



The Secretary of Energy

Washington, DC 20585

August 5, 2002

02-0001740

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DNF SAFETY BOARD

The Honorable John T. Conway
Chairman
Defense Nuclear Facilities Safety Board
625 Indiana Avenue, NW
Suite 700
Washington, DC 20004-2901

Dear Mr. Chairman:

Last year the Defense Nuclear Facilities Safety Board addressed the Department of Energy's electrical safety programs, and raised concerns about whether contractors' electrical safety programs were making sufficient progress to be consistent with the guidance provided in the DOE handbook, *Electrical Safety* (DOE-HDBK-1092-98). The Board also encouraged the Department of Energy (DOE) to revise the handbook in several areas. We are taking a number of actions to respond to these concerns.

First, we are updating the DOE *Electrical Safety* handbook. The Department agrees with your staff that the DOE *Electrical Safety* handbook provides effective guidance on how to establish and implement adequate electrical safety programs, including how to deal with nonlisted electrical equipment. This handbook also adopts and endorses appropriate national consensus standards. I expect our contractors to be familiar with and work to current codes and standards in this area. However, as currently configured, the handbook specifically references and cites many electrical codes and standards that are revised continuously. As a result, we have found it difficult to maintain an up-to-date listing of these specific references and it needs to be revised to make it more current.

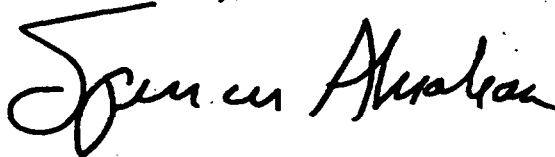
The Department is revising the handbook to delete specific references to codes and standards and make the handbook (a) a generic reference guide to appropriate codes and standards, (b) a guidance document for effective electrical safety programs, and (c) a document providing guidance for unique DOE work environments not specifically addressed in national consensus standards. The revised handbook will include a new chapter, "Underground Utilities Detection Equipment During Excavation," as the Board suggested. However, based on discussions with you and your staff, we agree that unique guidance on electrical safety during decontamination and decommissioning activities is not warranted at this time. Applying appropriate national consensus standards to all DOE activities should assure an adequate electrical safety program for all of our work. The revised handbook as specified above will take about one year to complete and we will work with your staff on this revision.



Enclosed for your information are reports prepared by the Lawrence Livermore National Laboratory, Oak Ridge Operations Office/Y-12, Pantex, and the Savannah River Site. These reports discuss specific improvements to each site's electrical safety program. Particularly noted is the progress in these programs to identify existing noncompliant and nonlisted electrical equipment. The Department plans to continue to monitor progress at these and other sites to ensure that adequate electrical safety programs are in place at every defense nuclear facility.

I would like to thank you and your staff for your continuing interest and information on electrical safety matters.

Sincerely,

A handwritten signature in black ink, appearing to read "Spencer Abraham". The signature is written in a cursive style with a large, sweeping initial "S".

Spencer Abraham

4 Enclosures

cc: J. Gordon, NA-1
M. Whitaker, S-3.1
J. Decker, SC-1
W. Magwood, NE-1
J. Roberson, EM-1

John T. Conway, Chairman
 A.J. Eggenberger, Vice Chairman
 Joseph J. DiNunno
 John E. Mansfield
 Jessie Hill Robertson

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

825 Indiana Avenue, NW, Suite 700, Washington, D.C. 20004-2901
 (202) 694-7000



June 21, 2001

The Honorable Spencer Abraham
 Secretary of Energy
 1000 Independence Avenue, SW
 Washington, DC 20585-1000

Dear Secretary Abraham:


In 1998, the Department of Energy (DOE) issued a handbook on *Electrical Safety* (DOE-HDBK-1092-98). The Defense Nuclear Facilities Safety Board (Board) reviewed this document before it was issued, provided constructive comments, and encouraged its use complex-wide. The Board's staff has used the guidance in this handbook as a reference for performing electrical safety reviews at several DOE nuclear sites. The handbook's Appendix A *DOE Model Electrical Safety Program* provides guidance for developing and maintaining an effective electrical safety program, and was used by the Board's staff as the template for an acceptable electrical safety program.

The staff reviews at several DOE nuclear sites noted that DOE and its contractors are not giving appropriate consideration to the guidance in DOE's *Electrical Safety* handbook. The Board urges DOE to take a proactive stance to ensure that adequate electrical safety programs are in place at every defense nuclear facility. The electrical safety programs at all DOE sites could be enhanced by evaluating each program against the guidance in DOE's *Electrical Safety* handbook and implementing appropriate upgrades. The Board also encourages DOE to continue with its planned updates to the handbook, addressing such topics as electrical safety during excavation, decontamination, and decommissioning activities.

