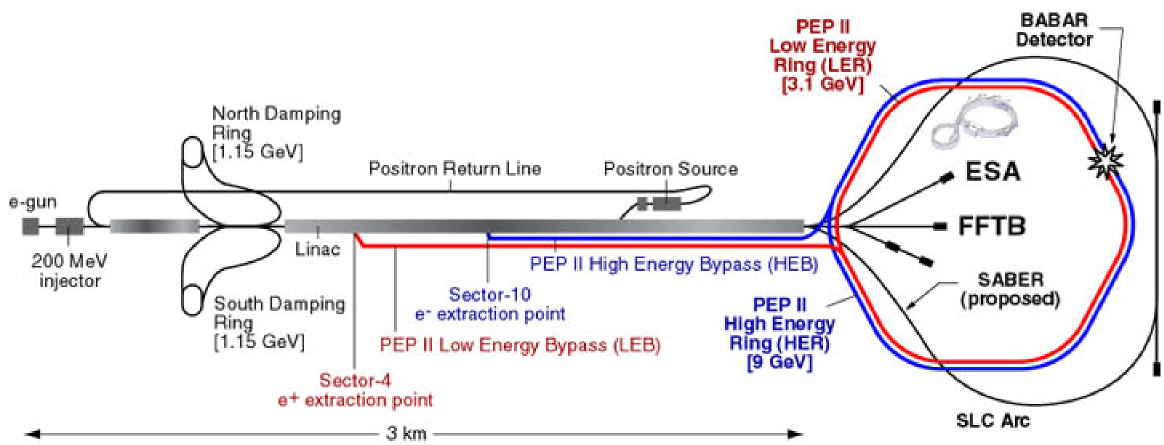

Figure 1-1. Overview of the Linac and PEP-II Accelerator Facilities.

Since October 11, 2004, the Director has called for the re-invigoration of workplace safety at SLAC. The Director issued general guidance on his expectations for safety at SLAC (http://www.slac.stanford.edu/slac/safetyfirst/) which required all facility personnel to review facility safety protocols. In addition he required all employees, in collaboration with their supervisors, to generate a personal Job Hazard Analysis and Mitigation (JHAM) document for their respective jobs. This was a new program that was completed by November 15, 2004. Training identified through this process was then to be scheduled and completed. Included in this initiative was electrical safety training that was provided to virtually everyone on site. In addition, as the result of the electrical accident and a hoisting and rigging near miss incident that occurred about the same time, several ES&H Bulletins were issued on electrical safety, hoisting and rigging safety and non-employee training (subcontractors and users) to raise awareness of related safety details in these regards.

NLCTA facility managers have stated that they are ready to startup normal operation. They submitted to the Director a restart plan authorized by their facility managers. The NLCTA management have responded to all the requirements set forth by the Director; all training required for restart has been completed; all procedures required for restart are in place; all critical facilities and equipment have been inspected. In addition, NLCTA management has committed to addressing the pre- and post-restart items identified herein on a timely basis. Therefore, the Review Team (hereafter "Team") believes the facility can be operated safely.

Figure 1-2. View of the NLCTA linac.

1.2 Charge to the Review Team

In March 2005, the Director of the Stanford Linear Accelerator Center requested that Steve Williams, Assistant to the Director, lead a review to evaluate all aspects of the NLCTA ES&H compliance. In addition, the Team was asked to verify the soundness of the facility managers' Action Plan with respect to the *SLAC Safety Management System* and the expectation that "Safety Comes First." The Team also was to review the overall plan to resume operation of the accelerator to ensure that it was complete and comprehensive with special attention to:

1) Determining that the pre-operational procedures are updated with the new requirements from the recently updated bulletins and safety procedures.
2) Determining that the training plan of the operational staff is in order.
3) Reviewing the managers' plan to maintain operational safety control of the facility during operation.

1.3 Membership of the Team

The Team (see Appendix B) was lead by Steve Williams. Members were chosen on the basis of their independence from the project, as well as for their technical and/or management expertise, and experience with the operation of large scientific research facilities. Continuity and perspective were provided by the fact that many of the members have served on previous safety review Committees. The Team was organized into subcommittees, each assigned to evaluate a particular aspect of the facility corresponding to the members' areas of expertise.

1.4 The Review Process

A kickoff meeting was held on April 6, 2005. The review was conducted from April 6, 2005 through May 6, 2005, at the Stanford Linear Accelerator Center (SLAC), Menlo Park, California. The Review Plan (Appendix B) was developed with the cooperation of the DOE Stanford Site Office (SSO). Planning, reporting and status meetings were held Wednesdays throughout the process.

Facility walkthroughs and meetings with facility personnel began on April 7, 2005 and continued until May 6, 2005.

1.5 Conclusion

The Restart Validation Team (see Appendix B) has verified, subject to pre-restart and post-restart recommendations, that the safety systems are operational and that procedures have been modified to incorporate the new policies issued since October 11, 2004.

The validation was accomplished through the review of documents provided by those responsible for operation and maintenance of the accelerators and experimental facilities. Discussions, interviews and walkthroughs with responsible personnel were conducted over three weeks. A list of pre- and post-restart recommendations appears in Appendix D.

2 General Safety

2.1 Integrated Safety Management

Findings

The NLCTA Restart Plan is an example of ISM planning and authorization in the NLCTA in that it addresses the scope of people preparedness, procedure readiness and equipment readiness and it has been authorized by the Department Head of the Linear Collider Department, The NLCTA Operations Manager and the NLCTA Safety Officer.

ISM principles are well understood by the NLCTA management. They have implemented them in their daily work task list where hazard analysis and training are identified as required items before commencing work. A formal work authorization form is being used for appropriate tasks.

Recommendations

None

2.2 Safety Practices and Policies

Findings

The facility took good advantage of the Safety Comes First directive to brainstorm and examine safety polices and practices in the NLCTA. The meeting discussions resulted in a number of safety concerns which lead to a list of recommended actions – such as revising daily task planning (tail-gate) meetings, instituting a twice-a-week planning meeting, reviewing training requirements for special projects. The daily work review integrates hazard analysis and mitigation into the task planning. They have implemented the work authorization process using the Accelerator Department form.

The NLCTA facility and staff used the post-accident time to establish their AHAs and JHAMs.

They plan to use ES&H Bulletin #74 when their user spokesperson, for example Sammi Tantawi, brings in Russian collaborators for planning the training and safety awareness needed by the users before they commence with the experiments.

The NLCTA Safety Assessment Document (1996) and a draft revision (February 2005) was reviewed. It is generally accepted that SADs should be reviewed periodically (suggest annually) and changes made to keep the document current for potential hazards in the facility and the mitigations – engineered and administrative. Nine years is a long time to go by. Since the facility is being significantly modified for E-163, we recommend that the SAD be updated to reflect the status at the end of that process (approximately December 2005).

Comments

We suggest that the Associate Director for the Technical Division should schedule a Readiness Review before operating E-163.

Recommendations (post-restart)

See Table 2-1.

Table 2-1: Safety Practices and Policies (Post-Restart).

