



Department of Energy
Washington, DC 20585

April 3, 2009

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Thad M. Corbett
Vice President
Pacific Underground Construction, Inc.
1817 Stone Avenue
San Jose, California 95125

WEA-2009-02

Dear Mr. Corbett:

This letter refers to the Department of Energy's (DOE) Office of Health, Safety and Security's Office of Enforcement investigation into the facts and circumstances associated with the September 13, 2007, polyvinyl chloride (PVC) pipe explosion that occurred in Sector 30 of the linear accelerator facility at the SLAC National Accelerator Laboratory (SLAC). The results of the on-site investigation were provided to you in an Investigation Report dated July 23, 2008, and an enforcement conference was held on September 18, 2008, at SLAC. A summary of the conference is enclosed.

Based on our evaluation of the evidence in this matter, including information presented during the enforcement conference, DOE has concluded that violations of 10 C.F.R. Part 851, *Worker Safety and Health Program*, by Pacific Underground Construction, Inc., (Pacific Underground) have occurred.

DOE views this event as highly significant in that the explosion could have resulted in fatalities or severe injuries far exceeding the temporary hearing loss reported by one worker. These consequences were averted only by circumstance and timing. As the General Construction Subcontractor for the underground utilities replacement work, your company was responsible for proper execution of the work associated with the Safety and Operational Reliability Improvements project in Sector 30 of the linear accelerator facility. This included a responsibility for ensuring safe working conditions not only for your employees but also those subcontractor employees performing work pursuant to a contract with your company.

It was evident from the enforcement conference that you failed to understand these responsibilities. This breakdown was further indicated by your company's failure to review the accuracy and completeness of submissions from your subcontractor, which included safety-related work planning and hazard control documents, before submittal to

SLAC. This review was required by SLAC's contract terms and conditions. Your reliance on SLAC's approval process represented a neglect of your safety responsibilities as the General Construction Subcontractor. Your failure to ensure that the subcontractor was familiar with applicable worker safety and health requirements and standards also represents a major cause of concern. DOE further observed during the enforcement conference that you continue to lack a thorough understanding of your roles and responsibilities for safety as a contractor performing work at SLAC.

Based on the self-disclosing nature of the violations following the pipe explosion and Pacific Underground's failure to institute any corrective actions to preclude recurrence of this type of event or the violations, DOE has determined that no mitigation is warranted. Furthermore, DOE could have chosen to cite Pacific Underground for multiple violations of 10 C.F.R. Part 851 as reflected in the enclosed Preliminary Notice of Violation (PNOV). However, DOE elected to group the violations into one Severity Level I violation and reduce the base civil penalty amount in consideration of the size of your company and the role of other contractors in contributing to the circumstances that allowed these violations to occur. The resulting proposed civil penalty is \$42,000.

Pursuant to 10 C.F.R. § 851.42, *Preliminary Notice of Violation*, you are obligated to submit a written reply within 30 calendar days of receipt of the enclosed PNOV, and to follow the instructions specified in the PNOV when preparing your response. If no reply is submitted within 30 days, in accordance with 10 C.F.R. § 851.42(d)(2), this PNOV will constitute a final order. After reviewing your response to the PNOV, including any proposed additional corrective actions entered into DOE's Noncompliance Tracking System, DOE will determine whether further action is necessary to ensure compliance with DOE worker safety and health requirements. DOE will continue to monitor the completion of corrective actions until these matters are resolved.

Sincerely,



John S. Boulden III
Acting Director
Office of Enforcement
Office of Health, Safety and Security

Enclosure

cc: Patricia Dehmer, SC-1
Paul Golan, SSO
Richard Azzaro, DNFSB

Preliminary Notice of Violation

Pacific Underground Construction, Inc.
SLAC National Accelerator Laboratory

WEA-2009-02

As a result of the Department of Energy's (DOE) investigation into the facts and circumstances associated with the polyvinyl chloride (PVC) pipe explosion that occurred in Sector 30 of the linear accelerator facility at the SLAC National Accelerator Laboratory (SLAC) on September 13, 2007, multiple violations of DOE worker safety and health requirements by Pacific Underground Construction, Inc. (Pacific Underground) were identified.