Enclosed for your information is a report prepared by members of the Board's staff providing illustrative examples of areas where electrical safety programs are not meeting the guidance in the *Electrical Safety* handbook. The Board was particularly concerned that many sites do not have a structured program for identifying existing noncompliant and nonlisted electrical equipment. Defective or improperly installed electrical equipment not only poses an electrical safety risk to workers, but also can initiate facility fires and disable important safety equipment.

The Board wishes to be informed of DOE's progress in addressing the issues noted above.

Sincerely,


 John T. Conway
 Chairman

c: The Honorable Carolyn L. Huntoon
 Brigadier General Thomas F. Gioconda
 Mr. Mark B. Whitaker, Jr.

Enclosure

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 DNF SAFETY BOARD

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

Staff Issue Report

April 16, 2001

MEMORANDUM FOR: J. K. Fortenberry, Technical Director

COPIES: Board Members

FROM: A. K. Gwal

SUBJECT: Department of Energy's Electrical Safety Program

This report documents a series of reviews of the electrical safety programs at the Pantex Plant, Lawrence Livermore National Laboratory (LLNL), the Y-12 National Security Complex (Y-12), and the Savannah River Site (SRS) performed by members of the staff of the Defense Nuclear Facilities Safety Board (Board) during the year 2000. The staff also monitored occurrence reports and activities related to electrical safety, including three occurrences involving electrical lines cut during excavation activities in January, February, and April 2001 (at Oak Ridge National Laboratory, Los Alamos National Laboratory, and SRS). Staff members A. Gwal, T. Davis, W. White, and C. Graham met with personnel from the Department of Energy (DOE) and the respective contractors to conduct these reviews.

Background. The DOE Handbook, *Electrical Safety* (DOE-HDBK-1092-98) presents the electrical safety standards for all DOE facilities. It provides uniform electrical safety guidance and information to help DOE facilities reduce or eliminate risks associated with the use of electrical energy. DOE also requires, through authorization bases and contractual documents that existing and new facilities comply with the provisions of Occupational Safety and Health Administration (OSHA) standards 29 Code of Federal Regulations (CFR) 1910 and 29 CFR 1926, the National Electrical Code (National Fire Protection Association [NFPA] 70), the National Electrical Safety Code (American National Standards Institute [ANSI] C2), and Electrical Safety Requirements for Employee Workplaces (NFPA 70E). These codes and standards also form the basis of the requirements for the handbook. The implementation of the guidance in the *Electrical Safety* handbook is not contractually required by DOE at the defense nuclear facilities. However, the Board's staff observed that the above facilities have utilized the handbook to some degree in developing their electrical safety procedures.

Issues. The Board's staff identified the following issues during its review of the electrical safety program at the Pantex Plant, LLNL, Y-12, and SRS.

Electrical Safety During Excavation—The staff has observed numerous examples of electrical cables/conduits being struck or cut during excavation activities at DOE sites. A search of DOE occurrence reports revealed multiple such occurrences at sites in the defense nuclear complex, including SRS, the Hanford Site, the Pantex Plant, Oak Ridge National Laboratory,

Los Alamos National Laboratory, the Rocky Flats Environmental Technology Site, and Idaho National Engineering and Environmental Laboratory.

The Board's staff believes such accidents could be minimized or avoided by the detection of underground utilities immediately before excavations are performed and by the conduct of thorough work planning. Locations of underground utilities need to be adequately identified using as-built drawings, subsurface radar, and a magnetometer. Currently, DOE Safety Notice 96-06, *Underground Utilities Detection and Excavation*, addresses electrical safety during excavation, but there are no contractual requirements for compliance. There is a need to revise the *Electrical Safety* handbook to add guidance for excavation safety and the detection of underground utilities. Indeed, DOE committed to adding a chapter on excavation safety more than 3 years ago when the handbook was issued.

At Pantex, in particular, existing detection equipment is not capable of adequately detecting the location of underground utilities. The Board's staff encouraged Pantex to evaluate alternate detection equipment (such as subsurface radar detection systems) and to adhere strictly to the recommendations of DOE Safety Notice 96-06. The staff also observed that excavation activities at Oak Ridge Y-12 require only the review of as-built drawings to determine possible interference with underground utilities prior to excavation, with optional use of detection devices before digging. The contractor at Y-12 has been encouraged by the Board's staff to require the use of appropriate detection devices as a means of reducing the incidence of accidents and power interruptions resulting from excavation activities. Existing detection equipment at SRS is capable of adequately detecting the location of underground utilities. However, because survey markers are easily moved, there is a need to establish a time limit between the survey and the initiation of work. In addition, electrical personnel should be trained to understand the limitations of detection equipment.

Authority Having Jurisdiction (AHJ)—According to the *Electrical Safety* handbook, the official designated as the electrical AHJ should have thorough knowledge of standard materials and work practices used in the installation, operation, construction, and maintenance of electrical equipment. The AHJ should, through experience or education, be knowledgeable about the requirements contained in the OSHA standards; the National Electrical Code; the National Electrical Safety Code; DOE requirements; and other appropriate local, state, and national standards. The AHJ is responsible for interpreting codes as well as regulations and standards, and for approving electrical equipment, site assembled electrical equipment, and materials.

