

memorandum

DATE: November 8, 2006

REPLY TO

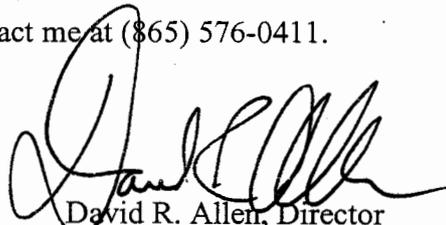
ATTN OF: SE-32:Allen

SUBJECT: **FINAL REPORT FOR THE ASSISTANCE VISIT ON CONTROL OF HAZARDOUS ENERGY – LOCKOUT/TAGOUT AND FALL PROTECTION AT THOMAS JEFFERSON NATIONAL ACCELERATOR FACILITY, AUGUST 28-31, 2006**

TO: James Turi, Manager, Thomas Jefferson Site Office, SC-TJSO

Attached is the final report for the Assistance Visit on Control of Hazardous Energy – Lockout/Tagout and Fall Protection at the Thomas Jefferson National Accelerator Facility conducted by the Oak Ridge Office staff on August 28-31, 2006. The findings, observations, and noteworthy practices were discussed with your staff at the conclusion of the site visit. Also, prior to this document being issued as final, it has undergone a factual accuracy review and was discussed with Thomas Jefferson Site Office staff.

If there are any questions, please contact me at (865) 576-0411.



David R. Allen, Director
Environmental and Quality
Management Division

Attachment

cc w/attachment:

Steve Neilson, SC-TJSO
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**U.S. Department of Energy
Oak Ridge Office**



**Final Report
Assistance Visit
Control of Hazardous Energy - Lockout/Tagout
and Fall Protection at
Thomas Jefferson National Accelerator Facility
August 28-31, 2006**

James W. Craven
James W. Craven

11/3/06
Date

Larry D. Perkins
Larry D. Perkins

11/6/06
Date

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ACRONYMS

ANSI	American National Standards Institute, Inc.
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
EH&S	Environment, Health, and Safety
FEL	Free Electron Laser
FIND	Finding
FP	Fall Protection
LO/TO	Lockout/Tagout
MHSR	Material Handling Safety Representative
NFPA	National Fire Protection Association
NP	Noteworthy Practice
OBS	Observation
ORO	Oak Ridge Office
OSHA	Occupational Safety and Health Administration
OSP	Operational Safety Procedure
TJNAF, Laboratory, or J Lab	Thomas Jefferson National Accelerator Facility
TJSO	Thomas Jefferson National Accelerator Facility Site Office

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EXECUTIVE SUMMARY

At the request of the U.S. Department of Energy (DOE) Thomas Jefferson National Accelerator Facility Site Office (TJSO), an Oak Ridge Office (ORO) team visited the Thomas Jefferson National Accelerator Facility (TJNAF also referred to as Laboratory or J Lab) on August 28-31, 2006, to conduct assessments of two specific areas: the Control of Hazardous Energy - Lockout/Tagout (LO/TO) and Fall Protection (FP). James W. Craven and Larry D. Perkins, ORO, assisted the TJSO with this assessment.

This report is divided into separate parts for each area reviewed. The following seven findings (FIND), nine observations (OBS), and two noteworthy practices (NP) were identified during the review:

Findings

- FIND-01 (LO/TO)** The LO/TO Program does not meet all of the Occupational Safety and Health Administration (OSHA) and National Fire Protection Association (NFPA) 70-E requirements.
- FIND-02 (LO/TO)** Based on interviews with site personnel, there was confusion and misunderstanding concerning the LO/TO training. In addition, certification of LO/TO training that includes each employee's name, the date of training, and the employer certification is not maintained per the requirements of 29 Code of Federal Regulations (CFR) 1910.147(c)(7)(iv).
- FIND-03 (LO/TO)** The annual LO/TO inspection for 2005 was not performed in accordance with 29 CFR 1910.147(c)(6)(ii) and 29 CFR 1910.147(c)(6)(i)(D).
- FIND-04 (LO/TO)** How to overlock a LO/TO with personal locks and how to verify that voltage has been removed is confusing. Some workers appear to check absence of voltage at motor leads. This approach does not meet the requirements of 29 CFR 1910.333(b)(2)(iv); 29 CFR 1910.333(b)(2)(iv)(A); 29 CFR 1910.333(b)(2)(iv)(B).
- FIND-01 (FP)** All TJNAF personnel using personal fall arrest systems have not been fully trained on the limitations, selection maintenance, and the use and storage of fall arrest systems. The training provided has not been certified as required by the applicable standards. (29 CFR 1926.503(a) and (b), American National Standards Institute [ANSI] Z359.1, Section 7.3)
- FIND-02 (FP)** Personnel suspended in a personal fall arrest harness can quickly experience significant medical problems, and planning for the timely rescue of personnel suspended in a personal fall arrest system is not being completed. A Task Hazard Analysis is not routinely completed to address rescue or self-rescue methods. (29 CFR 1926.503(d)(20), TJNAF Environment Health & Safety (EH&S) Manual Appendix 6131-T1)

FIND-03 (FP) The Fall protection net used at the Free Electron Laser (FEL) facility is not being load tested or certified at each installation as required. (29 CFR 1926.105(c)(1) and .502(c)(4); ANSI A10.11, Section 9, and the User Instruction Manual)

Observations

OBS-01 (LO/TO) Several times, statements were made that “it costs too much to have people verify LO/TO on systems” or “it costs too much to buy new tags.” LO/TO must be performed in accordance with the OSHA requirements regardless of the cost. The cost issue was discussed several times in the OSHA LO/TO preamble, and it was an unacceptable reason for not following the standard.