Number	Recommendation	Target Date
1	Review and revise the SAD to reflect the current status of potential hazards and their mitigations at the point in time that the E-163 facility is ready to commence operations.	December 31, 2005

2.3 Training

Findings

The Facility Managers took the opportunity after October 11, 2004 to prepare JHAMS based on a careful analysis of the facility hazards and identified training courses for the staff. Care was taken to develop four modules of training to qualify an NLCTA operator in the area of general safety, RF systems, accelerator beam systems and RASK mode (not currently in use).

We examined the training records and found that basic ETAs (now STAs) are up to date. The staff has been assigned a lot of training and taken a great deal of the classes needed but some assigned courses have either not been taken, are overdue for retraining in courses noted as mandatory or supervisor-required, or may no longer be needed. This needs to be remedied.

Comments

The Team found no issues related to training which would preclude safe turn-on and operation of the NLCTA.

Recommendations (post-restart)

See Table 2-2.

Table 2-2: NLCTA Training (Post-Restart).

Number	Recommendation	Target Date
1	Review staff training requirements and currency to eliminate “Never Taken” and “Overdue” courses in the department’s STAs.	June 1, 2005

3 Safety Topics

3.1 NLCTA Radiation Safety and Operational Procedures

Findings

The radiation safety team consisting of Hesham Khater, Heinz Vincke, Alyssa Prinz, Mike Saleski, and Sayed Rokni 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 NLCTA SAD. The changes have not been updated since the SAD was released on April 24, 1996. The changes in the NLCTA radiation safety systems, which have been reviewed by the Radiation Safety Committee (RSC) and/or Radiation Safety Officer, are: the operation of the klystrons and modulators in unattended (RF only) mode and the connection of 4 new XL-4 klystrons (8-Pack klystrons) to power four 60-cm structures in the NLCTA tunnel. With the additional structures in place, the maximum operating NLCTA beam energy increased from 180 MeV to an estimated value of 350 MeV. The Team concludes that the changes to the NLCTA have been analyzed, documented, reviewed independently and properly approved per SLAC internal radiation safety guidelines. The NLCTA operations to date have been conducted safely within the established Accelerator Safety Envelope.

The operational envelope, as expressed in the Beam Authorization Sheet (BAS) provides adequate controls to protect users, visitors and staff from ionizing radiation. The NLCTA BAS is jointly prepared by the Radiation Physics Group and properly implemented by the PPS and the BCS groups.

SLAC Memo RSO-04-10 specifies conditions necessary for restart of accelerators without a full PPS certification, provided the relevant PPS and BCS systems were certified within the last 6 months. The PPS certification of these areas is a condition in the BAS that needs to be met per existing requirements.

Operations Procedures and Practices

The NLCTA has a well-maintained and mature set of facility operation procedures. While no formal interviews were conducted, the staff of qualified accelerator operators seems well trained and cognizant of important safety protocols and procedures.

Some time was spent scrutinizing the role of the Accelerator Department Safety Office (ADSO) at the NLCTA facility. Other similar facilities at SLAC have a single designated safety officer (or safety office) to aid line management with the management of safety. This responsibility largely rests with the NLCTA Safety Officer, but some extra oversight by the ADSO is also provided.

The NLCTA facility was constructed and initially operated by Accelerator Research Department A (ARDA), an organization with little experience operating an accelerator facility. At that time it was certainly appropriate for constant external safety oversight.

Several years ago the operation and management of the NLCTA facility was transferred to the NLC Department (now ILC). There are now decades of collective operating experience for accelerator facilities amongst the Operations Manager, the Safety Officer, and the staff of qualified Operators. Under this new reality, the role of ADSO may be reevaluated.

The NLCTA is a small facility with fewer staff compared to the B-Factory. As such, the NLCTA Safety Officer may play other roles in the organization that have programmatic interest and at times may be in a position of at least the appearance of a conflict of interest. This would primarily come into play with operational safety decisions, such as non-standard hazard remediation and close-out requirements for work performed under a Radiation Safety Work Control Form (RSWCF). The ADSO processes RSWCFs for the NLCTA. Other safety procedures that are unique to accelerator operations can and do benefit from the experience of the ADSO. These include PPS entry/exit procedures, search procedures, PPS testing procedures, Beam Containment System procedures, and Beam Shut-off Ion Chamber procedures.

The NLCTA Safety Officer is the appropriate person from the line for developing safety programs for new NLCTA facilities and upgrades. Such programs are generally independently reviewed by subject matter experts and/or citizen committees. Other general safety issues, such as electrical and workplace OSHA compliance, while also concerns for the ADSO, are best served by other subject matter experts if adequate knowledge is unavailable in the line organization.

The safety roles of the NLCTA Safety Officer and the ADSO as defined and practiced are appropriate for the facility.

Recommendations

None

Accelerator Safety Envelope

The NLCTA SAD has not been updated since it was released on April 24, 1996. Changes made to the radiation safety systems have been reviewed and approved in accordance with SLAC internal guidelines.

Conclusion

No operation action can cause the facility to exceed the beam power limits of the Accelerator Safety Envelope as defined in the SAD.

Review of NLCTA Operations Safety Audit Report

There are no open findings from the 2001 Accelerator Operations Safety Audit of the NLCTA.

Open concern from the 2001 audit: Although documented radiation surveys have demonstrated that the shielding is sufficient for the current operations, there is insufficient documentation that the shielding is adequate for planned future operations within the parameters of the SAD.

Conclusion

The concern was addressed in a memo written by Hesham Khater on September 3, 2002. Shielding is adequate for the Accelerator Safety Envelope specified in the NLCTA SAD and the concern should be closed.

Review of Operator Training Records

Records of the following operations were reviewed: Marc Ross, Keith Jobe, Chris Adolphsen, Stefan Doebert, Doug McCormick, Janice Nelson, Tonee Smith, and Kathleen Ratcliffe.

Conclusion

All operator training records are current except for the following:

1. No training record was found for one of the operators.
2. Practical RWT-1 training was missing from another operator's record.
3. Another operator had undergone the training but was not allowed to operate the machine. However, the operator's training allowed access to the NLCTA enclosure as a building manager.

Review of Area Monitoring Dose Report

All dose reports for the last 3 years were reviewed. A total of 15 TLD are placed along the outer wall and roof of the NLCTA enclosure, the NLCTA klystrons and the adjacent 8-pack klystrons and SLED line. The TLD located in the NLCTA control room consistently showed no dose. All other locations except for two locations near the NLCTA klystrons and 8-pack SLED line showed integrated dose of < 30 mrem during any 6-month monitoring period. The TLD near the NLCTA klystrons showed a maximum dose of 232 mrem and the TLD near the 8-pack SLED line measured 111 mrem during the last 6-month monitoring period (April, 2004 - October, 2004). The dose values measured at these two locations are due to the increase in the use of klystrons and SLED line for RF processing of structures inside the NLCTA enclosure.

Conclusion

The measured radiation levels are within the design limits.

Facility Walkthrough

Shielding items specified in the BAS were checked out. All shielding items were in place.

Conclusion

All shielding items were in place.