At Pantex, the program for the contractor's electrical AHJ has not been fully implemented. Issues associated with this program include the lack of appropriate resources to fulfill AHJ responsibilities and a multiyear delay in addressing DOE's findings related to the program. The staff is concerned that the lack of an adequate AHJ function has impacted Pantex's ability to address existing electrical equipment that is nonlisted or not in compliance with NFPA 70. A preliminary review of approximately 20 facilities by Pantex personnel revealed more than 506 instances of noncompliant or nonlisted equipment. Included are such items as emergency lights, transformers, switches, heater elements, and power supplies.

In addition to increasing the electrical safety risk to workers, the failure of nonlisted equipment or equipment that has not been properly installed per NFPA 70 could have a significant impact on facility safety. The use of noncompliant or nonlisted equipment increases the risk of fire and other equipment failures. A search of DOE occurrence reports revealed more than 100 occurrences at DOE facilities since 1991, related to defective or improperly installed electrical equipment. In particular, there have been several occurrences at DOE defense nuclear facilities in which a facility fire resulted from the use of defective or improperly installed electrical equipment:

- In 1991, defective electrical equipment led to a fire at the K Reactor at SRS.
- In 1997, an electrical equipment failure led to a fire in the emergency power switchgear at Building 707 at the Rocky Flats Environmental Technology Site.
- In 1999, use of an inappropriately rated solenoid led to a fire in Zone 12 at Pantex.

Following a review by the Board's staff in March 2000, the Pantex contractor conducted a self-assessment of its electrical AHJ program. This assessment, completed in July 2000, led to several findings. These findings were addressed through corrective actions identified to DOE in August 2000. One of these corrective actions, a rewrite of the AHJ standard to focus only on the identification and acceptance of unlisted electrical equipment, was completed in January 2001. The other major corrective action, a new site standard to establish an electrical AHJ program that would follow the guidance in DOE's handbook, was issued in April 2001. The staff will review the implementation of this new site standard during the next few years. In the interim, however, there has been little progress in addressing the backlog of non-listed equipment.

During its review of the electrical safety programs at LLNL, Y-12, and SRS, the Board's staff observed that although the contractors had established an AHJ program, no structured effort had been made to identify nonlisted and noncompliant electrical equipment that failed to meet the acceptance criteria set forth in the *Electrical Safety* handbook.

Electrical Safety Committee—The *Electrical Safety* handbook recommends that each site establish an Electrical Safety Committee (ESC), as well as an AHJ interpretation of the electrical requirements of OSHA, the National Electrical Code, and other standards applicable to the site or its facilities. The ESC also interfaces with DOE, all organizations and sites, and other DOE contractors. In addition, the ESC performs the following functions:

- Presents management with the requirements and training needed to implement the electrical safety program.
- Advises management of the need to fund and support these requirements.
- Maintains and assists in the implementation of the electrical safety program.
- Develops and maintains the electrical safety manual.

- Assists the departments by interpreting the electrical requirements of DOE Orders, criteria, and guides, as well as other codes, standards, and practices.
- Maintains a copy of each interpretation given.
- Publishes electrical safety bulletins.

The Board's staff has observed that the ESCs at Pantex, Y-12, LLNL, and SRS are involved primarily in the development of procedures and portions of the safety manual and are not performing all the duties and responsibilities set forth in Appendix A of the *Electrical Safety* handbook. Weaknesses in electrical safety can potentially impact any activity or facility function, as virtually everyone is exposed to electrical hazards. The staff believes the role of the ESC at DOE sites needs to be strengthened.

02 - 1740

**DNFSB Report
Electrical Safety Program
Evaluation
Savannah River Site**

7-19-01

The DNFSB “Staff Issue Report”, dated April 16, 2001, raised several issues which I will address, individually, in this document.

Issue # 1 “Electrical Safety during Excavation”

The report identified the following:

“Existing detection equipment at SRS is capable of adequately detecting the location of underground utilities. However, because survey markers are easily moved, there is a need to establish a time limit between the survey and the initiation of work. In addition, electrical personnel should be trained to understand the limitations of detection equipment.”

Response:

The Senior Electrical Review Board (SERB) pursued the issue of a time limit with the SRS Safety Department. Although SRS requires “painted markings” be made on the ground, which can’t be removed as easily as survey flags, the possibility exists for those markings to disintegrate over time, as well. As a result of subsequent discussions, the applicable SRS procedure (8Q, 34 “Excavations and Trenches”) was revised to require a “specific timeframe” be established for that purpose. That revision is in effect, today. The same procedure requires safety reviews to be performed and documented for all jobs involving excavations and trenches. Authorization permits are required for all excavations, and the Site Electrical Safety Manual governs all excavations or penetrations of surfaces where there is any possibility that the workers might encounter energized electrical wiring or components. The locating equipment operators are trained on the proper operation as well as the limitations of each unit. No further action is planned at this time.