OBS-02 (LO/TO) Modifications of electrical panels to allow a hasp to be installed so a person could use a lock on the breaker have been made at various locations at the Laboratory. However, no documentation from the manufacturer was available to show approval for this modification.

OBS-03 (LO/TO) It was noted during interviews that the Chairperson for the LO/TO Committee stated he had not received J Lab’s LO/TO training.

OBS-01 (FP) Based on information received during the interviews, implementation of proper fall arrest system use is not fully adequate.

OBS-02 (FP) A personal fall arrest system consists of all components used to arrest a person from a fall at a working height. All components of the fall arrest system (e.g., anchor connectors, retracting wire cable or web lanyards, rail or beam anchors, or cross-arm straps) are not inspected annually by a competent person. (ANSI Z359.1, Section 6.1)

OBS-03 (FP) The Material Handling Safety Representative is not issuing aerial work platform operators a “Jefferson Laboratory Material Handling License.” (TJNAF EH&S Manual, Chapter 6147)

OBS-04 (FP) Documentation and appointment of competent persons for the erection and inspection of scaffolds is incomplete. Only one of the four individuals identified as a competent person had attended the “Scaffold Competent Person Training Course.” Scaffold inspection checklists should be enhanced to provide a place for documentation of daily inspections.

OBS-05 (FP) A boatswain’s chair has been used for access to equipment in Hall B for approximately five years beyond the manufacturer’s recommended service life. In addition, the Operational Safety Procedure (OSP) for the boatswain’s chair work activity should be upgraded to capture all operational requirement for lifting personnel identified in 29 CFR 1926.550, as well as specifying that the fall arrest lanyard be attached to an independent anchor point meeting the criteria for a fall arrest anchor.

OBS-06 (FP) Personnel were observed using portable ladders inappropriately (i.e., using a step ladder to access an area where it was not tall enough or configured appropriately to access and standing above the designated rung on a step ladder).

Noteworthy Practices

NP-01 (FP) TJNAF recently implemented a formal inspection program for personal fall arrest harnesses and associated lanyards. During implementation of this program, all old equipment including those that were past the manufacturer's recommended service life were removed from service and replaced with all new harnesses and lanyards. Based on observations at the facilities visited, this equipment is maintained in good condition and properly stored and inspected.

NP-02 (FP) The Subcontract Request for the Proposal for Construction of a Mobile Equipment Storage Building identified and incorporated sufficient flow-down of TJNAF and regulatory requirements and contained a commensurate level of hazard assessments to support the effective evaluation of the subcontractor's fall protection program.

Part I

Control of Hazardous Energy - Lockout/Tagout

1.0 INTRODUCTION

At the request of the U.S. Department of Energy (DOE) Thomas Jefferson National Accelerator Facility Site Office (TJSO), the Oak Ridge Office (ORO) conducted a lockout/tagout (LO/TO) evaluation at the Thomas Jefferson National Accelerator Facility (TJNAF also referred to as Laboratory or J Lab) on August 28-29, 2006. The evaluation process consisted of three primary elements: (1) reviewing applicable sections of the TJNAF Environment, Health, and Safety (EH&S) Manual and other site documentation; (2) interviewing TJNAF personnel and subcontractors, and (3) conducting a limited walkthrough of site facilities to verify compliance with applicable requirements and standards. The main divisions reviewed were the Physics Division, Accelerator Division, and the Facilities Management Division. In addition, the primary subcontractors providing support to the TJNAF Laboratory facilities were also evaluated.

2.0 SUMMARY OF RESULTS

2.1 Procedures

Interviews were conducted with the author of the LO/TO procedure to get a better understanding of the terminology used in the LO/TO program document. In addition, interviews with several other people were conducted, which resulted in different understandings of when a lock without a tag could be used and when a tag without a lock could be used.

Training requirements were also discussed with interviewees; and again, interviewees had differing understandings. Administrative locks and tags appear to be used for all forms of LO/TO and protection of employees. Confusion about the use of administrative locks and tags was evident. One interviewee stated he would not be surprised if the administrative locks were used for personal protection, and this statement was confirmed by other interviews stating how they would over lock an administrative lock before performing work on a system or motor. It was also apparent that administrative locks and tags are being used as group locks and tags. Based on the interviews conducted and varied understandings conveyed, there is concern that a misunderstanding on group locks is widespread. Some employees think that the individual puts his personal lock keys in the lockbox, and one person then overlocks the lockbox.

