

**Independent Oversight  
Inspection of Environment,  
Safety, and Health Programs at the**



# **Thomas Jefferson National Accelerator Facility**

**August 2008**

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Office of Environment, Safety and Health Evaluations  
Office of Independent Oversight  
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## Abbreviations Used in This Report

<b>CAIRS</b>	<i>Computerized Accident/Incident Reporting System</i>
<b>CAS</b>	<i>Contractor Assurance System</i>
<b>CATS</b>	<i>Corrective Action Tracking System</i>
<b>CEBAF</b>	<i>Continuous Electron Beam Accelerator Facility</i>
<b>DOE</b>	<i>U.S. Department of Energy</i>
<b>ES&amp;H</b>	<i>Environment, Safety, and Health</i>
<b>FEL</b>	<i>Free Electron Laser</i>
<b>FM&amp;L</b>	<i>Facilities Management and Logistics</i>
<b>HSS</b>	<i>Office of Health, Safety and Security</i>
<b>ISC</b>	<i>Integrated Support Center</i>
<b>ISM</b>	<i>Integrated Safety Management</i>
<b>JSA</b>	<i>Jefferson Science Associates, L.L.C.</i>
<b>NSRC</b>	<i>Nanoscale Science Research Centers</i>
<b>OSHA</b>	<i>Occupational Safety and Health Administration</i>
<b>PPE</b>	<i>Personal Protective Equipment</i>
<b>SC</b>	<i>Office of Science</i>
<b>SOTR</b>	<i>Subcontracting Officer's Technical Representative</i>
<b>THA</b>	<i>Task Hazard Analysis</i>
<b>TJNAF</b>	<i>Thomas Jefferson National Accelerator Facility</i>
<b>TJSO</b>	<i>Thomas Jefferson Site Office</i>

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# 1 Introduction

The U.S. Department of Energy (DOE) Office of Independent Oversight, within the Office of Health, Safety and Security (HSS), inspected environment, safety, and health (ES&H) programs at the DOE Thomas Jefferson Site Office (TJSO) and the Thomas Jefferson National Accelerator Facility (TJNAF) during May through July 2008. HSS reports directly to the Secretary of Energy, and the ES&H inspection was performed by Independent Oversight's Office of Environment, Safety and Health Evaluations.

Within DOE, the Office of Science (SC) has line management responsibility for TJNAF. SC provides programmatic direction and funding for research and development, facility infrastructure activities, and ES&H implementation at TJNAF. At the site level, line management responsibility for TJNAF operations falls under the TJSO Manager. Under contract to DOE, TJNAF is managed and operated by Jefferson Science Associates, L.L.C. (JSA), which is a partnership involving the Southeastern Universities Research Associates and Computer Sciences Corporation.

TJNAF's primary mission involves research in the areas of nuclear physics, theoretical and computational physics, superconducting accelerator operations, and -lasers (FELs). To accomplish this mission, TJNAF operates various scientific facilities, including the Continuous Electron Beam Accelerator Facility (CEBAF), the Free Electron Laser (FEL) facility, and various other equipment and laboratories. These facilities are available to various users from DOE, other U.S. government agencies, other countries, and various other industrial and academic organizations. These agencies and organizations provide funding for various experiments and equipment modifications/upgrades to support experiments, many of which are performed by visiting scientists/students.

Potential hazards that need to be effectively controlled at TJNAF include exposure to radiation, radiological contamination, lasers, hazardous chemicals, and various physical hazards associated with facility operations (e.g., cryogenics, oxygen-deficient environments, and high-voltage electrical equipment). Radiological/irradiated materials and hazardous chemicals are present in various forms at TJNAF.

The purpose of this Independent Oversight inspection was to assess the effectiveness of ES&H programs at TJNAF, as implemented by JSA, under the direction of TJSO and SC. Independent Oversight evaluated a sample of activities at TJNAF, including:



Aerial

- Implementation of the core functions of integrated safety management (ISM) for selected TJNAF facilities and activities, focusing on work planning and control systems at the activity and facility levels. The Independent Oversight inspection selectively evaluated:

- Work activities at the FEL Test Laboratory, which is a kilowatt-class, high-average-power, sub-picosecond free electron laser (FEL), used for research funded primarily by the Department of Defense.
- Work activities at the Test Laboratory, which is a building at TJNAF where various TJNAF organizations perform a variety of experiments and tests involving mechanical and electrical equipment, chemical and cryogenic materials, and lasers.
- Facility maintenance and construction performed by subcontractors at the direction of the TJNAF Facilities Management and Logistics (FM&L) organization.
- TJSO and TJNAF feedback and continuous improvement systems, with a focus on their application to TJNAF facilities and activities that were evaluated during this Independent Oversight inspection. The review of TJNAF feedback and improvement programs included an evaluation of injury and illness reporting and investigation, which is one of Independent Oversight’s current focus areas. The review of feedback and improvement systems also constitutes the Independent Oversight evaluation of the effectiveness of TJSO’s and TJNAF’s implementation of DOE Order 226.1A, *Implementation of DOE Oversight Policy*, which is a long-term Independent Oversight focus area.