Review of NLCTA Procedures

All safety items inside and outside the NLCTA enclosure were inspected. In addition, a meeting with the NLCTA Safety Officer took place during which the following items were inspected:

a) Expired BASs
b) Previous RSWCF
c) Previous daily inspection checklists

d) Previous weekly inspection checklists
e) Search and secure procedures
f) PPS interlock checklist
g) PPS certification workbook
h) PPS alarm procedure
i) NLCTA BSOIC certification checklist
j) BSOIC alarm response procedure
k) Guideline for working in NLCTA beamline enclosure
l) End Station B safety orientation
m) NLCTA emergency procedure
n) Incident response procedure
o) Call-in list
p) Operator training records

Conclusions

a) A large number of RSWCFs were closed and filed without obtaining all signatures.
b) Procedures do not identify who is authorized to perform the work.
c) Beam containment daily check may be setting the 8 PICs to trip at levels higher than the 50 nA level identified in the BAS. The 50 nA corresponds to 0.6 mrem/h outside the enclosure and 6 mrem/h on top of the roof.
d) No procedure for initial klystron testing (except for the 8-Pack). NLCTA relies on Klystron Department staff for information regarding initial installation and testing of klystrons.
e) The NLCTA BSOIC certification checklist is in draft form.

Relevant PPS Procedures

See Table 3-1.

Table 3-1. Index of ESD Safety Assurance Testing procedures used by the PPS group to certify the PPS systems for NLCTA

Procedure	File name	Number	Date	Comments
NLCTA INT: PPS NLCTA Interlock Certification Procedure	18-29-01	-07	04/21/02	Used in BAS but obsolete - correct is 18-29-05
NLCTA EH: PPS NLCTA Electrical Hazard Certification Procedure	18-29-02	-06	04/30/01	Used in BAS but obsolete - correct is 18-29-06
NLCTA RAD: PPS NLCTA Radiation Certification Procedure	18-29-03	-07	03/29/04	Used in BAS but obsolete - correct is 18-29-07
NLCTA 8-PACK: PPS NLC 8-Pack (HVPS #3) Certification Procedure	18-29-04	-01	10/17/02	Not referred to in BAS
NLCTA IINT: PPS NLCTA Initial Acceptance Interlock Test Procedure	18-29-05*	-00	05/07/03	Not referred to in BAS
NLCTA IEH: PPS NLCTA Initial Acceptance Electrical Hazard Test Procedure	18-29-06*	-00	05/07/03	Not referred to in BAS
NLCTA IRAT: PPS NLCTA Initial Acceptance Radiation Test Procedure	18-29-07*	-01	03/30/04	Not referred to in BAS
NLCTA ESAT: ESD PPS NLCTA Safety Assurance Test Procedure (draft version) – Will replace 18-29-05, 18-29-06, 18-29-07	18-29-08	-00	09/17/04	Not referred to in BAS

* Correct documents to be used in the BAS.

Note: All PPS procedures are accessible on the group drive at: V:\ESD\Safety\CTL-PPS. There are 4 subfolders in this folder:

- Active PPS Procedures
- PPS PROCEDURES Archive
- PPS PROCEDURES DRAFT
- PPS PROCEDURES Latest

Relevant BCS Procedures

See Table 3-2.

Table 3-2. Index of ESD Safety Assurance Testing procedures used by the PPS group to certify the BCS systems for NLCTA

Procedure	File name	Number	Date	comments
NLCTA BCS PIC Pre-Run Checkout procedure	18-08-80*	-03	11/11/03	Calibration should be done for 50nA and not for 90nA

* Correct document to be used in the BAS.

Note: These procedures are accessible on the group drive at: V:\ESD\Safety\CTL-BCS\BCS PROCEDURES Latest. There are 2 subfolders in this folder:

- References for Procedures
- NLCTA

Note: The NLCTA Pre-Run data sheet is at this link: NLCTA Pre-Run data sheet.

List of NLCTA Safety Documents Related to Radiation Safety Not in The BAS

- 020301 Search & Secure
- 020302 Entry & Exit
- 020313 8-pack radiation survey (with RF)
- 020314 8-pack radiation survey (klystron)
- 020401 Training Requirements
- 020402 Training Record Worksheets
- 020403 Training Workbook
- 020502 Incident
- 020504 PPS Security Fault
- 020505 BSOIC Trip

E-163 Experiment

The feasibility of laser-based high-gradient acceleration of charged particles has been demonstrated in the Laser Electron Acceleration Project ("LEAP") on the Stanford Campus. The E-163 experiment will continue research in that field by using the same technology installed in End Station B (ESB) at SLAC.

The E-163 experiment will require two major changes to the NLCTA from a radiation safety standpoint. First, the thermionic injector will be replaced by a laser-driven radiofrequency electron gun. Second, beam will be kicked out of the NLCTA by an extraction dipole and into a second shielded enclosure running parallel to the NLCTA, within which the E-163 experiments will be conducted.

Conclusion

1. Concrete shielding enclosure is in place; no beam line components; no local shielding.
2. All calculations are done.
3. No RSC presentation yet.

Recommendations (pre-restart)

See Table 3-3.

Table 3-3: NLCTA Operations (Pre-Restart).

Number	Recommendation	Target Date
1	All shielding items in the NLCTA, including klystron local shielding items, must be secured and posted as radiation safety items (NLCTA).	Prior to Restart
2	All procedures listed in the NLCTA BAS need to be reviewed and updated before issuing the BAS (RP/NLCTA/ADSO).	Prior to Restart
3	All RSWCFs will be reviewed. Any RSWCF closed and filed without obtaining all signatures will be examined and the work will be inspected for completion (NLCTA).	Prior to Restart

Recommendations (post-restart)

See Table 3-4.

Table 3-4: NLCTA Operations (Post-Restart).

Number	Recommendation	Target Date
1	Complete operators' training before allowing operators to run the accelerator (NLCTA).	As Needed
2	Produce a procedure for initial klystron testing and installation that includes requiring a detailed traveler and photo showing added shielding (NLCTA and Klystron Department).	October 31, 2005
3	Update the SAD (NLCTA).	December 31, 2005
4	A protocol will be established for an internal periodic review of all documents requiring signatures (NLCTA).	May 31, 2005

3.2 Electrical Safety

Findings

The NLCTA Facility is generally in good compliance with SLAC ES&H Policies and Procedures regarding Electrical Safety. A walk-through review of the facility and related areas turned up few problems.

NLCTA has implemented a formal lock down policy that provides for worker safety in the accelerator tunnel, though more thorough documentation of the verification that all circuits are locked down is needed, in particular the configuration needs to be documented and re-verified on a regular basis. This will be implemented, possibly as part of the PPS certification process before startup of the facility.

The NLCTA operations staff are trained to the level of a qualified electrical worker, following the requirements in *ES&H Manual* Chapter 8, "Electrical Safety," including CPR first aid. One operator was interviewed as part of this review. The operator was quizzed on the knowledge of the new electrical requirements detailed in ES&H Bulletins #68 and #69. This individual had generated a number of EWPs and was aware of the requirements described in the documents, including lock and tag processes. Their management has made it clear they are to follow these requirements. NLCTA also conducts a morning "tail gate" meeting which reviews the work plans for the day, including electrical work.

This review finds that NLCTA operators are familiar with the changes in the SLAC electrical safety program and have updated practices as appropriate to incorporate these changes. One notable quote was "I feel a lot safer now," indicating training and processes are in place making for a safer work environment.

While not electrical safety, it was noted during the walk-through that the fire extinguishers were not having the monthly inspection sheet initialed when inspected. NLCTA management will ensure that this is done in the future.