There is also confusion about the reuse of tags and locks. Several locations were identified where tags and locks had the name and date of the person using the tag or lock marked out, and this resulted in the reuse of the tag and/or lock for a different person or job. Statements were also made during interviews that some people take a crane out of service by letting someone hold or watch the controls while another employee works from the top of the crane without an appropriate LO/TO in place.



Exhibits 1-4. Examples of LO/TO Tags and Locks

The LO/TO procedure states that whenever an administrative LO/TO is applied to an energy-control device (switch, valve, etc.) it shall be attached with a multi-lock hasp. This will allow personal protection LO/TO to be applied as needed during maintenance and service. This brings up questions about group LO/TO and how people verify LO/TO before working on a system. The procedure goes on to state that administrative LO/TO has no timeframe; thus, this type of LO/TO is being used for all forms of LO/TO, which causes confusion.

One interviewee stated that if a system was locked out by an administrative lock and tag that the worker would only check the incoming power at the work location, not at the LO/TO source, then continue to work as de-energized. The interviewee also stated that the worker would suit up with 70-E clothing and then proceed with the work.



Exhibits 5-6. Examples of Modified Electrical Cabinet

The statement in the LO/TO procedure, “some systems are safer when devices are locked on” is very misleading, and no examples are provided to help clear up the issue. When employees were asked about this statement, almost all of them did not know the meaning and how it is applied. This has also led to confusion about LO/TO.

The LO/TO Procedure, Chapter 6110, states “Kirk Key systems are not suitable as personal safety lockout devices at Jefferson Lab.” However, during interviews, it was stated that this system has been used for protection of employees. It was also stated that the update to LO/TO was going to allow this system for performing LO/TO of systems. The current procedure states “Whenever administrative LO/TO is applied to an energy-control device (switch, valve, etc.), it shall be attached using a multi-lock hasp. This will allow personal protection LO/TO to be applied as needed during maintenance and service.” The procedure goes on to say “Note that Kirk Key systems are a form of administrative lockout:...” The procedures go on to note the following “At the time repair begins, the administrative LO/TO to secure all energy sources in accordance with Jefferson Lab’s personal or group LO/TO procedures.” It also states that “Administrative LO/TO shall be used at Jefferson Lab whenever it is appropriate as a means to protect equipment, the integrity of the working system, and people who may be affected by the equipment’s or system’s use.”



Exhibit 7. Example of Kirk Key System

Several people interviewed stated that a person's personal lock could not be left on a system if they were not physically working on the system has helped to lead to confusion about LO/TO.

2.2 Training

Employees were asked what type of LO/TO training they received. The employees stated they received classroom training, and several employees stated they received a web-based training. No classroom training classes were being conducted during the review, and several attempts were made to review the web-based training. However, the web-based training could not be reviewed during the visit because of system problems. Several employees stated that they had concerns with the web-based training for LO/TO. This concern has been self-identified by the Lab.

Some employees understood that once one completes the web-based training that he or she is now trained to perform LO/TO with no additional training. This is contrary to the information provided to the reviewer by the site. The LO/TO procedure states that to become a tagger one must meet the following requirements: (1) complete one of the LO/TO training seminars (SAF 104); (2) complete specific LO/TO training on the equipment you may service—documented refresher training is required every two years; (3) receive supervisor's authorization to perform a task which requires the securing of a hazardous energy source; and (4) verify with your supervisor your authorization to work on the equipment. In addition to this, no list of trained workers is being kept.

2.3 Annual Review

A request for the past three years' annual LO/TO reviews was made and reviews for 2000-2004 were provided. However, no report for 2005 was supplied; and according to information provided, no one performed a review of the LO/TO program in 2005. The procedure states that "Each Jefferson Lab division ensures it has conducted an annual evaluation of its LO/TO" was not true because the documents to support the statement were unavailable. This concern has been self-identified by the Lab.

Several assessments discussed concerns about the computer LO/TO on-line training and issues with administrative LO/TO. According to the assessment reports, the issues with the administrative LO/TO date back to 2000, according to the assessment reports. The same type of issues still exists.

One assessment (LO/TO Management Self-Assessment) report discussed the decision to eliminate all energized work, making it nearly impossible to follow Occupational Safety and Health Administration (OSHA) LO/TO requirements in 29 CFR 1910.331-335. Examples as stated within the OSHA regulations are the removal of electrical wires from breakers as an additional safety requirement. This has caused the organizations to develop a work around and OSHA requirements (as stated with the LO/TO Management Self-Assessment) are not being followed.

One assessment discussed the fact that the LO/TO procedure forbids the use of Kirk Key systems for LO/TO. However, the assessment states that this is unnecessarily restrictive.

The LO/TO procedure also states a Kirk Key system is a form of administrative lockout which also leads to confusion.

3.0 FINDINGS, OBSERVATIONS, AND NOTEWORTHY PRACTICES

3.1 Findings

**FIND-01
(LO/TO)**

The LO/TO Program does not meet all of the OSHA and National Fire Protection Association (NFPA) 70-E requirements.