Issue # 2 “ Authority Having Jurisdiction (AHJ)”

The report identified the following:

“During its review of the electrical safety programs at LLNL, Y-12, and SRS, the Board’s

staff observed that although the contractors had established an AHJ program, no structured effort had been made to identify non-listed and non-compliant electrical equipment that failed to meet the acceptance criteria set forth in the Electrical Safety Handbook. “

Response:

The SRS electrical safety program and SRS site Standards Board (Electrical Technical Committee) address both the AHJ responsibility and the listed versus unlisted electrical equipment issues. The present requirement to procure “listed” electrical equipment has been in place for many years. There is also a Site requirement document which lists the requirements to inspect and document unlisted electrical equipment prior to placing that equipment in service. The Site is sensitive to legacy equipment conditions, through the SRS preventive and corrective maintenance programs, and evaluates electrical equipment, accordingly. The program had been in place long before DOE-HDBK-1092-98 was issued, and has established its credibility and functional integrity, repeatedly, during that time.

No further action is planned at this time.

Issue # 3 “ Electrical Safety Committee” The report identified the following:

“The Board’s staff has observed that the Esc(s) at Pantex, Y-12, and SRS are involved primarily in the development of procedures and portions of the safety manual and are not performing all the duties and responsibilities set forth in Appendix A of the Electrical Safety Handbook. Weaknesses in electrical safety can potentially impact any activity or facility function, as virtually everyone is exposed to electrical hazards. The staff believes the role of the ESC at DOE sites needs to be strengthened.”

Response:

The SRS equivalent to the ESC is the Senior Electrical Review Board (SERB). The SERB meets or exceeds the requirements outlined in DOE-HDBK-1092-98, Appendix A, section 3.3. The SERB is very actively involved with the implementation of the electrical safety program. The Board meets every month, is made up of senior electrical engineers, electricians, etc. from each WSRC division, a DOE Representative and has their management support. They review all reported electrical incidents, from both the previous and present months, and perform a root cause analysis of each incident. If necessary, the Board Chairman then assigns action items to the appropriate representative for continuous improvement opportunities. This may include a Lessons Learned Notification be written or a procurement investigation initiated by a SERB member. Other times an Electrical Safety Express newsletter is written and distributed to the site.

Electrical safety is the first item on every monthly agenda, and the agenda format is followed without deviation. The average attendance at these monthly meetings is fifteen

to twenty members, further demonstrating their individual commitment to the electrical safety program. The Board evaluates DOE Complex-wide notices, publications, and reported incidents as they are made available. They, likewise, receive the scrutiny of this highly qualified membership.

SRS workers routinely bring electrical safety issues before the SERB for guidance and interpretations. This interaction with the work force helps strengthen the overall program by keeping the program in tune with the needs of the worker.

Finally, the Board publishes their monthly Electrical Safety Indicator Report, their past meeting minutes, Electrical Newsletters, and all past Electrical Safety Express publications on the SERB Home Page. This Home Page is part of the SRS site network, and accessible to all workers, supervisors, managers, and safety specialists. The other DOE Complex electrical safety program representatives routinely contact the SERB for electrical safety concerns and program sanity checks. SRS plans to continue to utilize the Handbook as a resource for continuously improving its Electrical Safety Program. No further action is planned at this time.

Summary:

The SRS management team has made significant progress toward establishing and maintaining a highly effective Electrical Safety Program. Their commitment and dedication to success in all areas of safety has maintained an expectation of excellence, which pervades every area of daily operations. The Electrical Safety Program is no exception.

The "Department of Energy Model Electrical Safety Program (September 1993)" was one of the documents used to enhance the existing program. In 1994 a highly specialized and qualified team developed the "Electrical Safety Plan". This plan served as the platform for the format of the current program.

The SRS program has evolved over the years. It is continuously challenged, and openly evaluated for continuous improvement opportunities. The DOE Handbook on electrical Safety (DOE-HDBK-1092-98, January 1998) was thoroughly reviewed at the time of its publication and distribution. The Senior Electrical Review Board, and the SRS Electrical Safety Program had been in place and functioning effectively for more that three years prior to that time. Some additional improvements to the existing program were made at that time, as a result of that review.

The Handbook is continuously referenced by SRS, today, as the model DOE program. Although the SRS Program is not a replica of the Handbook, the inherent functional expectations of the model are consistently followed. Whenever a program policy or function is questioned by any of the SRS workgroups or departments, the Handbook is routinely referenced for program policy guidance.

Open communication with all Site workers and a commitment to continuous improvement have been identified as functional strengths of the SRS Electrical Safety Program, since it was formally implemented in 1996.