In support of a separate HSS Independent Oversight special review of nanomaterials, the Independent Oversight team also collected information about nanomaterial work practices at TJNAF. The special review is being performed at the request of the Secretary of Energy and includes onsite reviews of work practices at selected DOE laboratories. To collect data efficiently and with minimal impact on DOE site operations, the onsite review of TJNAF was performed concurrently with this ES&H inspection. The primary focus of the onsite reviews is to compare selected DOE laboratory operations against the approach outlined in the DOE *Nanoscale Science Research Centers Approach to Nanoscale ES&H Revision 2 – June 2007* (referred to as the NSRC Approach). TJNAF currently has one project involving nanomaterials which is performed at the FEL. The results of Independent Oversight’s review of nanomaterial work practices for this project are discussed in the FEL work control section and will also be discussed in a separate special review report.

Sections 2 and 3 discuss the key positive attributes and weaknesses, respectively, identified during this inspection. Section 4 provides a summary assessment of the effectiveness of the major ISM elements that were reviewed. Section 5 provides Independent Oversight’s conclusions regarding the overall effectiveness of TJSO and TJNAF management of ES&H programs, and Section 6 presents the ratings assigned during this inspection. Appendix A provides supplemental information, including team composition.

Appendix B presents the findings identified during this Independent Oversight inspection. The findings are also referenced in the applicable portions of Sections 3 and 4 of this report. In most cases, the findings listed in Appendix B were derived from multiple individual deficiencies that are described in the detailed results provided to the site in a separate document.

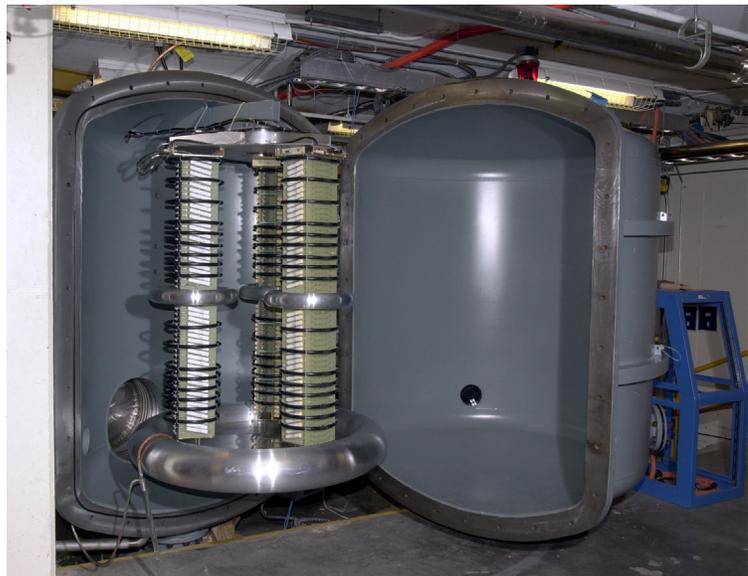
In accordance with DOE Order 470.2B, *Independent Oversight and Performance Assurance Program*, SC must develop a corrective action plan to address each of the findings identified in Appendix B, including the associated individual deficiencies, and provide appropriate causal analyses, corrective actions, and recurrence controls for each finding. The weaknesses in Section 3 provide a management-level summary of the findings; these weaknesses do not need to be separately addressed in the SC corrective action plan because the findings encompass the scope of the weaknesses.

## 2 Positive Attributes

Positive attributes were identified in several ES&H programs, particularly in certain aspects of hazard controls and TJSO oversight.

### **Laser hazards for FEL work activities are well characterized and controlled.**

FEL makes extensive use of engineered controls for personnel protection that are supplemented by administrative controls, such as rigorous certification of the protection systems following modification and extensive training requirements. For example, the FEL Laser Safety Training for system modifications is comprehensive and appropriately addresses the requirements of the FEL laser standard operating procedure. The practical training is particularly effective in demonstrating the operation of the system, including responses to use of crash buttons and other interlock challenges.



FEL High Voltage Power Supply

**The Test Lab has a comprehensive and proactive safety program in place for its use of acids.** The Test Lab uses various acid mixtures containing high concentrations of hydrofluoric acid for cavity processing, and materials research and development. The safety program for acids includes detailed hydrofluoric acid and general chemistry awareness and first aid training, task specific on-the-job training, personal protective equipment (PPE) evaluation and monitoring, and coordination with local hospitals.