- a. Locks – Personal, Administrative, Department, Group are confusing and do not meet the requirements of 29 CFR 1910.147(c)(5)(ii)(B)
 - i. Locks are not controlled (they are lying around with tags within some facilities).
- b. Tags – The use of Administrative and Personnel tags do not meet all of the OSHA requirements as identified in 29 CFR 1910.147(c)(5)(ii)(A)(2); 29 CFR 1910.147(c)(5)(ii)(D); 29 CFR 1910.147(c)(7)(ii)(C)
 - i. Tags have the names and dates marked out and reused.
- c. Use of locks without a tag and the use of tags without a lock is not well defined as identified in OSHA 29 CFR 1910.147(c)(7)(ii); 29 CFR 1910.147(c)(5)(ii)(A)(2); 29 CFR 1910.147(c)(5)(ii); 29 CFR 1910.333(b)(2)(iii)(D); 29 CFR 1910.333(b)(2)(iii)(E)(2).
- d. Confusion about the Group LO/TO program is evident throughout TJNAF.
 - i. As stated in interviews some people think they are required to put their personal locks in the group lock box.
 - ii. The use and the purpose of group LO/TO are confusing to the employees and do not meet the requirements of 29 CFR 1910.147(f)(3)(i).
- e. There appears to be confusion throughout TJNAF about verification of LO/TO.
 - i. The approach being used does not meet the requirements of 29 CFR 1910.333(b)(1); 29 CFR 1910.147(c)(4)(ii)(D); 29 CFR 1910.147(d)(6). For example, overlocking a disconnect that has already been locked out with an administrative lock using a personal lock without verifying that the correct circuit is de-energized.
- f. The use of a person to monitor the controls of a crane so another person can work from the crane does not meet the requirements of LO/TO as addressed in 29 CFR 1910.147(a)(3)(i).

During interviews, it was evident that the Kirk Key system has been used in the past for LO/TO. The current TJNAF procedure does not allow use

of the Kirk Key system for LO/TO; however, the LO/TO draft procedure does indicate that use of the Kirk Key system would be adequate to meet the requirements of OSHA's LO/TO. The use of a Kirk Key system for LO/TO does not meet the requirements of 29 CFR 1910.333.(b)(2)(ii)(B).

**FIND-02
(LO/TO)** Based on interviews with site personnel, there was confusion and misunderstanding concerning the LO/TO training. In addition, certification of LO/TO training that includes each employee's name, the date of training, and the employer certification is not maintained per the requirements of 29 CFR 1910.147(c)(7)(iv).

- a. The web-based training did not work effectively.
- b. Several people interviewed expressed concerns about the web-based training.
- c. The requirements to become a person who can perform LO/TO are not explained in detail in the training reviewed.
- d. Several people expressed concerns about the way questions were answered in the classroom training and were confusing to the student.

**FIND-03
(LO/TO)** The annual LO/TO inspection for 2005 was not performed in accordance with 29 CFR 1910.147(c)(6)(ii) and 29 CFR 1910.147(c)(6)(i)(D).

**FIND-04
(LO/TO)** How to overlock a LO/TO with personal locks and how to verify that voltage has been removed is confusing. Some workers appear to check absence of voltage at motor leads. This approach does not meet the requirements of 29 CFR 1910.333(b)(2)(iv); 29 CFR 1910.333(b)(2)(iv)(A); 29 CFR 1910.333(b)(2)(iv)(B).

3.2 Observations

**OBS-01
(LO/TO)** Several times, statements were made that "it costs too much to have people verify LO/TO on systems" or "it costs too much to buy new tags." LO/TO must be performed in accordance with the OSHA requirements regardless of the cost. The cost issue was discussed several times in the OSHA LO/TO preamble, and it was an unacceptable reason for not following the standard.

**OBS-02
(LO/TO)** Modifications of electrical panels to allow a hasp to be installed so a person could use a lock on the breaker have been made throughout the Laboratory. However, no documentation from the manufacturer was available to show approval for this modification.

**OBS-03
(LO/TO)** It was noted during interviews that the Chairperson for the LO/TO Committee stated he was not trained in LO/TO.

3.3 Noteworthy Practices

None

Part II

Fall Protection

1.0 INTRODUCTION

At the request of the TJSO, ORO conducted a fall protection safety evaluation at TJNAF on August 30-31, 2006. The evaluation process consisted of three primary components: (1) reviewing applicable sections of the TJNAF EH&S Manual and other site documentation; (2) interviewing TJNAF personnel, and (3) conducting a limited walkthrough of the site. A thorough walkthrough of all site facilities to verify compliance of applicable fall protection standards related to facility and equipment condition was not conducted during this evaluation.