Response to NNSA request for Information in follow-up to the DNFSB Electrical Safety review. (updated 11/8/01)

Reference DNFSB letter (and attachment) 06/21/01

The DNFSB Electrical Safety review of BWXT Y-12, conducted in 2000, used the DOE Electrical Safety Handbook as a reference document. Although the DOE Electrical Safety Handbook is not contractually required for the Y-12 Complex, the handbook was used as a guidance document for the establishment of the electrical safety program and implementing management requirements (procedures) at BWXT Y-12, including the establishment of the Electrical Safety Committee, and the AHJ. The DNFSB Report identified three issues; Electrical Safety During Excavation; Authority Having Jurisdiction (AHJ) and identification of non-listed and non-compliant equipment; and the Electrical Safety Committee.

Electrical Safety During Excavation

The DNFSB identified several issues regarding excavation safety during their visit to Y-12. The excavation safety program for the plant required the review of as-built drawings to determine possible underground utilities, but the use of detection equipment was optional. In addition, the radar equipment that the plant used for detection was considered outdated technology.

Since the Defense Board visit, BWXT Y-12 has implemented the following changes:

A team was established in July, 2001 to review DOE Notice 96-06 and the Y-12 procedures for excavation safety. The team is comprised of members from the Engineering, Safety, Quality, Maintenance, Utilities, and Construction Organizations. The document review of the excavation safety procedures has been completed and concerns and issues with the current process have been identified. The team is currently making revisions to streamline the permitting process and incorporate requirements for the use of detection devices into the procedures.

Until the procedures are revised, the Manager of the Electrical Engineering Design Organization is required to review all excavation permits to ensure that the appropriate use of detection devices for field locating is conducted prior to excavation.

BWXT Y-12 (Engineering Organization) has purchased several new pieces of equipment, which are now being used for locating underground utilities on excavation work. This equipment includes a DitchWitch 75T (frequency transmitter) and two DitchWitch 75R's (frequency receiver) for locating buried telephone, power, CATV, gas, sewer and water lines. The ground penetrating radar system has been upgraded with the purchase of a new digital control unit and a new antenna. In addition, a new electronic distance meter was purchased for improved surveying, and a re-bar locator has been transferred to the Engineering Organization from the construction contractor.

AHJ Issue

During its review at LLNL, SRS and Y-12, the DNFSB observed that, although the contractors had an established AHJ program, no structured effort had been made to identify non-listed and non-compliant electrical equipment that failed to meet the acceptance criteria set forth in the DOE Electrical Safety Handbook. The board cited the fact that a preliminary review of 20 facilities at Pantex identified "more than 506" instances of non-compliant or non-listed

equipment.

The AHJ (for the National Electrical Code) position at BWXT Y-12 resides in the Maintenance Organization. This person is responsible for interpreting codes, standards, and regulations; inspecting and approving electrical equipment installations; and inspecting and approving non-listed / labeled equipment. The AHJ utilizes support from the Electrical Safety Committee and the Electrical Engineering Organization as needed. These roles and responsibilities are identified in the BWXT Y-12 Electrical Safety program document, which was revised in April 2001.

Regarding the DNFSB concern that DOE sites do not have a structured program for identifying existing non-compliant or non-listed electrical equipment:

Equipment installed in compliance with a code or standard in effect at the time of installation may not be in compliance with the current codes/standards.

The current BWXT Y-12 Electrical Safety procedure requires that all equipment purchased is to be approved by an Nationally Recognized Testing Laboratory (NRTL) if available, or by the plant AHJ. The plant's contract with the approved Electrical Equipment vendor requires that all equipment supplied is to be NRTL approved. The procedure also requires an AHJ inspection of all new electrical installations or modifications.

At this time, the plant has not undertaken a project to review / inspect all existing electrical equipment and installations to 1) identify non-compliant and non-listed equipment, 2) have the AHJ inspect and approve all non-listed equipment found, and 3) upgrade all non-compliant equipment to meet the current code (or to research when the equipment was installed to determine whether it was installed in accordance with the codes/standards in effect at the time). However, the Electrical Safety Committee is currently reviewing the non-listed / non-compliant equipment issue. The committee will develop options and recommendations that will be provided to Senior Management to review for determination of future actions.

When an electrical incident occurs at the plant, an investigation is conducted in accordance with plant requirements to determine the cause and appropriate corrective actions. This includes a review for determination of potential plant-wide trends and necessary corrective actions.

Electrical Safety Committee

The Board observed that the Electrical Safety Committees at the facilities they reviewed are primarily involved in the development of procedures and safety manuals, and not performing all the duties and responsibilities identified in the DOE Electrical Safety Handbook.

The responsibilities for the Electrical Safety Committee (ESC) identified in the DOE handbook are not performed solely by the BWXT Y-12 Electrical Safety Committee. Although the committee performs many of these tasks, the tasks in the handbook are divided between the Committee, the Safety Department, the Electrical Engineering Organization and the AHJ.

- The ESC is responsible for developing procedures, recommending and developing training, advising management of the need for funding to support electrical safety initiatives, assisting in electrical incident investigations, and communicating alerts and bulletins.
- The Safety Department establishes the ESC, assigns the Chairperson and is responsible for

the Committee charter.