**Hazards associated with nanomaterial research at FEL are effectively mitigated through application of appropriate engineering controls, along with development and implementation of conservative administrative controls and PPE consistent with the NSRC Approach document.** TJNAF has applied conservative controls for nanomaterial hazards in several areas. Ventilation design, operations, and maintenance requirements are comprehensive and conservative. PPE requirements conservatively include respiratory protection in addition to the specified skin protection for all activities with exposed nanomaterials outside of the approved fume hood. Although nanomaterials are not specifically addressed in Federal transportation or waste disposal regulations and thus are not required by regulation to be packaged,

transported, or disposed of as hazardous materials, TJNAF has established specific packaging, transport, and waste disposal requirements and protocols. Industrial hygiene sampling and waste handling processes are defined in procedures and are meeting (or are making acceptable progress in meeting) the expectations stated in the NSRC Approach document.

**FM&L Subcontracting Officer’s Technical Representatives (SOTRs) are very experienced, knowledgeable, and effectively engaged in reviewing subcontractor performance and ensuring that TJNAF requirements are met during maintenance activities.** FM&L SOTRs approve subcontractor safety plans, walk down new requested facilities maintenance work to develop the scope of work, identify hazards and determine needed controls, draft formal task hazards analysis, develop operating procedures, ensure coordination with facility tenants, conduct interactive pre-job briefings with subcontractor workers and supervisors, authorize the start of work, review and actively support work activities, and solicit feedback to develop lessons learned.

**TJSO has substantially improved its staff capability and processes to provide effective oversight of ES&H performance at TJNAF.** Through a series of initiatives to drive contractor performance and to establish clear directives and processes, TJSO has established a solid baseline oversight program with a small number of ES&H staff. TJSO directives are well thought out and clearly written, supporting consistent implementation of oversight actions within the staff. Additionally, cooperative support arrangements with the SC Integrated Support Center (ISC) have provided effective subject matter expert support to the TJSO ES&H staff. TJSO staff conduct frequent facility walkthroughs and are very knowledgeable of conditions and operations. Issues are identified, and rigorous technical review is applied to potential problems. TJSO staff are mentored in their oversight skills by their peers and by TJSO management.

## 3

## Weaknesses

Although aspects of ES&H management are effective, there are weaknesses in ISM programs at TJNAF, most significantly in implementation of site processes for forklift safety and some aspects of TJNAF feedback and improvement programs.

**Site forklift operations and training do not meet several Worker Safety and Health Program Rule (10 CFR 851) and ES&H Manual requirements and have increased the risk of a serious accident.** In an evolution at FEL, a forklift attachment for lifting an 856-pound magnet was not approved for the forklift, as required by the Occupational Safety and Health Administration (OSHA) and the ES&H Manual, and exceeded the forklift load capacity for the load configuration. Forklift operators were not trained on fork and attachment adaptation, operation, and use limitations, and operators were not aware of these limitations. In addition, the attachment nameplate and safety markings (load limits, cautions, model number, and serial number) were not maintained in a legible condition. TJSO identified a similar deficiency earlier in the year with illegible markings on a similar forklift attachment. The site disposed of the attachment identified earlier in the year, but continued use of the similar attachment in this incident indicates that corrective actions and extent-of-condition determination for the earlier deficiency were not effective. The number and severity of deficiencies observed in the forklift program indicate that increased management attention is needed to ensure safe forklift operations at the site. (See Finding #C-1.)

**TJNAF feedback and continuous improvement processes are not fully effective.** Assessments of safety-related programs, activities, and performance have been limited in number, scope, and rigor. Although many issues have been adequately managed using the site issues management process and tracking tool, some issues are not being formally managed, the issues management procedure has a number of deficiencies, and issues are not conservatively categorized for significance. Most first aid cases and some operational events have not been formally investigated or put into the issues management tracking system. ISM core functions for work planning and control are not always evaluated and addressed, and recurrence controls are not always adequately identified. Some events have not been reported to DOE as required. Analysis of events for recurrence and trends has not been performed at the frequency required by DOE documents, and trending information for issues and incidents lacks sufficient analysis and determination of needed recurrence controls. Procedures for these assurance systems need to provide unambiguous, complementary, structured, step-by-step processes that drive rigorous and compliant implementation. (See Findings #D-2, #D-3, and #D-4.)

**TJSO oversight of contractor and site office corrective action management has not been fully effective.** Causal analysis of site office issues has not been adequate, and there is no sustained method for providing oversight of the effectiveness of contractor corrective actions. Although TJSO staff check contractor actions to verify completion, TJSO has not adequately validated the effectiveness of TJNAF corrective actions in

addressing significant issues or adverse performance trends. The TJSO directives for corrective action oversight provide general guidance for effectiveness reviews, but TJSO historically has not scheduled or performed effectiveness reviews. (See Finding #D-1.)