Some Equipment Lockout Procedures (ELPs) have been reviewed for compliance with new bulletins, though a process for indicating this review needs to be implemented (date and signature on cover page for example). NLCTA management has committed to the review and validation of all required ELPs before first use.

Recommendations (pre-restart)

See Table 3-5.

Table 3-5: NLCTA Electrical Safety (Pre-Restart).

Number	Recommendation	Target Date
1	Document the configuration of supply power to the tunnel hazards and institute a plan for regular re-verification.	Prior to Restart
2	Mitigate bolded items from electrical walk-through spreadsheet.	Prior to Restart

Recommendations (post-restart)

See Table 3-6.

Table 3-6: NLCTA Electrical Safety (Post-Restart).

Number	Recommendation	Target Date
1	Implement *ES&H Manual* Chapter 8 requirements for GFCI testing.	May 31, 2005
2	Ensure fire extinguisher inspection tags are signed off as part of a monthly facility inspection.	May 31, 2005
3	All ELPs to be verified, dated, and signed off before first use.	Prior to Use
4	Mitigate remaining items from electrical walk through.	August 1, 2005

3.3 Facility Ownership and Maintenance

Findings

As the sole occupants of ESB the facility management has accepted full responsibility for controlling activities in the building. This is a fairly small facility with limited access. They have good control over facility users and maintenance people in other departments through the AD Work Authorization Process.

Recommendation (post-restart)

None

3.4 Hoisting and Rigging

Findings

The large ESB B062 crane is locked out from non-authorized use. The crane is operated from a remote control unit. The remote control unit is kept in the NLCTA control room when not in use. Operation of the remote control unit requires a key kept by the NLCTA operator.

Operators of the B062 crane include Keith Jobe, the CEF riggers, MFD operators, and Mike Racine of CEF. NLCTA has prepared an internal procedure entitled “End Station B Crane Inspection Checklist” that governs crane operations. Prior to authorizing use of the B062 crane, the NLCTA operator and/or Keith Jobe ensure that the crane operator for the activity at hand has a completed JHAM, a completed lifting plan signed by a member of the Hoisting and Rigging Reinstatement Panel, and know the ESB checklist. Approximately 8 lift plans had been prepared and signed off by the Panel.

The slings and fixtures associated with the crane were neatly stored and had all required markings. However none of the slings, fixtures, or spreader bar had any markings from the SLAC Hoisting and Rigging Inspector.

A spreader bar with welded load-bearing connections had not been through the inspection process specified in ES&H Bulletin #71.

The crane has both 15-ton and 50-ton lifting systems incorporated into it. The 15-ton system is currently not used due to an operational problem; specifically, when operated for a certain period of time, it trips off the electrical system. Since the 15-ton and 50-ton systems are mechanically independent (separate winches, motors, drums, brakes, etc), the operational problem with the 15-ton hook does not appear to have any effect on the 50-ton system. The 15-ton system is prevented from use by a portion of the remote control operating unit being taped over.

There are two hooks on the ESB crane which are used occasionally to lift equipment in the facility space. This 40-year old crane has a number of compliance issues which were identified in the OSHA audit and are expected to be fixed by CEF in the coming year. The issues generally deal with working from the elevated control cage and maintenance access to the crane. The facility crane users do not access the crane in this way as they have a remote control which allows them to operate from the floor. Potential risks concern maintenance personnel. The last preventative maintenance was completed in April, 2004. It was not done in October, 2004 due to a “lack of manpower.” The general issue of crane maintenance is being addressed by CEF.

The ESB crane custodian should establish a required crane maintenance and inspection schedule. The responsibility for carrying out these tasks lies with CEF.

Conclusions

The NLCTA hoisting and rigging operations appear to be well-managed and in accord with the requirements of ES&H Bulletin #71, the only exception being the untested spreader bar. Arc flash calculations (ES&H Bulletin #72) have not been formally completed for the crane breaker; the breaker is currently in the ‘on’ position.

There are a couple of operational concerns with the B062 crane. First, the 15-ton lifting system is not working properly. Since this system likely is more desirable to use than the larger 50-ton system for almost all NLCTA loads, it would seem to be a priority to return the 15-ton lifting system to its proper operating condition. Recent meetings have been held between NLCTA and CEF in order to effect this change.

Second, there is a lack of clarity regarding who is responsible for inspection of the hoist cables. OSHA regulations, i.e., 29 CFR 1910.179(j)(2)(iv), for cranes in frequent (at least once monthly) use require:

> “Visual inspection daily; monthly inspection with a certification record which includes the date of inspection, the signature of the person who performed the inspection and an identifier of the chain which was inspected”

For cranes in less frequent use (less frequently than monthly but more often than once in 6 months), the hoist cable inspection requirement applies prior to each use.

Recommendations (post-restart)

See Table 3-7.

Table 3-7: Hoisting and Rigging (Post-Restart).

Number	Recommendation	Target Date
1	Establish a crane maintenance and inspection schedule with documentation.	October 1, 2005
2	The spreader bar located on the mezzanine at level at the west end of B62 should be red-tagged or otherwise prevented from use until tested in accord with the requirements of ES&H Bulletin #71.	Completed
3	The breaker panel(s) for the B62 crane shall undergo arc flash calculations and appropriate labeling in accord with ES&H Bulletin #72.	Prior to Use
4	The 15-ton lifting system should be repaired and returned to normal operating service.	TBD

3.5 Laser Safety

Findings

The lasers for the future E-163 experiment at NLCTA were moved from building 407b (B407b) in the Research Yard into the new laser (clean) room in ESB. With permission from the SLAC Laser Safety Officer and the NLCTA Safety Officer, setup and operation of these lasers were allowed for a period of several days to allow the factory engineer and the experimenters to determine that the lasers were in proper operating order after the move. All lasers were then shut down, locked and the enabling keys removed. These lasers will remain inoperable until approval to operate is obtained. This approval will only be obtained after completion of an Operations Readiness Review. The planning for the safety systems for this facility is already very mature and it is expected they will be ready for operation within six months.

Following is a description written by Eric Colby, spokesman for E-163 of the safety preparations now underway:

> "E-163 has installed a functioning Class IV laser system in a hard-wall (fully opaque) clean room within End Station B. The laser ultimately will be transported though evacuated lines to both the NLCTA gun area (class IIIa UV and class IV IR laser light) and into the E-163 shielded enclosure (class IV IR laser light). Consequently there are three zones to secure. The laser room will be secured with mechanical stoppers interlocked to door microswitches. The NLCTA and E-163 enclosures will be secured by locking the outer door magnalock, observing the door microswitches, and opening special stoppers at the entrance of the evacuated transport lines only when the destination enclosure in known to be secured. The Emergency Off buttons for electron beam shutoff will be used by the LSS to close the transport stoppers. Within the laser room, panic buttons will be installed that kill the laser power supplies.
>
> At present the laser cannot be transported out of the clean room, and transport portals have been sealed shut and tagged-out. E-163 plans have been discussed with the NLCTA Operations Group, and it is anticipated that laser light can be introduced into the NLCTA enclosure and E-163 shielding enclosure as soon as a full Laser Safety System is installed and certified. This is hoped to take place by June 2005.

As of now, the initial technical specification, logical circuitry design, and initial parts ordering for the E-163 Laser Safety System have been completed. The circuitry designs await formal internal review by Bill Kroutil, and are anticipated to occur within the next two weeks. With final approval of the circuitry, the design specification document will be signed off."