The violations involved deficiencies in construction safety, fire protection, and adherence to general requirements and procedures. Although multiple violations were identified, DOE elected to group the violations into one Severity Level I violation. DOE further chose to reduce the base civil penalty for this violation in consideration of the size of your company and the role of other parties in contributing to the conditions that allowed the violations to occur. The proposed civil penalty is \$42,000.

In accordance with 10 C.F.R. Part 851, Appendix B, *General Statement of Enforcement Policy*, the grouped violation is outlined below with the noncompliances organized by safety area.

VIOLATION

I. Construction Safety

Title 10 C.F.R. § 851.24, *Functional areas*, requires that “[c]ontractors must have a structured approach to their worker safety and health program which at a minimum, include provisions for...construction safety” and that “[c]ontractors must comply with the applicable standards and provisions in Appendix A of this part, entitled ‘Worker Safety and Health Functional Areas’.”

Appendix A, Section 1, *Construction Safety*, states that “[f]or each separately definable construction activity (e.g., excavations, foundations, structural steel, roofing), the construction contractor must: [p]repare and have approved by the construction manager an activity hazard analysis prior to commencement of affected work. Such analyses must: [i]dentify foreseeable hazards and planned protective measures...” This section

further states that the construction contractor must “[e]nsure workers are aware of foreseeable hazards and the protective measures described within the activity analysis prior to beginning work on the affected activity.”

Appendix A, section 1(d), states that “[t]he construction contractor must prepare a written construction project safety and health plan to implement the requirements of this section and obtain approval of the plan by the construction manager prior to commencement of any work covered by the plan. In the plan, the contractor must designate the individual(s) responsible for on-site implementation of the plan, specify qualifications for those individuals, and provide a list of those project activities for which subsequent hazard analyses are to be performed.”

Contrary to these requirements, Pacific Underground, as a construction contractor, failed to ensure that its subcontractor, Western Allied Mechanical, Inc. (Western Allied), developed a construction project safety and health plan and activity hazard analysis to effectively implement the requirements of appendix A, section 1. The site-specific safety plan (SSSP) and job safety analysis (JSA) prepared by Western Allied did not adequately identify and assess the hazards associated with the piping replacement work being conducted in Sector 30 or establish controls necessary to eliminate or abate those hazards to protect workers. Specific examples are listed below:

- A. The “Sub Contractor Site Specific Health & Safety Plan Form” for the “SLAC Underground Utilities Upgrade” project prepared by Western Allied as its SSSP did not identify any project activities for which subsequent hazard analyses would be performed. The form contained only generic information regarding the scope of work to be performed and the associated hazards and hazard controls that would be implemented relative to the work. The form also did not specify the qualifications of the individual designated as responsible for oversight and implementation of daily operations conducted under the plan.
- B. The JSA prepared by Western Allied for the piping replacement work, “CTW Piping Replacement – Sectors 21 thru 30,” dated September 4, 2007, did not identify foreseeable hazards and appropriate protective measures associated with the work to be performed. Pacific Underground representatives, including the project foreman, periodically reviewed the JSA as evidenced by their signatures on the JSA as part of daily sign-in expectations. These reviews failed to ascertain the following:
 - The JSA identified “solvents & cements” as potential hazards and “PVC solvent/cement” as a hazardous material that would be used at the job site. The JSA failed to identify the following properties and precautions for use of those materials as identified on (1) the material safety data sheet (MSDS) for IPS Weld-On solvent cement for PVC plastic pipe, dated April 2007; (2) the MSDS for IPS Weld-On adhesive primer for plastic, dated June 2007; and (3) the IPS Weld-On PVC 2711 plastic pipe cement product label:
 - A flammability rating of 3

- Keep away from heat, sparks, open flame, and other sources of ignition
 - Vapors may ignite explosively
 - Use with adequate ventilation.
- The JSA listed “cutting and torching of bolts” as a phase of work/job step and “static electricity and sparks” as potential hazards. The analysis failed to consider the potentially explosive conditions created by the combination of ignitable vapors from the PVC primer and cement, an enclosed space (i.e., sealed piping system), and the application of heat to the carbon steel piping attached to the PVC piping. The work documents and SSSP for the project did not identify the need to install a pressure gauge in the piping system so that required pressure testing could be performed. The JSA did not identify the task of cutting into and welding on the newly installed carbon steel piping to install a pressure gauge.