# 4 Results

The following sections provide a summary assessment of the TJSO and TJNAF activities that Independent Oversight evaluated during this inspection.

## 4.1 Work Planning and Control Processes

The Independent Oversight review of work planning and control processes focused on the adequacy and implementation of institutional expectations and requirements for activity-level work planning and control. TJNAF uses several work control processes to govern work within the various divisions and facilities across the site. The processes include scheduling and work definition components such as task lists and work orders and a hazard analysis component beginning with a risk determination. One of five risk codes is assigned for each work activity based on a determination of accident probability and predicted property loss or injury consequence. The ES&H Manual provides several tables to assist in the risk determination; however, the actual determination of probability and consequence is expert based, and undocumented. Risk codes of two or less are considered skill of the craft, and no further hazard analysis is needed, although in some cases, a rudimentary hazard identification checklist is completed within the various task list items. For higher risk activities (risk codes of three or above), the ES&H Manual requires a more formal hazard analysis to be documented in a work control document (procedure, work permit, etc.). These analyses document the hazards of the work and associated controls. TJNAF recently issued a formal work control policy and flowchart to better integrate various components of the work control processes across the site. Some inconsistencies were identified in the implementation of the recently changed work control policy; for example, there are some TJNAF procedures and documents with incorrect or misleading references to DOE orders and manuals and the TJNAF ES&H Manual as “guidance” documents rather than requirements.

### Free Electron Laser

The FEL Division of TJNAF operates the FEL, with matrixed support from several other site organizations, such as the Engineering and the ES&H & Quality Divisions. During the Independent Oversight inspection, the FEL was in an extended shutdown to install a new ultraviolet spectrum line and several upgrades to safety and operational systems, including a new optical transport system



Internal Components for the FEL Upgrade

to the user labs. Independent Oversight observed several work activities associated with the outage, as well as two specific ongoing experimental activities not directly related to the main laser; these involved boron nitride nanotube synthesis using a commercially available class 4 laser, and high-voltage operations associated with the gun test stand.

FEL has defined the scope of work activities in sufficient detail to permit adequate identification and analysis of activity-level hazards. Work is adequately scheduled. In most cases, hazards were adequately identified and analyzed. In two cases where they were not, FEL took prompt corrective action.

For most activities, FEL identified appropriate engineering and administrative hazard controls, but in several cases, the controls were not adequately implemented. In one case, the failure to appropriately implement hazard controls and OSHA requirements resulted in an unapproved modification to a forklift that led to significantly exceeding the forklift load rating, thereby exposing workers to an increased risk of injury. (See Finding #C-1.)

Activity-level work authorization is adequately controlled in FEL through a combination of the morning planning meeting, task scheduling, and a rolling two-week schedule. Workers, engineers, and scientists were actively involved in the work authorization processes. With the exception of the forklift operation discussed above, observed production work was authorized and performed in accordance with established controls. Workers were highly competent and knowledgeable, aware of their stop work authority, and did not hesitate to pause work and ask for help when problems were encountered.

Overall, FEL has adequately implemented the components of ISM. With few exceptions, work is adequately defined, hazards are adequately analyzed, and work is performed in accordance with established controls. However, some hazard controls were not adequately implemented, and in one of those cases, inadequate implementation of forklift controls increased the risk of injury to workers. Increased management attention is needed, particularly for forklift operations and other tasks deemed to be low risk, to ensure that the appropriate controls established in the ES&H Manual are known by workers and enforced.



**Test Laboratory**

### **Test Laboratory**

Various TJNAF divisions run experiments at the Test Laboratory. The Test Laboratory is responsible for the cryogenic modules used in the TJNAF accelerator over their lifecycle, including operational support, and performs the testing, research, development, refurbishment, and design of cryogenic modules.

The Test Laboratory has defined the scope of work activities in sufficient detail to permit adequate identification and analysis of activity-level hazards. Task-level activities are appropriately defined in procedures for higher risk work. Long-term schedules

for Test Laboratory activities are effective in ensuring the coordination of planning activities, and at the task level, the scopes of work are adequately defined through temporary operational safety procedures, standard operational procedures, operational safety procedures, and task hazard analysis worksheet task breakdowns.

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Experiment and production hazards are adequately identified and analyzed through the hazard analysis process. At the task level, task hazard analysis worksheets and operating procedures were used to adequately identify, analyze, and document hazards for the work observed by the Independent Oversight team.

The Test Laboratory uses an effective combination of engineered controls, administrative controls, and PPE to control hazards. Engineered controls are the preferred method of hazard control and are used extensively. For higher risk activities, procedures are used to document and implement applicable administrative controls and PPE.