- The Electrical Engineering Department is responsible for ensuring that new and modified electrical installations are designed in accordance with applicable codes and standards, and requiring AHJ approval for equipment designs when NRTL approved equipment is not available.
- The AHJ is responsible for interpretation of codes and standards, inspection and approval of new and modified electrical installations, and inspection and approval of equipment that is not NRTL approved.

The specific roles and responsibilities for each of these entities as they relate to the plant's electrical safety program are documented in the BWXT Y-12 Electrical Safety program document, which was issued in April 2001. This program document was written by the Electrical Safety Committee, which is made up of members from the Maintenance, Electrical Engineering, Power Operations, Safety, and Training Organizations, the Electrical workers union, and the plant AHJ. The new procedure clarifies the requirements for each of these groups, and Line Organizations who own electrical equipment, and replaces four existing procedures. The Committee Charter was updated in September 2001, to reflect the requirements of the new procedure.



Lawrence Livermore National Laboratory
HAZARDS CONTROL DEPARTMENT

November 14, 2001

Mr. Rich Stark, EH-53
U.S Department of Energy
19901 Germantown Road
Germantown MD 20974
FAX: 301-903-6172

Subject: LLNL's Electrical Safety Program in Light of the DNFSB Concerns

Dear Mr. Stark:

It is our understanding that EH is preparing to respond to the Defense Nuclear Facilities Safety Board (DNFSB) letters dated June 21 and April 16, 2001, concerning the electrical safety programs at several DOE sites. At the request of Pat Tran, we are providing input to you about LLNL's electrical safety program in light of the DNFSB concerns. We hope that you will find this information useful in preparing your response.

1. As stated in the April 16, 2001 memo, page 1, paragraph 2, the DOE Electrical Safety Handbook is not contractually required by DOE at defense nuclear facilities. In keeping with the intent of the handbook authors, LLNL uses this handbook as a guidance document rather than a Work Smart Standard. When our Electrical Safety Engineer was interviewed by the DNFSB on September 21, 2000, there was some discussion about this topic, and Ajit Gwal remarked that the LLNL Authority Having Jurisdiction (AHJ) structure was superior to the one recommended in the handbook.
2. The April 16th memo, page 3, paragraph 3 states, "although (LLNL) had established an AHJ program, no structured effort had been made to identify nonlisted and noncompliant electrical equipment that failed to meet the acceptance criteria set forth in the *Electrical Safety* handbook."
 - In fact, LLNL has instituted a very aggressive program to specifically address this concern. Our Electrical Safety Engineer was invited to address the DOE Electrical Safety Committee meeting at the Princeton Plasma Physics Laboratory (PPPL) on July 31, 2001, specifically about LLNL's AHJ equipment inspection program implementation and training. This session was well received by DOE and contractor representatives, and we have been contacted by several sites requesting assistance in establishing similar programs.

LLNL's Electrical Safety Program

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11/14/01

- Since September 2000, we have been delivering 40-hour AHJ field representative training to technically experienced employees who have been nominated by their Departments for this function. To date, some 50 employees have completed the training, and we expect to have approximately 40 more trained by July 2002. We have contracted with Underwriters Laboratories (UL) to provide a portion of this training.
 - LLNL Technical Release Representatives (TRRs) were briefed on August 18, 1999, on the AHJ program's impact on their processing of purchase requests. Specific NRTL language has been inserted into the LLNL Terms and Conditions by Procurement as of March 21, 2001.
 - A communication campaign is in progress to effect a staged rollout of the AHJ equipment inspection program. The rollout was announced in Newslines on June 8th, 2001, and has been reinforced in general distribution Lessons Learned bulletins, ES&H Team meetings, and Department meetings. Equipment Supervisors are responsible for checking to see whether their equipment has an NRTL label on it. If it does not, they contact a certified AHJ Field Representative, who examines the equipment and determines its acceptability. If the AHJ rejects the equipment, it must be corrected or removed from service. All inspected equipment is tracked through a secure-server web-accessed database system (LiveLink) and bar-code labels.
 - All non-NRTL equipment in LLNL Safety Significant or Safety Class nuclear facilities has been AHJ inspected and documented, as of September 12, 2001.
 - LLNL is on a five-year implementation schedule to identify and inspect all other existing non-compliant equipment. This schedule was approved by Mike Hooper of DOE OAK on July 12, 2000.
 - The Lab has dedicated approximately \$130K to the training effort thus far. In addition, support time from technical editors, programmers, instructional designers and the Program AHJ salary bring the Lab's total financial commitment to approximately \$500K.
3. Electrical Safety Committee: The memo states on page 4, final paragraph, that the LLNL electrical safety committee, known locally as the Electrical Safety Advisory Board (ESAB) is not fulfilling the roles outlined in the *Electrical Safety* handbook in seven specific areas. Even though the *Electrical Safety* handbook is not an adopted Work Smart Standard, the ESAB actively fulfills each of the named functions, as follows:
- "*Presents management with the requirements and training needed to implement the electrical safety program.*" The ESAB is specifically chartered to determine electrical safety training requirements and to approve electrical safety training curricula. The new AHJ field representative training, for example, is a product of a subcommittee of the ESAB (the AHJ Working Group), led by the Program AHJ, and staffed by members of the ESAB,

LLNL's Electrical Safety Program

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11/14/01

including the chair and the secretary. The working group meets weekly and reports to the ESAB at each monthly ESAB meeting.