Recommendations

None

3.6 Seismic Safety

Findings

The facility was inspected for seismic stability. The detailed report appears in Appendix A. The following areas were examined:

- Shielding concrete blocks in ESB
- Unique equipment and experimental setups
- Large and heavy equipment
- Tanks and cylinders
- Storage elements

ESB and Shielding Blocks

The seismic upgrades of ESB have mostly been completed in accordance with the "SLAC ESA & ESB Phase II Seismic Assessments" report. The completed work consisted of: the seismic upgrade of the beam housing concrete shielding blocks in accordance with the drawing ID 293-129-51-C0-E, and the seismic upgrade of the south concrete shielding block wall in accordance with the reference report. But, the north concrete shielding block wall has not been seismically upgraded yet. However, the storage racks on this wall have been properly anchored to this wall while its contents have not been properly anchored to the wall.

At the west end of the building, the B Target Room concrete shielding blocks are stacked on top of each other without any seismic restraints (see picture in Appendix A), the only means to resist any seismic forces are the friction between the blocks. Thus, the area inside of the building at the west end is potentially unsafe during a major earthquake. The same can be said about the items stored on the mezzanine on the west side of the building. These items are stored without proper seismic restraints. Thus, either the items should be properly secured or should be removed to a new storage area. These conditions existed prior to the Laboratory's shut down and should not hinder the restart of ESB. These items are listed in the existing seismic upgrade plans for the Laboratory but have not yet been funded. We recommend that the funding priority be re-assessed in light of the ever increasing use of this facility.

Comments

Unique equipment and experimental setups: See the detailed report regarding issues in the E-163 accelerator housing now in construction.

Large and heavy equipment: Generally equipment is well anchored. See the detailed report for recommendations on additional anchoring.

Tanks and Cylinders: The liquid nitrogen gas tank and Dewar found to be properly strapped to the steel column when they were not in use. The 2,000-gallon double-walled tank located outside of the building on the south side was anchored properly in compliance with the SLAC Earthquake Safety Committee (EqSC) requirements and approval.

Storage Elements: All shelves and storage cabinets including the contents stored in or on them were assessed. All cabinets except for just a few were floor mounted and properly restrained. The storage cabinet in E-163 experiment hall was not secured and needs to be secured. The content in electronic rack in B129 needs to be rearranged in such a way to move the heavy items to the bottom of the cabinet rather than at the top. The portable tool box next to the soft small clean room should be moved near a sturdy structure and should be properly strapped.

Conclusion

In general the contents of the building meet the intent of the “life safety” requirements of the SLAC EqSC. Thus from seismic safety point of view, the restart of NLCTA should not be delayed. However, it is strongly suggested to carry out the recommendations in this report during pre- or post-restart in order to enhance the “life safety” of the building.

Recommendations (post-restart)

See Table 3-8.

Table 3-8: Seismic Safety (Post-Restart).

Number	Recommendation	Target Date
1	Reassess the priority for seismic upgrades in ESB.	October 1, 2005
2	Schedule a follow-up assessment in September to assess the status of recommendations in Appendix A.	September 30, 2005

3.7 OSHA Findings Closeout

Findings

A walkthrough was conducted with the following people: Dave Osugi, Tom Rizzi, Scott Blankenship, Bob Reek, Steve Williams, and Keith Jobe. During this meeting we discussed Area Hazard Analyses (AHAs) both their benefits and shortfalls. It was agreed that more work needs to be done site-wide on AHAs to make them consistent, limit their scope, and to make sure building managers are aware of them and have physically signed them.

The E-163 facility modification is underway and consequently many extension cords were observed attached to experimental equipment. Extension cords are approved for temporary use only (<90days) and continued vigilance is needed to ensure that extension cords are not used as permanent power supplies for equipment. As the experimental configuration is finalized, the power sources should be finalized with the installation of rigid conduit.

The E-163 facility has some head bump hazards which should be fixed ASAP to avoid minor injuries.

The February 2004 OSHA inspections were addressed in their restart plan and are either closed or planned for mitigations through the CEF OSHA corrective action process.

Comments

In general the facility is well maintained. Marc Ross and Keith Jobe make a conscientious effort to ensure that safety is taken seriously there. Keith in particular is thoroughly aware of needed corrective actions and has a process for closing them.

Housekeeping was acceptable to good in this facility. The E-163 extension should be “cleaned up” as that experiment becomes ready in the fall.

Recommendation (pre-restart)

See Table 3-9.

Table 3-9: OSHA (Pre-Restart).

Number	Recommendation	Target Date
1	Eliminate head bump hazard in E-163 hut.	Prior to Restart

Recommendation (post-restart)

See Table 3-10.

Table 3-10: OSHA (Post-Restart).

Number	Recommendation	Target Date
1	Include an OSHA inspection in the E-163 startup authorization.	Prior to authorizing E-163

3.8 Non-ionizing Radiation

Findings

NLCTA and the previous NLC 8-pack area use X-band RF at a frequency of 11.424 GHz. The XL4 klystrons used can operate between 50 MW and 60 MW peak for 1.5 microseconds. They run at repetition rates of up to 120 Hz although almost all running has been at 60 Hz and below. There are 5 klystrons used for NLCTA and 4 klystrons have been used in the 8-pack. The new 8-pack operation is planned to only use 2 klystrons. Klystron output powers are combined in both areas and therefore waveguide may carry 100 MW to 200 MW for 1.5 microseconds.

All of this high power RF is in vacuum waveguide which is interlocked to remove RF if the pressure rises above a preset level. A vacuum leak would trip the interlock at a level where there would still be no RF leakage. LOTO is used if the waveguide is opened.

An RF gun has been added to NLCTA to support E-163. The RF gun is fed from a standard 5045 klystron at S-band. The output of the 5045 is also in interlocked vacuum waveguide and therefore is safe for the same reasons the X-band RF is safe.

The drive systems for these klystrons both X-band and S-band come from separate amplifiers of 500 W to 2 kW peak. The drive power is conducted from the amplifier to the klystron in either coaxial cables or waveguide. Most of the X-band is a combination of coax and waveguide. The average power levels involved are very low and administrative controls are used to ensure that the connections are properly made prior to turning on the drive amplifiers which are TWTA's for X-band and solid-state for the S-band system. The number of people who work on these systems is also very limited.

Future plans for ILC would add a long pulse modulator and L-band klystron into ESB. This should be addressed by the NLCTA management with appropriate review and has not been addressed as part of this review.

Concerns

While there is no imminent danger from non-ionizing radiation at NLCTA, SLAC does not have a definitive policy on non-ionizing radiation, especially with regards to peak power versus average power and pulse width. The standard in IEEE C95.1-1991, "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz," which is a revision of ANSI C95.1-1982, is officially part of our Work Smart Standards Set. This has been brought to the attention of the Non-ionizing Radiation Safety Committee (NIRSC) with the suggestion that they recommend a policy within a 3-month timeframe. This policy should state what the dangers if any are, what mitigation should be used, etc. NLCTA should become familiar with this standard and be prepared to implement it when the SLAC policy is established.

There are a handful of people who may work with the low/medium-level drive signals in NLCTA and 8-Pack. It is recommended that a safety review be held with staff on non-ionizing radiation as part of the start up for NLCTA.