2.0 SUMMARY OF RESULTS

2.1 Personal Fall Arrest Systems

Training on the inspection, use, and limitations of personal fall arrest harnesses is not provided for all users. Training is provided during the Aerial Work Platform Operator Orientation (SAF-302); however, not all personnel issued or using personal fall arrest equipment attend this class. A comparison of the spreadsheets documenting issue of personal fall arrest harnesses versus the Aerial Work Platform Operator training verified that some personnel were issued fall arrest harnesses that had not attended the training course. Some of the interviewees indicated that training for personnel using fall arrest equipment is provided by the supervisor; however, there is no consistent format for this training and verification cannot be made that the training is being conducted for all users. **(FIND-01)**

In addition, no written certification record of training is completed for either the supervisor provided training or the Aerial Work Platform Operator Orientation. Such certification must include the name of the employee trained, date(s) of training, and signature of the person providing the training or the employer. **(FIND-01)**

Based on interviews with site personnel, training and practices for use of fall arrest harness(es) appeared to be inadequate as evidenced by the following statements made during the course of the interviews:

- a harness would be kept in service if they noticed mild weld splatter visible on the webbing during the pre-use inspection;
- lanyards could be secured to the building structure by wrapping the lanyard around the beam and attaching the snap hook back onto the lanyard itself (no distinction was made on specially designed tie-back lanyards);
- personnel were unaware that special precautions were required for the use of fall arrest equipment by personnel and materials exceeding specified weight limits; and
- designated anchor points were not always used for fall arrest systems (personnel stated process piping and other articles had been used as anchor points for a fall arrest system). **(OBS-01)**

The fall arrest harnesses and lanyards observed in the facilities visited were in good condition and properly stored. The inspection labels on each harness had been updated to include the most recent inspection date. The bulk of the fall arrest harnesses and lanyards currently being used were placed in service during July 2005, with a few being added later in 2005 and early 2006. The Fall Arrest Harness Inspection Spreadsheet documented that all harnesses due an annual inspection in July 2006 had been inspected by the Material Handling Safety Representative (MHSR) or a designated representative, with the exception of six harnesses that were inaccessible because they were locked within an operating Hall. **(NP-01)** According to the MHSR, as well as the other designated inspectors, the harness inspections are performed in accordance with requirements specified by the manufacturer. No checklist or detailed documentation of the inspection criteria has been developed or maintained. Other components used in the personal fall arrest system (i.e., anchor connectors, retracting wire cable or web lanyards, rail or beam anchors, or cross-arm straps) are inspected by personnel prior to use; however, there is no documented annual inspection of such equipment by a designated competent person. **(OBS-02)**

Planning and preparation for the timely rescue of an employee suspended in a fall arrest harness has not been fully implemented. Several personnel interviewed specifically stated that they were not aware of any planning for or plans in place to rescue personnel suspended in a fall arrest harness. A Task Hazard Analysis Worksheet is not routinely completed to address the fall protection requirements, including the potential need for rescue or the provisions for self-rescue as required by EH&S Manual Appendix 6131-T1, *Fall Protection Systems*. OSHA Safety and Health Information Bulletin, issued March 24, 2004, *Suspension Trauma/Orthostatic Intolerance*, defines the hazards of being suspended in fall arrest equipment and the need for evaluation of rescue practices where medical or rescue response is required. **(FIND-02)**

2.2 Personnel Net

A personnel net is used for fall protection at the Free Electron Laser (FEL) truck ramp during the removal of shield blocks. The net is an Adjust-A-Net™ Personnel/Debris Net System manufactured by DBI/Sala. The net system is installed during each removal/placement operation for the shield blocks. The manufacturer's user instruction manual requires that this net system be inspected or certified compliant by a competent person after each installation, and prior to use, in accordance with the requirements of 29 CFR 1926.502(c)(4) and ANSI A10.11 Section 9. The net system has not been tested or certified at each installation. The manufacturer also specifies inspection and record retention requirements for the competent person, as well as training requirements for personnel working above the net. These requirements have not been implemented. **(FIND-03)**

2.3 Aerial Work Platforms

EH&S Manual Chapter 6147, *Aerial Work Platforms*, establishes the criteria for qualification of aerial work platform. These qualifications include:

- having a valid state motor vehicles driver's license;
- having a Jefferson Lab Material Handling License issued by the MHSR;
- satisfactorily completing the Aerial Work Platform Operator Orientation prior to initially being authorized to operate, and at least once every two years to maintain certification;

- receiving special training prior to being authorized to operate aerial work platforms on the accelerator site and in experimental halls; and
- having specific permission to use the equipment from the supervisor/owner.

The EH&S Manual also provides that the qualified operators receive authorization to use an aerial work platform jointly from their supervisor and the MHSR, and that the MHSR maintain a list of authorized aerial work platform operators that identifies those operators authorized to operate aerial work platforms in specific listed locations. The joint authorization of aerial work platform operators is not being formally documented. The MHSR does not maintain a list of authorized operators which includes specific location information and the use of the lifts in specific locations are to be controlled by the supervisor. **(OBS-03)**

The MHSR no longer issues aerial work platform lift operators a Jefferson Laboratory Material Handling Licenses. During the development of corrective actions for the Rigging and Material Handling Assessment conducted in August 2005, it was determined that material handling licenses would no longer be issued and that the individual supervisors would be responsible for certifying the qualifications of equipment operators. EH&S Manual Chapter 6140 was revised to reflect these changes; however, the impact to Chapter 6147 was not identified, and the chapter was not updated accordingly. **(OBS-03)**

Aerial work platforms observed in the TJNAF facilities were in good condition. All labeling was legible; controls were clearly marked, and guard rails were in place. No defects were noted with the observed equipment.