- *"Advises management of the need to fund and support these requirements."* The ESAB reports through the ES&H Working Group. Senior management has been responsive to support of the electrical safety mission. (See above description of resource commitment to the AHJ program.)
- *"Maintains and assists in the implementation of the electrical safety program."* This is the primary function of the ESAB. It reviews all policy documents and actively incorporates the requirements of the cross-section of Lab activities into a singular program.
- *"Develops and maintains the electrical safety manual."* This is done by the ESAB. The LLNL Electrical Safety Manual is comprised of four chapters contained in the LLNL ES&H manual. They are:
 - 16.1 Electrical Safety
 - 16.2 Work and Design Controls for Electrical Equipment
 - 16.3 LLNL AHJ Requirements for Approving Electrical Equipment, Installations, and Work
 - 12.6 LLNL Lockout / Tagout Program
- *"Assists the departments by interpreting the electrical requirements of DOE Orders, criteria, and guides, as well as other codes, standards, and practices."* This is primarily a function of the Building and Program AHJs, but they both sit on the ESAB, and the decisions are made with committee input.
- *"Maintains a copy of each interpretation given."* All interpretations are kept on the AHJ LiveLink database for easy access by field representatives, DOE personnel, and interested employees.
- *"Publishes electrical safety bulletins."* These are issued by the ESAB and released in Lessons Learned format. The Lessons Learned are distributed Lab-wide.

I hope you find this information helpful in formulating your response. Please do not hesitate to contact our Electrical Safety subject matter expert, Keith Gershon, or me if you need further assistance.

Sincerely,



James O. Jackson
Department Head
Hazards Control Department

NOV-27-2001 TUE 01:59 PM

FAX NO. 9254225270

P. 05/05

LLNI's Electrical Safety Program

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11/14/01

JOJ/kdg/agm: HC-SPD-01-009

cc:

Gary Dreifuerst

Rebecca A. Failor

Keith Gershon

Phil Hill, NNSA/OAK

Steve Leeds

Pat Tran

02 - 1740

DNFSB Staff Issue Report
on
Electrical Safety Program
At the
Pantex Plant

DNFSB staff conducted an evaluation of the Pantex Plant Electrical Safety Program in March 2000 as part of a review of the Department's of Energy's Electrical Safety Program at multiple sites. In June 21, 2001, the DNFSB issued a letter to the Secretary of Energy forwarding the Staff Issue Report dated April 16, 2001 containing the specific observations from the site reviews. These observations were focused in the areas of Electrical Safety during Excavation, Authority Having Jurisdiction (AHJ), and the Electrical Safety Committee. The following paragraphs provide the status of actions being taken at the Pantex Plant to address the concerns documented in the DNFSB Staff Issue Report.

Issue 1- Electrical Safety during Excavation

The report identified the following:

“The staff has observed numerous examples of electrical cables/conduits being struck or cut during excavation activities at DOE sites. A search of DOE occurrence reports revealed multiple such occurrences at sites in the defense nuclear complex, including SRS, the Hanford Site, the **Pantex Plant** (emphasis added)...”. “The Board's staff believes such accidents could be minimized or avoided by the detection of underground utilities immediately before excavations are performed and by the conduct of thorough work planning. Locations of underground utilities need to be adequately identified using as-built drawings, subsurface radar, and a magnetometer.” “At Pantex, in particular, existing detection equipment is not capable of adequately detecting the location of underground utilities. The Board's staff encouraged Pantex to evaluate alternate detection equipment (such as subsurface radar detection systems) and to adhere strictly to the recommendations of DOE Safety Notice 96-06.”

Response:

Responsible managers from the Pantex Plant concur with the statement that electrical safety during excavations can be enhanced by the “detection of underground utilities immediately before excavations are performed and by the conduct of thorough work planning.” Therefore, Pantex uses these approaches to ensure this type of work is performed safely. For example, Pantex uses detection equipment that utilizes radio frequency to detect underground utilities. Experience with this equipment indicates that it has the capability to reliably detect underground utilities. Further, work planning for excavations at the Pantex Plant is performed in a thorough manner that includes referencing as-built drawings, identifying underground utilities with detection equipment, and marking utilities prior to the performance of work. These evolutions are done in a

controlled manner using documented work control processes and procedures to ensure the work is done safely.