Work is appropriately authorized, and pre-job briefs and meetings are used to ensure that the controls are understood. The workers are knowledgeable, and most work observed by Independent Oversight was performed in accordance with controls defined in procedures. In a few instances, workers did not follow some aspects of safety controls (e.g., they did not wear safety shoes).

Overall, the Test Laboratory has adequately implemented the ISM core functions. With few exceptions, work is adequately defined, hazards are adequately analyzed, controls are established, and work is performed in accordance with established controls. Continued attention to maintenance activities is warranted to ensure that workers fully implement safety requirements.

### **Facilities Management and Logistics**

FM&L is responsible for maintenance, modification, and improvement of facilities at TJNAF. Most of this work is performed by subcontractors, with direction, coordination, and review by designated SOTRs.

FM&L subcontractor facility work activities are generally well defined in sufficient detail to establish the desired outcome and to facilitate adequate identification and analysis of activity- and task-level hazards. Facilities maintenance work requests and resulting subcontractor work orders identify the problems to be fixed but appropriately allow the subcontractor to define the scope of work, consistent with contract requirements and limitations.

In essentially all instances, work activity and task-level hazards were effectively identified and analyzed through the TJNAF work planning and hazard analysis process. SOTRs and subcontractors walked down requested work and met with facility tenants, subject matter experts, and managers, as appropriate, to determine the work scope and schedule, identify and analyze the hazards, and discuss the hazard controls that were or could be implemented. Subcontractors and SOTRs effectively use formal task hazard analyses (THAs) to analyze the hazards associated with higher risk work.

For most work activities, appropriate hazard controls were developed and effectively implemented. Electrical, mechanical, and fire protection subcontractor contracts and safety plans appropriately established generic work practices, training, and PPE to effectively mitigate identified and analyzed hazards associated with contracted skill-of-the-craft work. For higher hazard work, SOTRs develop and require implementation of hazard controls using formal THAs. All reviewed formal THAs were well written and effectively defined and communicated activity- and task-specific hazard controls required to mitigate the hazards identified in the formal THA.

Subcontractors were appropriately authorized to start work only after interactive pre-job briefings between the responsible SOTRs and subcontractor staff, and with a few isolated exceptions, electrical, mechanical, and construction subcontractor work was appropriately and safely implemented in accordance with established

controls. Essentially all subcontractor work activities were performed within established controls by competent, knowledgeable, well-trained, and safety-conscious subcontractor and SOTRs.

Overall, FM&L staff and subcontractors have effectively implemented the ISM process at the task and activity level. Work is adequately defined and scheduled with a team approach. Essentially all subcontractor work hazards were adequately identified and analyzed. In most cases, hazard controls for subcontractor maintenance activities were appropriately developed and implemented at the task level. Finally, work was appropriately authorized following effective pre-job briefings, and in essentially all cases, work was performed in accordance with established controls by highly competent and knowledgeable subcontractors with effective SOTR direction, coordination, and review.

## 4.2 Feedback and Improvement Systems

### TJSO

In 2004, TJSO initiated a comprehensive effort to improve the safety culture and performance at TJNAF because of concerns about accident and injury rates, and other safety performance issues noted by the TJSO Manager and his staff. The initiatives and assessments have led to a series of TJNAF actions to improve the implementation of ISM at the TJNAF and have contributed to improved TJNAF safety management performance. The TJSO Manager and his staff are actively engaged in ensuring continuous improvement and have identified specific areas and tasks for future efforts.

The TJSO oversight program fully meets the intended objectives of DOE Order 226.1 and provides effective oversight of ES&H at TJNAF. The formal assessments and self-assessments that have been conducted were thorough and provided useful feedback and improvement. TJSO oversight and operational awareness practices and directives have undergone a number of recent improvements and include elements of necessary oversight, including formal and informal assessments, surveillances, for-cause surveillances, and walkthrough activities. TJSO directives also include requirements for reporting, trending, and tracking of issues and corrective actions for the site office, and the TJNAF issues identified by the site office.

The experienced ES&H staff members and the professional mentoring conducted by TJSO management provide a strong base of individuals who are able to provide oversight for the wide range of operations at TJNAF. Recent improvements in this area include development of a formal qualification program to support ES&H staff members' ability to conduct operational oversight. Facility walkdowns with senior management are scheduled and conducted, allowing less-experienced staff members to compare their assessment results with observations from more experienced staff. Additionally, TJSO requires peer mentoring of ES&H staff, which also contributes to a broad base of professional knowledge.

Coverage and staffing are adequate to achieve required oversight activities. Currently, the site office has one unfilled ES&H specialist position and one unfilled facility operations staff member position. Other staff members currently perform the duties of these positions. Specific expectations for staff members' assessment and operational awareness items are well defined. TJSO and ISC personnel have an effective and cooperative approach to ES&H oversight activities that has been a key element in the increased level of oversight conducted by TJSO.