Recommendation (pre-restart)

See Table 3-11.

Table 3-11: Non-Ionizing Radiation Safety (Pre-Restart).

Number	Recommendation	Target Date
1	Review RF safety in NLCTA with affected staff.	Prior to Restart

Recommendation (post-restart)

See Table 3-12.

Table 3-12: Non-Ionizing Radiation Safety (Post-Restart).

Number	Recommendation	Target Date
1	Appropriate NLCTA management should familiarize themselves with the cited RF safety standard.	September 1, 2005

Appendix A
Seismic Safety Inspection of End Station "B"

Participants: Keith Jobe, Fred Asiri

Inspection took place from 9:00 to 10:30 AM on April 12, 2005

References: Excerpts (Appendix C) from report titled "SLAC ESA & ESB Phase II Seismic Assessments," Appendix C, End Station B; Drawing ID 293-129-01-C0-E

Building Contents for sake of this inspection has been categorized as follows:

- Shielding concrete blocks in End Station "B"
- Unique equipment and experimental setups
- Large and heavy equipment
- Tanks and cylinders
- Storage elements

Concrete shielding blocks in End Station "B"

The seismic upgrades of the End Station "B" have mostly been completed in accordance with the "SLAC ESA & ESB Phase II Seismic Assessments" report. The completed work consisted of: the seismic upgrade of the beam housing concrete shielding blocks in accordance with the drawing ID 293-129-51-C0-E, and the seismic upgrade of the South concrete shielding block wall in accordance to the reference report. But, the North concrete shielding block wall has not been seismically upgraded yet. However, the storage racks on this wall has properly anchored to this wall while its content are not.

At the west end of the building, the concrete shielding blocks are stacked on top of each other without any seismic restrains (see picture on page 4), the only means to resist any seismic forces are the friction between the blocks. Thus, the area inside of the building at the west end is potentially unsafe during a major earthquake. Same can be said about the items stored on the mezzanine on the west side of the building. These items are stored without proper seismic restraining means. Thus, either the items should be properly secured or should be removed to a new storage area. While, these conditions have been existed prior to the Labs shut down and should not hinder the restart of the End Station "B." These issues should be considered for the future safety plan of the End Station "B."

Unique equipment and experimental setups

Unique equipment and experimental setups in the End Station "B" as shown on the attached drawing ID 293-129-01-C0-E can be categorized in three groups; the NLCTA 8-pack project (shown in the bubbles on the drawing), the E-163 experiment and the experimental equipment inside the beam housing as well as the wave guide for the support of the beam line.

All major equipment in support of the 8-pack project and E-163 experiment have been designed and installed in compliance with the "Specification for Seismic Design of Buildings, Structures, Equipment, and Systems at the SLAC" and approval of the SLAC Earthquake Safety Committee (EQSC).

The equipment inside of the beam housing were inspected and seemed to be adequately anchored to the concrete floor slab. However, the jack screws supporting the heavy magnets did not seem sturdy to resist a major earthquake and may suffer some damage. But, it would not endanger the life safety. The wave guides, copper tubes, on the roof of the beam housing were inspected and seemed adequately supported and restrained.

Large and heavy equipment

This category comprises floor-mounted items, typically weighing over 400 pounds, but may also include items of large bulk that weigh somewhat less than 400 lb. The following table summarizes results of the inspection and findings for this category. For location of the items refer to the drawing ID-293-129-01-C0-E.

Items	Description	Comments
Klystron indicated as Kly/MOD #0, #1 and #2	Each Klystron is properly anchored to the top of its oil tank frames. The oil tank is adequately nested inside a secondary containment oil tank. The secondary containment oil tank is floor mounted and properly anchored to the concrete floor slab.	Items seem to meet the “life safe” performance level of the SLAC EQSC.
Capacitors for Station # 2	Anchored properly to the top of its oil tank and the oil thanks is floor mounted and properly anchored to the concrete floor.	It seems to meet the “life safe” performance level of the SLAC EQSC.
High Voltage Power Supply # 3	Floor mounted and properly anchored to the concrete floor.	It seems to meet the “life safe” performance level of the SLAC EQSC.
E-163 Modulator	Floor mounted and properly anchored to the concrete floor.	It seems to meet the “life safe” performance level of the SLAC EQSC.
E-163 Klystron	Floor mounted and properly anchored to the concrete floor.	It meets the “life safe” performance level of the SLAC EQSC.
Electrical power racks Nos. 37,38 & 39 for E-163	These racks have properly anchored to the concrete floor.	They meet the “life safe” performance level of the SLAC EQSC.
Electrical power racks Nos. 40 thru 65	These racks secured to floor with ~¼ inch bolt randomly and seem to be marginally adequate.	These racks should be anchored similar to the racks Nos. 37 thru 40 adjacent.
300 KVA XMFR located at east end of North wall, #1 & # 2	Both are floor mounted and anchored adequately to the concrete floor.	They meet the “life safe” performance level of the SLAC EQSC.
Electrical distribution and disconnect panels on N. Wall	They are properly anchored to floor and/or wall.	They meet the “life safe” performance level of the SLAC EQSC.

Items	Description	Comments
HV Transformer #1 & #2 adjacent to N. wall	They are mounted on steel channels the steel channels are only clamped on one side to the concrete floor.	Each unit should be anchored to floor so to prevent sliding of the units.
HV power supply #1 & #2 adjacent to N. wall	They are mounted steel channels and the steel channels are clamped on both sides to the concrete floor.	They are marginally acceptable; however, anchorage of each unit should be improved.
Distribution panel 4P501F2 on N. wall	They are properly anchored to floor and/or wall.	They meet the "life safe" performance level of the SLAC EQSC.
300 KVA XMFR located adjacent to sliding concrete wall	It is floor mounted and anchored at three locations to the concrete floor and one leg bolted to a steel grading.	It is marginally acceptable; however it is better to be secured properly to the wall.
Power supply PS 1 thru PS	They are adequately anchored to the concrete floor.	They meet the "life safe" performance level of the SLAC EQSC.
Electronic racks # 1 thru # 28	They are secured to the floor in a few location and do not seem to meet SLAC EqSC requirements.	These racks should be anchored similar to the racks Nos. 37 thru 40 adjacent.
Extended Beam Object at the west end of the building	Floor mounted and properly anchored to the concrete floor.	It seems to meet the "life safe" performance level of the SLAC EqSC.
PPS rack 05 in control room in building 128	This unit is supported on the raised floor and has not been anchored to the floor.	This unit should be provided with an adequate seismic resistance device.

Tanks and cylinders

The liquid nitrogen gas tank and Dewar found to be properly strapped to the steel column when they were not in use. The 2000 gallons double wall tank located outside of the building on the south side was anchored properly anchored in compliance with the SLAC EqSC requirements and approval.

Storage elements

All shelves and storage cabinets including there contents stored in or on them were assessed. All cabinets except for just a few were floor mounted and properly restrained. The storage cabinet in E-163 experiment hall was not secured and needs to be secured. The content in electronic rack in building 129 needs to be rearranged in such a way to move the heavy items to the bottom of the cabinet rather at the top. The portable tool box next to the soft small clean room should be moved near a sturdy structure and should be properly strapped.