2.4 Scaffolds

No scaffolds were being used in the facilities visited during this assessment.

Scaffolds are erected and used in accordance with EH&S Manual Chapter 6132, *Ladders and Scaffolds*. This procedure requires that only qualified personnel may erect and use scaffolds at Jefferson Laboratory. The EH&S procedure also requires that scaffolds be erected under the supervision of a qualified or competent person and that the competent person monitors the erection of a scaffold and inspects it prior to initial use and daily thereafter.

Four completed Tubular Frame Scaffold Inspection Checklists and two Rolling Tower Inspection Checklists (EH&S Manual Appendix 6132-T3, Tables 1 and 2) were reviewed. The Tubular Frame Scaffold Checklists indicated that only an initial inspection was conducted. Both Rolling Tower Inspection Checklists had been signed on numerous dates, indicating that daily inspections were being conducted by the competent person prior to use. The text of the EH&S Manual chapter, as well two checklists provided, indicate that these two types of scaffolds are the ones primarily used at TJNAF. No provision is made in the procedure to address documentation of inspections for other types of scaffolds should they be used at the facility. The checklist forms provided also do not have provisions for daily inspection signatures and dates. The daily inspection dates were written in on the rolling tower inspection checklists.

SAF-601, Scaffold Competent Person, training course rosters were reviewed. The majority of the rosters were for courses conducted in 1991, with one roster from an August 2001 class. When comparing the course rosters with the completed qualified person inspection checklists provided, one of the persons signing as qualified person on the checklist had not attended the SAF-601 training course. In addition, of the four persons identified by the Laboratory as competent persons for scaffolding, only one appeared on these course rosters. No other evidence was provided establishing the criteria for selection as a competent person, or formal designation as a competent person. **(OBS-04)**

2.5 Boatswain's Chair

A boatswain's chair manufactured by French Creek Production is used for work activities in Hall B and is suspended from the hook of the Hall B Polar Crane or from an electric powered hoist. The boatswain's chair was not in use at the time of this assessment but had been used for work performed earlier in the year. An inspection of the chair revealed that it was placed in service in December 1996; and the manufacturer's label stated that the device was to be removed from service after 5 years of service. A letter from French Creek Production, Inc., was provided that addressed product life expectancy for the companies fall protection products in general. The letter stated that it recommended a maximum life expectancy of 3 years on lanyards and 5 years on harnesses in lieu of a formal inspection program. While the letter indicated that equipment being maintained under a formal inspection program could be used longer than the manufacturer's stated service life, the letter did not address boatswain's chairs. In addition, a documented formal inspection program for the equipment has not been in place since 1996. **(OBS-05)**

Operational Safety Procedure (OSP) PHY-05-008-OSP had been developed for the use of a Boatswain Chair in Hall B as required by EH&S Manual Chapter 3310. This procedure, as well as EH&S Manual Appendix 6140-T4, requires that all personnel lifts performed with a crane be conducted in accordance with all requirements of 29 CFR 1926.550. However, the operating guidelines listed in the OSP should be upgraded to incorporate the 29 CFR 1926.550 requirements such as the implementation of a trial lift prior to lifting personnel.



Exhibit 8. Example of Manufacturer's Label on Boatswain's Chair

2.6 Portable and Fixed Ladders

Portable ladders observed in the facilities visited were in good condition and properly stored. However, instances of improper portable ladder use were observed. In one case, personnel were working on building systems above a suspended ceiling and were using a step ladder to access the area by standing on the top step of the ladder. In another case, an employee had used a step ladder to access the roof of an office enclosure within one of the facilities. The ladder being used was too short to properly access the area due to its height and configuration. **(OBS-6)**



Exhibits 9-11. Inappropriate Use of Portable Ladders

2.7 Subcontractor Fall Protection Requirements

The TJNAF standard subcontract specifications, as well as the Request for Proposal for the construction of a Mobile Equipment Storage Building (RFP SURA-06-R128), were reviewed. The appropriate regulatory and TJNAF requirements have been incorporated into the subcontract documents and flowed down to the subcontractor. **(NP-02)**

At the time of the assessment, weather conditions precluded the subcontractor's field work activities; therefore, no field validation of the implementation of these requirements was completed.

2.8 TJNAF Work Smart Standards Set

As part of this assessment, the TJNAF work smart standards set for fall protection related hazards was evaluated. The following comments are provided for TJSO and TJNAF review.