II. Fire Protection

Title 10 C.F.R. § 851.23, *Safety and health standards*, requires compliance with 29 C.F.R. Part 1926, *Safety and Health Regulations for Construction*. Section 1926.352(i) states that “[d]rums, containers, or hollow structures which have contained toxic or flammable substances shall, before welding, cutting, or heating is undertaken on them, either be filled with water or thoroughly cleaned of such substances and ventilated and tested.”

Title 10 C.F.R. § 851.24, *Functional areas*, requires that “[c]ontractors must have a structured approach to their worker safety and health program which at a minimum, include provisions for ... fire protection” and that “[c]ontractors must comply with the applicable standards and provisions in Appendix A of this part, entitled ‘Worker Safety and Health Functional Areas.’” Appendix A, Section 2, *Fire Protection*, states that “[c]ontractors must implement a comprehensive fire safety and emergency response program to protect workers commensurate with the nature of the work that is performed,” and that “[a]n acceptable fire protection program ... includes meeting applicable building codes and National Fire Protection Association [NFPA] codes and standards.”

National Fire Protection Association (NFPA) 51B, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work*, 2003 edition, establishes the following provisions:

- Section 4.1.6 states that “[m]anagement shall ensure that all individuals involved in the hot work operations, including contractors, are familiar with the provisions of [NFPA 51B].”
- Section 4.1.6.2 states that “[i]ndividuals involved in hot work operations shall have an awareness of the inherent risks involved...”
- Section 4.1.7 states that “[m]anagement shall advise all contractors about site-specific flammable materials, hazardous processes or conditions, or other potential fire hazards.”

- Section 5.1.1 states that “[h]ot work shall be permitted only in areas that are or have been made fire safe.”
- Section 5.2(4) states that “[h]ot work shall not be permitted...[i]n the presence of uncleaned or improperly prepared drums, tanks, or other containers and equipment that have previously contained materials that could develop explosive atmospheres.”

Section 1.1.2 of NFPA 51B requires compliance with American National Standards Institute (ANSI) Z49.1, *Safety in Welding, Cutting, and Allied Processes*. ANSI Z49.1, 2005 edition, establishes the following provisions:

- Section 3.2.1.2 states that “[m]anagement shall assure that hazards and safety precautions are communicated to and understood by workers prior to the start of work.”
- Section 3.2.1.3 states that “[m]anagement shall assure that the individual is aware of the hazards involved and familiar with the provisions of [ANSI Z49.1].”
- Section 3.2.1.5 states that “[m]anagement shall select contractors to perform welding...who have an awareness of the risks involved” and that “[m]anagement shall advise contractors about flammable materials or hazardous conditions that are specific to the job site.”

Contrary to these requirements, Pacific Underground failed to ensure that appropriate welding and cutting fire safety control measures were implemented during the replacement of the old transite piping system in Sector 30 of the linear accelerator facility. Pacific Underground also failed to ensure that Western Allied employees were adequately trained in and familiar with applicable regulatory requirements and hazard controls for performing hot work safely. Specific examples are listed below:

- A. Pacific Underground failed to ensure that required work control measures, such as purging or cleaning the pipes and monitoring for vapor buildup, were implemented to protect workers from the flammable and explosion hazards associated with performing hot work on a system containing ignitable vapors.
- B. Pacific Underground failed to ensure that Western Allied employees were familiar with the provisions of NFPA 51B and ANSI Z49.1. Western Allied employees interviewed during the Office of Enforcement’s investigation were not familiar with these standards or the requirements contained therein.
- C. Pacific Underground failed to ensure that Western Allied was cognizant of the potential flammable and explosion hazards associated with performing hot work on piping that could contain ignitable vapors. Pacific Underground also failed to confirm that Western Allied had established provisions and undertook measures to ensure employee protection from such hazards. Western Allied employees have

previously performed pipefitting work with carbon steel at SLAC. The welder performing the hot work on September 13, 2007, however, had no experience working with a piping configuration comprised of different materials (ductile iron, PVC, and steel) such as the one used in the underground utilities upgrade in Sector 30 of the linear accelerator facility.