Conclusions

In general the contents of the building meet intend of "life safety" requirements of the SLAC EqSC. Thus, from seismic safety point of view the restart of NLCTA should not be delayed.

However, it is strongly suggested to carry out the recommendations in this report during pre or post start-up in order to enhance the “life safety” of the building.

Picture of concrete shielding block stacked without seismic ties.

Appendix B
Review Plan

NLCTA Restart Validation Plan

Objective: The objective of this Restart Validation Plan (RVP) is to evaluate the restart plans for operations of the NLCTA, and to assure that the facility is prepared to operate in a safe and environmentally sound manner. At the time of the electrical accident which occurred on October 11, 2004, the NLCTA was being run to test high gradient X-band accelerator structures. The decision was made by the Director to shut down all accelerators and examine the safety practices site-wide. A number of safety policy and procedure changes were made in the two months since that accident. This review is intended to review the safety systems in the NLCTA. Particular emphasis will be placed on the recent changes in SLAC policy and procedures and their incorporation into the operating procedures for the facilities.

Methodology: The Restart Validation Team (see Table 1) shall verify that the safety systems are fully operational and that procedures have been modified to incorporate the new policies issued since October 11. This will be accomplished through the review of documents provided by those responsible for operation and maintenance of the accelerators, storage ring and experimental facilities. Discussions, interviews and walkthroughs with responsible personnel will clarify any matters which require it. Finally the Team and the Director will walk through the facility to assure that it appears to be ready to operate. The programmatic areas to be evaluated and responsibilities of team members appear in Table 2). The Team members will provide a list of standards used for the review, a log of activities, people interviewed including titles, walkthroughs conducted, documents examined, findings of deficiencies, proper operations and noteworthy practices for inclusion in a report to the SLAC director. In addition to these details a concise list of pre- and post- restart recommendations will be established by the Team for the Director's review. Upon a successful review the Director may authorize the NLCTA facility to begin operations.

Specific issues to be addressed by the Validation Team:

- Annual Accelerator review of NLCTA in 2001
- Response to Director's Safety Comes First Directive
- Compliance with ESH Manual
- Compliance with Bulletin 61 Managing Electrical Hazards
- Compliance with Bulletin 68A Electrical Work
- Compliance with Bulletin 69A Lock and Tag
- Compliance with Bulletin 70 Non-life Supporting Gases Work
- Compliance with Bulletin 71 Hoisting and Rigging
- Compliance with Bulletin 72 Configuration Management
- Compliance with Bulletin 74 User Training
- Other issues cited by the Type A Accident Investigation Team
- Completeness of operations and maintenance employee JHAMS
- Completeness of Area Hazards Analyses (where not covered by an Safety Assessment Document)
- Radiation Safety System Re-certification plan

- Post-Restart Operations and Safety Management
- Demonstration that the SLAC Safety Management System (DOE ISMS) is utilized by NLCTA managers in daily operations
- Plans to closeout outstanding audit findings in a timely manner
- Work authorization processes
- Guideline for Operations

Criteria for Pre-Restart and Post-Restart Findings: The Validation Team will identify findings reported by the team as either a Pre-Restart or Post-Restart finding. A Pre-Restart finding must be corrected before an activity and be start. A Post-Restart finding must be corrected after the start of the activity under review. The following are examples of issues that are likely to rise to the level of a Pre-Restart finding:

- Non-compliance with SLAC ESH Manual or newer over-riding Bulletins
- Lack of adequate procedures or administrative systems having safety importance
- Operational or administrative non-compliance with procedures having safety importance
- Post corrective actions which have been lacking or ineffective
- Operator training having safety importance not specified in existing training
- Previously unknown risk to worker, or unknown threat to the public or environment
- Inability for safe shutdown
- Loss of essential monitoring
- Operation outside the Accelerator Safety Envelope
- Lack of control on the operability of equipment or subsystems having safety importance
- Violation or potential violation of worker occupational safety and health requirement
- Violation or potential violation of environmental protection requirement
- Non-safety processes, functions or components that could adversely impact safety

Scope: The purpose of this review will be to validate that engineered safeguards, administrative controls and procedures used to operate these facilities are adequately maintained and prepared for operation and that recent changes to SLAC safety policy and procedures has been incorporated into pre- and post- restart procedures.

Scope of review:

- Demonstration that ESH policy changes since October 11 have been incorporated into the operation of NLCTA Facility
- Verification that any significant safety system or configuration changes that have been made have been properly reviewed by appropriate departments.
- Plans for Personnel Protection System testing
- Operational procedures and authorizations for beam operations
- Operational procedures and authorizations for user experimental beamline operations
- Operator or system specialist training and qualification
- User experimenter training requirements established and implemented
- NLCTA safety analysis documents

Schedule: A kickoff meeting will be held with the Team and the SLAC Director on April 6 at 10am. The team will carry out their individual assignments in meetings arranged with appropriate personnel in the NLCTA operations department and report back to the Team on Wednesday at 10am weekly. A closeout will be held with the Director and DOE representatives when the Team is ready to make recommendations.

A report addressed to Jonathan Dorfan, SLAC Director, with recommendations and conclusions will be prepared at the completion of the review.

Table 1 Validation Team

Member	Organization
Steve Williams	Team Leader, Directors Office
Perry Anthony	Electrical Safety Officer, Directors Office
Sayed Rokni	Radiation Safety Officer, Directors Office
Tom Rizzi	OSHA
Saul Gold	Non-Ionizing Radiation
Ted Fieguth	LSO
Fred Asiri	Seismic Safety
Joe Kenney	Hoisting and Rigging
Mike Grissom	ISMS
Mike Saleski	Accelerator Operations

Appendix C
Acronym List and Glossary

A

AD — Accelerator Department

AHA — Area Hazards Analysis

B

BaBar — Official name for SLAC B-Factory detector.

Also known as B B-bar detector. (Named after the elephant in Laurent DeBrunhoff's children's books, with permission of DeBrunhoff's estate.)

BAS — Beam Authorization Sheet

BCS — Beam Containment System

B-Factory — The facility consisting of the linac, PEP-II and BaBar Detector.

One of two high-energy physics facilities currently in operation in the US (SLAC) and Japan (KEK). Both B-Factories collide electrons with positrons to produce large numbers of B mesons (bound states of a bottom quark and an anti-down quark) and anti-B mesons. By measuring the difference in decays of B and anti-B mesons, physicists hope to understand CP violation, thought to be the reason why matter dominates in the universe. At SLAC, the B-Factory accelerates electrons at 9 GeV and positrons at 3.1 GeV; at KEK, the energies are 8 GeV and 3.5 GeV.

BSY — Beam Switch Yard

The end of the linac where beams are switched to the SLC arcs, the PEP-II ring, FFTB, or end station areas.

C

CA — Corrective Action

CAP — Corrective Action Plan

CEF — Conventional and Experimental Facilities Department

CH — DOE Chicago Office

CID — Collider Injector Development

The first accelerator section of the B-Factory (also called the injector). Also: The general area near the injection guns, or the PPS area going from the guns to K01 accelerator section.

D

DIRC — Detector of Internally Reflected Cherenkov light.

DIRC is a device developed for use in the SLAC BaBar Detector. Also: Detection of Internally Reflected Cerenkov Light.

DO — Director’s Office

DOE — US Department of Energy

DRIP — Damping Ring Injection Point.