TJSO staff's oversight activities ensure that the TJSO senior management is kept well informed about ongoing operations and hazards at TJNAF. The oversight program is flexible and responsive to current issues, and it is well supported by the TJSO staff, who are motivated and committed to the program. Walkthrough surveillances

are frequent and professionally conducted, are appropriately obtrusive into laboratory operations, and identify many ES&H deficiencies. TJSO is working to improve their process to review, track, trend, follow up on, and close findings from walkthrough surveillances and to review areas requiring additional attention.

TJSO ES&H program oversight has ensured that DOE requirements are met for the employee concerns program, the worker safety program for Federal workers, and the corporate operating experience program. Close coordination with ISC staff has provided effective assistance in implementing these program requirements and has provided TJSO with useful self-assessment information.

Although most aspects of TJSO oversight are adequate, two areas warrant further improvement. First, TJSO tracking of contractor and site office corrective actions is not always sufficient to ensure that appropriate corrective actions are managed and evaluated. Follow-up actions (event investigation and critiques) for unusual events and issues have been self-identified by TJSO as a TJNAF performance weakness that requires greater attention. Additionally, TJSO has not yet adequately implemented effectiveness reviews to determine whether completed corrective actions have effectively resolved and prevented recurrence of the same or similar findings. Second, some assessments required by DOE or local site office directives are not included within the assessment schedule. In addition, the TJSO process does not routinely identify necessary additions or changes to the assessment schedule based on contractor assurance results or performance issues that warrant additional for-cause assessments and walkthrough surveillance activities. (See Finding #D-1.)

Overall, TJSO oversight meets the intent of DOE requirements. Although further improvements in evaluating corrective action effectiveness and scheduling assessments are warranted, TJSO oversight is driving improvements in TJNAF safety management and provides TJSO management with adequate information about the status of ES&H programs and issues at TJNAF.

## TJNAF

TJNAF has established and implemented all the elements of a contractor assurance system (CAS) as identified in DOE Order 226.1. In many cases, the implementation of these management systems is thorough and effective in providing feedback and continuous improvement. There has been much improvement in formalizing and strengthening CAS procedures and communicating requirements to persons responsible for implementation since JSA assumed Laboratory management in 2006. Much of this increased rigor has been incorporated in assurance system elements as a result of recent self-assessments of the ISM and CAS programs at TJNAF. However, in some cases, these management systems are not sufficiently defined, and implementation is not fully effective. In addition, implementation has just begun for some CAS elements

with respect to newly revised or established procedures or programs.



**Cryogenic Module**

TJNAF uses a variety of assessment activities to evaluate safety programs and performance and to drive continuous improvement, including formal independent and management self-assessments, facility safety inspections, and supervisor and manager work observations. Although some rigorous and effective assessments are being performed, many of these activities, primarily management self-assessments, lack sufficient scope and rigor, and do not appropriately support conclusions or

identify issues accurately or as required by governing site procedures. Although newly developed procedures and planning documents reflect a more comprehensive assessment program in the future, historically the topical scope and number of TJNAF self-assessments have been limited. (See Finding #D-2.)

Many safety issues are effectively managed using the site's Corrective Action Tracking System (CATS) tool and the associated issues management procedure, including significance ranking and assignment of causes. The procedure addresses the required elements of issues management, as described in DOE orders and associated guidance; identifies responsibilities; and describes the general process. However, it provides insufficient and inappropriate direction for effectively managing issues. Further, the implementation of the issues management program and documentation in CATS are not in compliance with the site issues management procedure, especially with regard to significance categorization and description of issues and actions. (See Finding #D-3.)

Events are identified, reported, and investigated and related issues resolved in accordance with formal processes defined in the ES&H Manual and issues management procedure. Although most events are properly identified, investigated, and managed, some events are not investigated, or the investigations are not documented or reported, as required by procedures. In some cases, DOE notifications are not always timely, and investigations and associated preventive actions do not sufficiently address work control deficiencies. (See Finding #D-4.)

OSHA recordable occupational injuries/illnesses and first aid cases are identified in a timely manner and recordable injuries, as well as some first aid cases, are investigated, documented, and reported using a structured process. Supervisors, managers, and ES&H subject matter experts are engaged in investigating injuries and illnesses and identifying corrective actions and recurrence controls. However, the TJNAF procedure only requires formal investigation of recordable injuries, and many first aid cases have not been formally investigated to determine whether corrective or preventive actions are required.

The JSA lessons-learned program has only recently been formalized and defined in a site procedure. The procedure defines a generally adequate and compliant operating experience program. However, the JSA lessons-learned program has not yet been fully implemented, and historically, there has been no formal screening and communication of external lessons learned.