III. General Requirements

Title 10 C.F.R. § 851.10, *General requirements*, states that “the contractor must: [e]nsure that work is performed in accordance with: (i) [a]ll applicable requirements of [Part 851]; and (ii) [w]ith [sic] the worker safety and health program for that workplace.”

The *SLAC Worker Safety and Health Program Description* (SLAC-I-720-0A21B-001-R000), dated February 2007, is applicable to all subcontractors at SLAC except those hired directly by DOE. That program description incorporates by reference the latest version of Chapter 42, *Subcontractor Construction Safety*, of the *SLAC Environment, Safety, and Health Manual*. The following refers to requirements in chapter 42 dated June 1, 2007.

- Section 5.1.2.4 states that “[s]ubcontractors are required to submit a site-specific safety plan (SSSP)” and that the SSSP must “[d]escribe the system used to ensure personnel will comply with safe and healthy work practices including [s]afety indoctrination and safety meetings, [w]orker training in hazard recognition, [d]isciplinary policy, and [d]escribe the system used to communicate with personnel, including notification of hazards.”
- Section 5.1.2.5 states that “JSAs must be prepared and reviewed at the start of any on-site work and any new phase or task and will be reviewed daily.”
- Section 5.1.3.3 requires that “subcontractors must perform daily inspections of activities and work sites relevant to the work being performed that day to ensure that the subcontractor is working within identified controls and has effectively controlled identified hazards....” This section further states that “[a]ll inspections, findings, and corrective measures must be documented and be available for review...” and that “[t]he daily inspection records must be kept at the job site.” This section also states that “[t]he subcontractor’s competent person will conduct regular inspections of the work place and maintain a log certifying compliance with accepted safe work conditions.”
- Section 5.1.9.8 lists as a key responsibility for the subcontractor (i.e., Pacific Underground) “[t]akes primary responsibility for the safety of their personnel, their [subcontractors] (i.e., Western Allied), and their equipment.”

Contrary to these requirements, Pacific Underground failed to execute its responsibilities for safe work performance and failed to ensure that Western Allied performed work in

accordance with SLAC's approved Worker Safety and Health Program and associated implementing procedures. Specific examples are listed below:

- A. Pacific Underground did not document the results of safety inspections for the work performed by Western Allied. Pacific Underground also failed to ensure that Western Allied performed and documented safety inspections for work conducted in Sector 30 of the linear accelerator facility.
- B. Pursuant to the general terms and conditions of its contract with Stanford University, Pacific Underground did not review the SSSP submitted by Western Allied to Stanford University for approval to ensure that it met the requirements of chapter 42, section 5.1.2.4 described above.
- C. The JSA applicable to the utilities upgrade work performed by Western Allied did not identify the task of installing a pressure gauge in the carbon steel pipe. Although this task was reportedly discussed during a tailgate meeting on the day of the explosion, Pacific Underground failed to ensure that a new JSA was prepared or the existing JSA was modified to reflect this new task.

Collectively, these deficiencies constitute a Severity Level I violation. As explained in 10 C.F.R. Part 851, appendix B, section VI(b)(1), “[a] Severity Level I violation is a serious violation. A serious violation shall be deemed to exist in a place of employment if there is a potential that death or serious physical harm could result from a condition which exists, or from one or more practices, means, methods, operations, or processes which have been adopted or are in use in such place of employment.”

Proposed Civil Penalty - \$42,000

REPLY

Pursuant to the provisions of 10 C.F.R. § 851.42, Pacific Underground is hereby obligated, within 30 calendar days of receipt of this Preliminary Notice of Violation (PNOV), to submit a written reply. Please send such reply by overnight carrier to the following address:

Director, Office of Enforcement
Attention: Office of the Docketing Clerk
U.S. Department of Energy
19901 Germantown Road
Germantown, MD 20874-1290

Copies should also be sent to the Under Secretary for Science and the Manager of the SLAC Site Office. This reply should be clearly marked as a “Reply to the Preliminary Notice of Violation” and must include the following for each violation: (1) any facts, explanations and arguments that support a denial that the violation has occurred as alleged; (2) any extenuating circumstances or other reason why the proposed remedy

should not be imposed or should be mitigated; and (3) a discussion of the relevant authorities that support the position asserted, including rulings, regulations, interpretations, and previous decisions issued by DOE. Copies of all relevant documents shall be submitted with the reply. Corrective actions that have been or will be taken to avoid further violations should be delineated with target and completion dates in DOE's Noncompliance Tracking System.