1. A PPS area between PPS Sector 0 and PPS Sector 2, and the Damping Ring vaults.
2. The point where the beamlines from and to the rings are connected (the Ten Finger Box).

E

EFD — Experimental Facilities Department

EH — DOE Environment, Safety, and Health

EOIC — Engineering Operator-In-Charge

ES&H — Environment, Safety, and Health

ES&HD ES&H Division

ESA End Station A

ETA Employee Training Assessment

EWP Electrical Work Plan

F

FFTB Final Focus Test Beam

A beam line still in development and replacing the old C line. This line is directly east of the linac.

H

H&R Hoisting and Rigging

HQ DOE Headquarters (includes EH and SC)

I

ISC Integrated Support Center (CH and OR)

ISM Integrated Safety Management

ISMS Integrated Safety Management System

J

JHAM Job Hazard Analysis and Mitigation

L

Linac Linear Accelerator

A type of particle accelerator in which charged particles are accelerated in a straight line, either by a steady electrical field or by means of radio frequency electric fields. In the latter variety, the passage of the particle is synchronized with the phase of the accelerating field. The SLAC linac is a two-mile long accelerator, consisting of cylindrical, disc loaded, copper waveguides placed on concrete girders in a tunnel about 25 feet underground.

LST Limited Stream Tube

M

MCC_1 Main Control Center

MCC_2 Motor Control Center

MFD Mechanical Fabrication Department

N

NFPA National Fire Protection Association

NFPA Standard 70E establishes requirements for Electrical Arc Flash Protection.

NLCTA Next Linear Collider Test Accelerator

A prototype of a short section of the proposed International Linear Collider that is in development at SLAC but not a part of the B-Factory facility.

O

OJT On-the-job Training

OR DOE Oak Ridge Office

ORPS Occurrence Reporting and Processing System

OSHA Occupational Safety and Health Administration

P

PEP — Positron Electron Project

Positron Electron Project (originally the Positron Electron-Proton Project). A 2.2 km circumference storage ring at SLAC with six interaction points, two SSRL beam lines, electron-positron storage and collision capability, 4 - 18 GeV energy range, and 50 mA currents. PEP has been upgraded to be the site of the SLAC B-Factory. See also PEP-II.

PEP-II — PEP Two (B-Factory)

PLC — Programmable Logic Array

PPE — Personal Protective Equipment

PPS — Personnel Protection System

Q

QATS — Quality Assurance Tracking System

R

R2As — Roles, Responsibilities, and Authorities

RD — Research Division

S

SATS — Self Assessment Tracking System

SC — DOE Office of Science

SEM — Site Engineering and Maintenance Department

SE&M — Site Engineering and Maintenance Department

SLAC — Stanford Linear Accelerator Center

SSO — DOE Stanford Site Office

STA — SLAC Training Assessment (replaced ETAs in March 2005)

SU — Stanford University

T

TD — Technical Division

Team — The Validation Team that produced this report.

TWTA — Traveling Wave Tube Amplifier

The TWTA amplifies the low-level RF signal to a level required to drive the klystron input.

U

UTR — University Technical Representative

Appendix D
Pre- and Post-Restart Recommendations

Pre-Restart Recommendations

Number	Pre-Restart Recommendation	Target Date
T3-3-1	All shielding items in the NLCTA, including klystron local shielding items, must be secured and posted as radiation safety items (NLCTA).	Prior to Restart
T3-3-2	All procedures listed in the NLCTA BAS need to be reviewed and updated before issuing the BAS (RP/NLCTA/ADSO).	Prior to Restart
T3-3-3	All RSWCFs will be reviewed. Any RSWCF closed and filed without obtaining all signatures will be examined and the work will be inspected for completion (NLCTA).	Prior to Restart
T3-5-1	Document the configuration of supply power to the tunnel hazards and institute a plan for regular re-verification.	Prior to Restart
T3-5-2	Mitigate bolded items from electrical walk-through spreadsheet.	Prior to Restart
T3-9-1	Eliminate head bump hazard in E-163 hut.	Prior to Restart
T3-11-1	Review RF safety in NLCTA with affected staff.	Prior to Restart

T3-3 = Table 3-3: NLCTA Operations (Pre-Restart).
T3-5 = Table 3-5: NLCTA Electrical Safety (Pre-Restart).
T3-9 = Table 3-9: OSHA (Pre-Restart).
T3-11 = Table 3-11: Non-Ionizing Radiation Safety (Pre-Restart).

Post-Restart Recommendations

Number	Post-Restart Recommendation	Target Date
T3-7-2	The spreader bar located on the mezzanine at level at the west end of B062 should be red-tagged or otherwise prevented from use until tested in accord with the requirements of ES&H Bulletin #71.	Completed
T3-4-4	A protocol will be established for an internal periodic review of all documents requiring signatures (NLCTA).	May 31, 2005
T3-6-1	Implement *ES&H Manual* Chapter 8 requirements for GFCI testing.	May 31, 2005
T3-6-2	Ensure fire extinguisher inspection tags are signed off as part of a monthly facility inspection.	May 31, 2005
T2-2-1	Review staff training requirements and currency to eliminate “Never Taken” and “Overdue” courses in the department’s STAs.	June 1, 2005
T3-6-4	Mitigate remaining items from electrical walk through.	August 1, 2005
T3-12-1	Appropriate NLCTA management should familiarize themselves with the cited RF safety standard.	September 1, 2005
T3-8-2	Schedule a follow-up assessment in September to assess the status of recommendations in Appendix A.	September 30, 2005
T3-7-1	Establish a crane maintenance and inspection schedule with documentation.	October 1, 2005
T3-8-1	Reassess the priority for seismic upgrades in ESB.	October 1, 2005
T3-4-2	Produce a procedure for initial klystron testing and installation that includes requiring a detailed traveler and photo showing added shielding (NLCTA and Klystron Department).	October 31, 2005
T2-1-1	Review and revise the SAD to reflect the current status of potential hazards and their mitigations at the point in time that the E-163 facility is ready to commence operations.	December 31, 2005
T3-4-3	Update the SAD (NLCTA).	December 31, 2005
T3-4-1	Complete operators’ training before allowing operators to run the accelerator (NLCTA).	As Needed
T3-6-3	All ELPs to be verified, dated, and signed off before first use.	Prior to Use
T3-7-3	The breaker panel(s) for the B062 crane shall undergo arc flash calculations and appropriate labeling in accord with ES&H Bulletin #72.	Prior to Use
T3-10-1	Include an OSHA inspection in the E-163 startup authorization.	Prior to authorizing E-163
T3-7-4	The 15-ton lifting system should be repaired and returned to normal operating service.	TBD

T2-1 = Table 2-1: Safety Practices and Policies (Post-Restart).
T2-2 = Table 2-2: NLCTA Training (Post-Restart).
T3-4 = Table 3-4: NLCTA Operations (Post-Restart).
T3-6 = Table 3-6: NLCTA Electrical Safety (Post-Restart).
T3-7 = Table 3-7: Hoisting and Rigging (Post-Restart).
T3-8 = Table 3-8: Seismic Safety (Post-Restart).
T3-10 = Table 3-10: OSHA (Post-Restart).
T3-12 = Table 3-12: Non-Ionizing Radiation Safety (Post-Restart)