Operating experience at Pantex confirms the adequacy of existing processes for electrical safety during excavation and compliance with the guidance in DOE Safety Notice 96-06, "Underground Utilities Detection and Excavation." During the time period of January 1998 through November 1, 2001, Pantex utility locators have detected and located 7,700 utilities. The number of cut utilities was 16; however, only two of these cut utilities were unmarked. The remaining 14 cut utilities were marked but were encountered during hand excavation with picks and a shovel. The number of hazardous lines encountered was 23 of .0003 percent of the total lines detected. More recent experience indicates zero cut utilities from the time period of January 2000 through November 2001. Therefore, operating experience indicates that utilities are adequately detected but are sometimes encountered during uncovering the utility.

In response to discussions with DNFSB Staff on subsurface radar detection systems, Pantex personnel performed an evaluation of the potential application ground penetrating radar (GPR) at the site. This evaluation included detailed conversations with manufactures of this type of equipment and demonstrations of this type of equipment at the Pantex Plant. The results of this evaluation indicated that GPR does not have the ability to penetrate the soils at the Pantex Plant to the depth necessary to reliably detect underground utilities. This type of technology does not perform well with the soil conditions at the Pantex Plant that consists of lean to heavy clays. In these types of conditions, GPR can only detect to shallow distances (a couple of inches). Although GPR does not appear to be applicable for use at the Pantex Plant, BWXT Pantex personnel will continue to search for improvements in detection equipment.

Issue 2 – Authority Having Jurisdiction

The report indicated the following:

"... The AHJ is responsible for interpreting codes as well as regulations and standards, and for approving electrical equipment, site assembled electrical equipment, and materials. At Pantex, the program for the contractor's electrical AHJ has not been fully implemented. Issues associated with this program include the lack of appropriate resources to fulfill AHJ responsibilities and a multiyear delay in addressing DOE's findings related to the program. The staff is concerned that the lack of an adequate AHJ function has impacted Pantex's ability to address existing electrical equipment that is nonlisted or not in compliance with NFPA 70. A preliminary review of approximately 20 facilities by Pantex personnel revealed more than 506 instances of noncompliant or nonlisted equipment. Included are such items as emergency lights, transformers, switches, heater elements, and power supplies..."

Response:

Responsible personnel at the Pantex Plant have taken positive steps to fully implement the Electrical Authority Having Jurisdiction (EAHJ) program. A plant standard has been developed and approved to institutionalize the scope of the program as well as the roles and responsibilities for its full execution. Also, a procedure has been established with shipping and receiving to evaluate and label all new electrical equipment prior to releasing it to the Plant. In addition, a Performance Based Incentive (PBI) has been established to have BWXT Pantex complete EAHJ surveys of in all outstanding facilities to identify all Nationally Recognized Testing Laboratory (NRTL) and non-NRTL items, and to label these electrical components or log them into a non-NRTL data base as appropriate. The scope of the PBI also includes the disposition of the backlog non-NRTL equipment. Full incentive fee is earned if BWXT Pantex completes all identify facility surveys (300 buildings) and dispositions 1000 items. It is anticipated that Performance Based Contracting tools will continue to be pursued until the identified non-NRTL backlog is fully addressed. These actions will ensure that electrical components in Pantex Plant facilities are listed or accepted by the EAHJ, and that future electrical components being introduced into facilities are listed or accepted.

Issue 3 – Electrical Safety Committee

The report indicated the following:

“The Board’s staff has observed that the ESCs at Pantex, Y-12, LLNL, and SRS are involved primarily in the development of procedures and portions of the safety manual and are not performing all the duties and responsibilities set forth in Appendix A of the *Electrical Safety* handbook. Weaknesses in electrical safety can potentially impact any activity or facility function, as virtually everyone is exposed to electrical hazards. The staff believes the role of the ESC at DOE sites needs to be strengthened.”

Response:

The scope of the Electrical Safety Committee (ESC) at the Pantex Plant has been expanded to include functions that are recommended by the Electrical Safety Handbook. For example, the Pantex Plant ESC performs the following functions: (1) develops and maintains the electrical safety manual, (2) provides interpretations of electrical requirements and maintains a copy of each interpretation given, (3) publishes electrical safety bulletins, (4) serves as an advisory group to the EAHJ, (5) provides feedback and improvement on the Electrical Safety Program, and (6) publishes electrical safety article in various plant periodicals.

Electrical safety requirements are specified in the Occupational Safety & Health Section of the Hazards Control Standards / Requirements Identification Document (S/RID). This S/RID is incorporated into the Management and Operating (M&O) Contractor contract for the Pantex Plant to form a binding, contractual agreement on the standards based

criteria (e.g., NPFA 70, 29 CFR 1910.303) that will be instituted to effectively control electrical hazards. The intent of the specified criteria is to define what is expected to achieve the desired result for the electrical safety program. The application and use of the Electrical Safety Committee as defined in the Electrical Safety Handbook defines a recommended approach of how to help achieve the desired results for the program. The existing requirements electrical safety are adequate because they define the desired result rather than the performance based actions to achieve this result which are under the purview of the Contractor and are obtained through Performance Based Contracting.