Pursuant to 10 C.F.R. § 851.42(d), if Pacific Underground does not submit a written reply within 30 calendar days of receipt of this PNOV, Pacific Underground relinquishes any right to appeal any matter in this Notice and this PNOV will constitute a final order. If Pacific Underground agrees to comply with the proposed remedy and waives any right to contest the PNOV, the penalty of \$42,000 must be paid within 30 calendar days after receipt of this PNOV by check, draft, or money order payable to the Treasurer of the United States (Account 891099) and mailed to the Acting Director, Office of Enforcement, Attention: Office of the Docketing Clerk, at the above address. In such cases, this PNOV will constitute a final order upon the filing of the reply. Pacific Underground may be required to post a copy of this PNOV in accordance with 10 C.F.R. § 851.42(e).



John S. Boulden III
Acting Director
Office of Enforcement
Office of Health, Safety and Security

Washington, DC
this 3rd day of April 2009

Pacific Underground Construction, Inc.
SLAC National Accelerator Laboratory Polyvinyl Chloride Pipe Explosion

Enforcement Conference Summary

On September 18, 2008, the Department of Energy's (DOE) Office of Health Safety and Security's Office of Enforcement held an enforcement conference with Pacific Underground Construction, Inc. (Pacific Underground) at the SLAC National Accelerator Laboratory (SLAC) in Menlo Park, California. The conference was held to discuss potential violations identified in the Office of Enforcement Investigation Report issued to Pacific Underground on July 23, 2008, involving the September 13, 2007, polyvinyl chloride (PVC) pipe explosion that occurred at SLAC.

Ms. Martha Thompson, Acting Director, Office of Enforcement, presided over the conference. Following introductions by the attendees, Ms. Thompson provided an overview of the conference's purpose and objectives.

Mr. Thad Corbett, Pacific Underground Vice President, stated that during the project bid process, his company prepared and submitted documents to the prime contractor, Stanford University, as required by the SLAC General Terms and Conditions for construction subcontracts. Mr. Corbett further stated that Pacific Underground's subcontractor, Western Allied Mechanical Inc., (Western Allied) also submitted its documents directly to Stanford University and that he believed the submissions were acceptable based on Stanford University's approval of them. He indicated that it was his company's responsibility to dig the trench and make the trench safe to enter, but it was Western Allied's responsibility to purge and clean the pipes before working on them. Mr. Corbett stated that Pacific Underground personnel reviewed the job safety analysis (JSA) as evidenced by their daily signatures on the JSA. Mr. Corbett also indicated that Pacific Underground completed an incident report as required after the pipe explosion.

Mr. Corbett acknowledged SLAC's efforts to improve communications with and training of subcontractors, and indicated that he has increased his presence at the worksite through weekly site visits. He also noted that a combined Pacific Underground and Western Allied site-specific safety plan was submitted to SLAC following the pipe incident. Mr. Corbett stated that he now has a better understanding of the significance of employee signatures on the JSA.

Ms. Kathy McCarty, Director, Office of Worker Safety and Health Enforcement, summarized the Office of Enforcement deliberation process. Ms. Thompson then adjourned the conference.

**Pacific Underground Construction, Inc.
SLAC National Accelerator Laboratory Polyvinyl Chloride Pipe Explosion
Enforcement Conference List of Attendees**

September 18, 2008

DOE – Office of Enforcement

Martha Thompson, Acting Director
Kathy McCarty, Director, Office of Worker Safety and Health Enforcement
Leslie Bermudez, Enforcement Officer
Richard Day, Enforcement Officer
Raul Bhat, Legal Advisor

DOE – SLAC Site Office

Paul Golan, Manager
Thomas Rizzi, Safety Team Lead
Donald Wilhelm, Safety Engineer

Pacific Underground Construction, Incorporated

Thad Corbett, Vice President

SLAC National Accelerator Laboratory

Craig Ferguson, Director, Environment, Safety and Health Division