TJNAF employees have both formal and informal means to communicate and obtain resolution of safety concerns, but the formal processes are rarely used. Responsibilities and processes for resolving employee concerns are described in site manuals. However, the ES&H Manual procedure is deficient in several areas, and the employee concerns processes do not adequately address the elements of anonymity and confidentiality.

Several other mechanisms at TJNAF promote feedback and continuous improvement. The Worker Safety Committee provides a valuable link between management and workers to communicate issues, initiatives, and management expectations. The Director's Safety Council provides another mechanism for communicating safety performance feedback and management expectations to, among, and from senior managers and senior safety staff. An employee behavior-based safety observation program and management safety observation program provide real-time feedback to workers on safe work performance attributes and at-risk behaviors, and also increase the safety awareness of personnel. At the activity level, TJNAF organizations use various methods, such as pre-job briefings and regular planning meetings, to solicit ES&H feedback and discuss lessons learned.

JSA workers perform assessments, inspections, and incident/accident investigations and often manage the associated issues in most cases, thoroughly and appropriately. However, these actions are not performed consistently in compliance with requirements. In many cases, the governing procedures provide ambiguous directions; therefore, the feedback and improvement elements are implemented based on individual, experience-based approaches rather than a well-defined, systems-based approach for which personnel have been adequately trained.

Overall, TJNAF has made recent and substantial changes to their contractor assurance processes and feedback and improvement methods that should assist effective ISM oversight. The ES&H Manual contains weaknesses in these institutional management system administrative procedures and processes that include inconsistent formatting and failure to always identify all responsibilities and action steps. Some processes described in the ES&H Manual are not in a standard procedure format with clearly defined sections for purpose, scope, responsibilities, action steps, definitions, etc. Procedures that use ambiguous terms and that lack complete, well constructed, and sequenced action steps increase the chances that requirements and management expectations will not be implemented as intended. These management feedback and improvement processes require additional attention to ensure the desired results.

**Occupational Injury and Illness Recording and Reporting.** TJNAF has implemented procedures and assigned responsibilities for recording and reporting occupational injuries and illnesses to employees and subcontractors. Employees who were interviewed by Independent Oversight confirmed that Laboratory employees are informed of their responsibilities to report all injuries and exposures. The individuals assigned the responsibilities for maintaining records for TJNAF were trained in the DOE requirements and authorized to utilize the DOE-wide Computerized Accident/Incident Reporting System (CAIRS) to report recordable cases. However, the site procedure did not include sufficient details to ensure ownership of responsibilities and that all requirements are met. With the exception of one case that was misclassified and not reported, monthly and quarterly reporting requirements are being met. As noted above, investigation reports are not required for non-recordable cases. The level of detail included in CAIRS reports from the Notable Event Reports was minimal and did not include investigation information that is needed to fully understand the events leading to the injury or to provide lessons learned. The OSHA 300A form, Summary of Work-Related Injuries and Illnesses, was properly prepared and certified annually. However, quarterly cross-checks of local records with CAIRS and periodic self-assessments of the recordkeeping and reporting program were not regularly performed as required. (See Finding #D-2.)

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## Conclusions

TJNAF has made significant improvements in safety management in the past few years. TJSO has driven some of the improvements through its oversight and contract management efforts. As examples, TJSO added performance measures to the most recent contract to incentivize JSA assessments of ES&H performance and initiated a comprehensive effort to improve the safety culture and performance at TJNAF, beginning in 2004, because of concerns about accident and injury rates and other safety performance issues noted by TJSO. In coordination with TJSO, TJNAF has taken a number of actions to develop a comprehensive safety strategy and improve ISM and safety performance at TJNAF. These efforts have contributed to safety management process enhancements and improvements in injury and illness rates at TJNAF, which are significantly lower than the DOE averages. In addition, with a few exceptions, work observed by Independent Oversight was performed safely and the higher-hazard work was performed in accordance with procedures or other approved work documents that adequately identified safety controls.

Although for most of the work observed by Independent Oversight, informal processes adequately identified appropriate safety controls, further enhancement of the risk determination process would provide greater assurance of proper categorization and that all hazards are adequately analyzed and controlled. In one instance, ineffective application of safety controls for forklifts resulted in an increased risk to workers; in a few other instances, forklift controls were not identified, communicated, and implemented with sufficient rigor. In addition, the CAS has some weaknesses in processes and implementation in such areas as assessments, issues management, and event investigation and reporting that need to be addressed to ensure that deficiencies in ES&H programs are identified and corrected to achieve continuous improvement. The absence of an adequate system for defining and communicating requirements contributes to some of the observed weaknesses in the CAS.

Areas of particular priority and emphasis for TJNAF should include:

- Evaluating and enhancing forklift safety programs in such areas as OSHA compliance, postings, operator training, and assessments
- Continue enhancement of the work control process
- Enhancing the CAS, with particular emphasis on performance-based assessments, and rigorous issues management and event investigation processes
- Establishing and implementing a well-defined infrastructure for document control and effective management and communication of requirements.