- Issue Number 087, Material handling - Cranes and Hoists. Add 29 CFR 1926.550 to the Sufficient External Standards Set. Cranes and hoists are being used to lift personnel using the criteria established by this standard. The standard is referenced in the internal procedures.
- Issue Number 132, Other Personnel Hazards - Working at heights/fall hazards. Add the following standards to the Sufficient External Standards Listing:
 - 29 CFR 1926.105
 - ANSI A10.11, American National Standard for Construction and Demolition Operations - Personnel and Debris Nets

- ANSI Z359.1, American National Standard Safety Requirements for Personal Fall Arrest Systems, Subsystems, and Components

3.0 FINDINGS, OBSERVATIONS, AND NOTEWORTHY PRACTICES

3.1 Findings

- FIND-01 (FP)** All TJNAF personnel using personal fall arrest systems have not been fully trained on the limitations, selection maintenance, and the use and storage of fall arrest systems. The training provided has not been certified as required by the applicable standards. (29 CFR 1926.503(a) and (b), ANSI Z359.1, Section 7.3)
- FIND-02 (FP)** Personnel suspended in a personal fall arrest harness can quickly experience significant medical problems, and planning for the timely rescue of personnel suspended in a personal fall arrest system is not being completed. A Task Hazard Analysis is not routinely completed to address rescue or self-rescue methods. (29 CFR 1926.503(d)(20), TJNAF EH&S Manual Appendix 6131-T1)
- FIND-03 (FP)** The Fall protection net used at the FEL Truck Ramp is not being load tested or certified at each installation as required. (29 CFR 1926.105(c)(1) and .502(c)(4); ANSI A10.11, Section 9; and the User Instruction Manual)

3.2 Observations

- OBS-01 (FP)** Based on information received during the interviews, implementation of proper fall arrest system use is not fully adequate.
- OBS-02 (FP)** A personal fall arrest system consists of all components used to arrest a person from a fall at a working height. All components of the fall arrest system (e.g., anchor connectors, retracting wire cable or web lanyards, rail or beam anchors, or cross-arm straps) are not inspected annually by a competent person. (ANSI Z359.1, Section 6.1)
- OBS-03 (FP)** The Material Handling Safety Representative is not issuing aerial work platform operators a “Jefferson Laboratory Material Handling License.” (TJNAF EH&S Manual, Chapter 6147)
- OBS-04 (FP)** Documentation and appointment of competent persons for the erection and inspection of scaffolds is incomplete. Only one of the four individuals identified as a competent person had attended the “Scaffold Competent Person Training Course.” Scaffold inspection checklists should be enhanced to provide a place for documentation of daily inspections.
- OBS-05 (FP)** A boatswain’s chair has been used for access to equipment in Hall B for approximately five years beyond the manufacturer’s recommended

service life. In addition, the OSP for the boatswain's chair work activity should be upgraded to capture all operational requirement for lifting personnel identified in 29 CFR 1926.550, as well as specifying that the fall arrest lanyard be attached to an independent anchor point meeting the criteria for a fall arrest anchor.

OBS-06 (FP) Personnel were observed using portable ladders inappropriately (i.e., using a step ladder to access an area where it was not tall enough or configured appropriately to access and standing above the designated rung on a step ladder).

3.3 Noteworthy Practices

NP-01 (FP) TJNAF recently implemented a formal inspection program for personal fall arrest harnesses and associated lanyards. During implementation of this program, all old equipment including those that were past the manufacturer's recommended service life were removed from service and replaced with all new harnesses and lanyards. Based on observations at the facilities visited, this equipment is maintained in good condition and properly stored and inspected.

NP-02 (FP) The Subcontract Request for the Proposal for Construction of a Mobile Equipment Storage Building identified and incorporated sufficient flow-down of TJNAF and regulatory requirements and contained a commensurate level of hazard assessments to support the effective evaluation of the subcontractor's fall protection program.

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Appendix A

Personnel Interviewed

Contracting Officer Technical Representative
Supervisor Harris Electric Company
Cryogenics Division Technician
EHS&Q Manager
Hall A Work Coordinator and Safety Warden
Electrical Safety Physics Division
Hall B Safety Warden & Supervisor
Work Control Coordinator, Hall C
EHS&Q Department Safety Representative for Facility Maintenance
Deputy Work Control Coordinator, Hall C
Technician Chemical Process Acid Transfer Building
Supervisor Chemical
EHS&Q Department Safety Representative for the Physics
Material Handling Safety Representative
Thomas Jefferson Site Office Health and Safety Representative
Facility maintenance Electrical
Mechanical Engineer, Facilities Management
Facilities Management Director
Subcontract HVAC Mechanic
Hall B Work Coordinator
Subcontract Electrician
Project Manager Mechanical Resources, Incorporated
Supervisor Accelerator Division
Alternate Work Coordinator, Hall B Physics
Instructor Lockout/Tagout Program

Appendix B

Records Reviewed

Control of Hazardous Energy (LO/TO)

- *TJNAF EH&S Manual*
 - Chapter 2210, *EH&S Responsibilities of Individuals*
 - Appendix 2210-T1, *Current EH&S Staff Assignments*, Revised 6/16/06
 - Chapter 2240, *Jefferson Lab EH&S Committees*, Revised 8/17/06
 - Chapter 2410, *Applicable Regulations and Contractual Commitments*, Revised 4/21/06
 - Appendix 2410-T1, *Jefferson Lab Hazard Issue List*, Revised 4/21/06
 - Appendix 2410-T2, *Work Smart Standards Set*, Revised 4/21/06
 - Chapter 3210, *Hazard Identification and Characterization*, Revised 10/15/99 (Including all Appendices)
 - Chapter 6110, *Lockout/Tagout*, Revised 10/1/02 (Including all Appendices)
- PHY-05-001 SOP, *Testing/Repair of Voltage Dividers Building 96D*, Issue Date 2/4/05
- PHY-05-002 SOP, *Testing/Repair of 120VAC Electronic Chassis, Hall B*, Issue Date 2/4/05
- PHY-05-003 SOP, *DVCS System Danfysik Power Supply LOTO for Mode 1 Work*, Issue Date 2/8/05
- PHY-05-004 SOP, *DVCS System Instrumentation Rack LOTO for Mode 1 Work*, Issue Date 2/8/05
- PHY-05-006 SOP, *Hall B Box Power Supplies*, Issue Date 4/28/05
- PHY-05-009 SOP, *Diagnostic Work in Energized Electrical Equipment – All Areas*, Issue Date 10/14/05
- PHY-05-010 SOP, *Hall A D1 Power Supply Test and Maintenance*, Issue Date 10/17/05
- PHY-05-011 SOP, *Hall A Q1 Power Supply Test and Maintenance*, Issue Date 10/17/05
- PHY-05-012 SOP, *Hall A Q2/3 Power Supply Test and Maintenance*, Issue Date 10/17/05
- PHY-05-013 SOP, *Hall A Big Box Power Supply Test and Maintenance*, Issue Date 10/17/05
- PHY-05-015 SOP, *Hall C Inverpower Power Supply Test and Maintenance*, Issue Date 11/10/05
- PHY-05-016 SOP, *Hall C HMS Power Supply Test and Maintenance*, Issue Date 11/10/05
- *CHL Linac Guard Vacuum Pumps 1,2,3, Lockout/Tagout Procedure*, Rev. C, No Issue Date
- *Lockout/Tagout Procedure for CTF Recovery Compressors C4 and C6*, No Issue Date
- *Lockout/Tagout Procedure for CTF Oil Processing System*, No Issue Date
- A-05-034-SOP, *LTET of Equipment without an Operational Voltage Verification Unit*, Issue Date 11/9/05
- ACC-PR-01-011, *Box Power Supply Safe Out Procedure*, Rev 2, dated 12/19/05
- Spreadsheet Listing of Current LO/TO Trained Employees, printed 8/6/06
- LOTO Training Power Point Presentation
- Cathode Power Supply (CPS) and High Power Amplifier (HPA) Enclosure Entry Overview Presentation (Equipment Specific LO/TO)
- E-mail from Bruce Ullman, re: Equipment Specific Qualifications, dated 9/5/06
- *Management Self Assessment 06-006, Lockout/Tagout*, dated 3/23/06
- Completed Group Lockout/Tagout Worksheets for the Acid Neutralization System (dated 8/1/04) and the CHL Building (dated 8/17/04)
- Trane Equipment, Service and Repair Sheet for Bearing/Drive Belt Replacement

- Energy Control Lockout Tagout Annual Inspection Report 2001 for Thomas Jefferson National Accelerator Facility, Signed 8/27/01
- Energy Control Lockout Tagout Annual Inspection Report 2002 for Thomas Jefferson National Accelerator Facility, Signed 8/27/02
- Energy Control Lockout Tagout Annual Inspection Report 2003 for Thomas Jefferson National Accelerator Facility, Signed 9/9/03
- Energy Control Lockout Tagout Annual Inspection Report 2003 for Thomas Jefferson National Accelerator Facility, Signed 9/10/04
- Draft EH&S Manual Chapter 6110, Lock Out/Tag Out (copy provided for comment)

Fall Protection

- *TJNAF EH&S Manual*
 - Chapter 6131, *Trip and Fall Protection*, Revised 3/10/06 (Including all Appendices)
 - Chapter 6132, *Ladders and Scaffolds*, Revised 6/1/01 (Including all Appendices)
 - Chapter 6140, *Cranes and Hoists*, Revised 8/26/05
 - Chapter 6147, *Aerial Work Platforms*, Revised October 1, 2002 (Including all Appendices)
- Spreadsheet of inspection dates for fall arrest harnesses, July 2006
- Letter from French Creek Production, Inc., re: Specified product service life for the company's harnesses and lanyards (Letter not dated, Faxed copy received by TJNAF 4/14/05)
- Spreadsheet of Aerial Platform/Manlift Training (personnel and date completed), July 2006
- Multiple Completed Scaffold Inspection Checklist (EHS Manual Appendix 6132-T3, Tables 1 and 2)
- Multiple Class Rosters for SAF-601, *Scaffold-Competent Person Training* (one roster for August 2001, nine for May and June 1991, and one for May 1990)
- Jefferson Laboratory Division 1 Master Specification (Safety and Health Requirements Excerpt), Revised 6/05
- Westover Communications Procedure, *Method of Procedure for the Removal of Utility Pole*, dated 7/13/06
- Product Data Booklet for the DBI SALA Adjust-A-Net Personnel Net System