TJSO should closely monitor TJNAF's efforts and continue to improve its systems and line management oversight of TJNAF. Many of the TJNAF ISM programs are relatively new or have been recently enhanced and thus warrant continued management attention to ensure that they mature and are rigorously assessed and improved as operational experience is gained.

# 6 Ratings

The ratings (see below for purpose and definition of ratings) reflect the current status of the reviewed elements of TJNAF ISM programs.

<b>Work Planning and Control</b>				
<b>ACTIVITY</b>	<b>CORE FUNCTION RATINGS</b>			
	<b>Core Function #1 – Define the Scope of Work</b>	<b>Core Function #2 – Analyze the Hazards</b>	<b>Core Function #3 – Develop and Implement Controls</b>	<b>Core Function #4 – Perform Work Within Controls</b>
<b>Free Electron Laser</b>	Effective Performance	Effective Performance	Needs Improvement	Effective Performance
<b>Test Laboratory</b>	Effective Performance	Effective Performance	Effective Performance	Effective Performance
<b>Facilities Management &amp; Logistics</b>	Effective Performance	Effective Performance	Effective Performance	Effective Performance

<b>Feedback and Continuous Improvement - Core Function #5</b>	
TJSO Feedback and Continuous Improvement Processes	Effective Performance
TJNAF Feedback and Continuous Improvement Processes	Needs Improvement

## Ratings – Purpose and Definitions

The Office of Independent Oversight uses a three-tier rating system that is intended to provide line management with a tool for determining where resources might be applied toward improving environment, safety, and health. It is not intended to provide a relative rating between specific facilities or programs at different sites because of the many differences in missions, hazards, and facility life cycles, and the fact that these reviews use a sampling technique to evaluate management systems and programs. The rating system

helps to communicate performance information quickly and simply. The three ratings and the associated management responses are:

- Significant Weakness (Red)
- Needs Improvement (Yellow)
- Effective Performance (Green).

## APPENDIX A

### Supplemental Information

#### A.1 Dates of Review

Planning Visit	May 19-22, 2008
Onsite Inspection Visit	June 2-12, 2008
Report Validation and Closeout	July 8-10, 2008

#### A.2 Review Team Composition

##### A.2.1 Management

Glenn S. Podonsky, Chief Health, Safety and Security Officer  
 Michael A. Kilpatrick, Deputy Chief for Operations, Office of Health, Safety and Security  
 William Eckroade, Director, Office of Independent Oversight  
 Thomas Staker, Director, Office of Environment, Safety and Health Evaluations  
 William Miller, Deputy Director, Office of Environment, Safety and Health Evaluations

##### A.2.2 Quality Review Board

Michael Kilpatrick	William Eckroade	Thomas Staker
Dean Hickman	Robert Nelson	William Sanders

##### A.2.3 Review Team

Thomas Staker, Team Leader	
Jimmy Coaxum	Bob Guy
Janice Macon	Bob Compton
Tim Martin	Ed Stafford

##### A.2.4 Administrative Support

Mary Anne Sirk	Tom Davis
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## APPENDIX B

### Site-Specific Findings

**Table B-1. Site-Specific Findings Requiring Corrective Action**

FINDING STATEMENTS	
C-1	Site forklift operations and training do not meet several Worker Safety and Health Program Rule (10 CFR 851) and ES&H Manual requirements.
D-1	TJSO oversight of site office and contractor corrective action management does not provide assurance that problem resolution is fully effective at TNJAF, as required by DOE Order 226.1A, <i>Implementation of DOE Oversight Policy</i> .
D-2	The TJNAF assessment program is not fully effective to provide sufficient frequency, scope, and rigor and assurance of the adequacy of safety programs as required by DOE Orders 226.1A, <i>Implementation of DOE Oversight Policy</i> , and 414.1C, <i>Quality Assurance</i> ; the TJNAF Contractor Assurance System; the ISM System Descriptions; and associated plans, policies, and procedures.
D-3	The TJNAF issues management program is not fully effective in ensuring that ES&H-related events, injuries, conditions, and program and performance deficiencies are rigorously categorized, analyzed, and corrected, and recurrence controls are established as required by DOE Orders 226.1A, <i>Implementation of DOE Oversight Policy</i> , and 414.1C, <i>Quality Assurance</i> .
D-4	TJNAF has not established sufficient processes nor implemented a fully effective event investigation and reporting program that rigorously identifies, investigates, reports, and prevents the recurrence of ES&H-related events and injuries as required by DOE Order 226.1A, <i>Implementation of DOE Oversight Policy</i> ; and DOE Manual 231.1, <i>Occurrence Reporting and Processing of Operations Information</i> .



