

# LBNL

## Construction Safety Manual



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## Acronyms

ACGIH – American Conference of Governmental Industrial Hygienists  
ACM – Asbestos-Containing Material  
AL – Action Level  
ALARA – As Low As Reasonably Achievable ANSI  
– American National Standards Institute ASME –  
American Society of Mechanical Engineers  
ASTM – American Society for Testing and Materials  
BBP – Blood Borne Pathogen  
BMPs – Best Management Practices  
CEHSP – Construction Environmental Health and Safety Plan  
CFR – Code of Federal Regulations  
CPR – Cardiopulmonary Resuscitation  
CSE – Confined Space Entry  
CWA – Clean Water Act  
dB – decibels  
dBA – decibels, A-weighted scale  
FM – Factory Mutual  
EHS – Environment/Health/Safety Division  
EPA – Environmental Protection Agency  
ES&H Environment, Safety & Health (the discipline)  
ESWP – Electrical Safe Work Permit  
FHA – Fall Hazard Analysis  
GFCI – Ground Fault Circuit Interrupter  
HAZCOM – Hazard Communication  
HCP – Hazard Communication Program  
HEPA – High Efficiency Particulate Absolute  
HPD – Hearing Protection Device  
H&R – Hoisting and Rigging  
IH – Industrial Hygiene  
IPT – Integrated Project Team  
JHA - Job Hazards Analysis  
LOTO – Lockout /Tagout  
mA – milliamps  
MSDS – Material Safety Data Sheet  
NEPA – National Environmental Policy Act  
NFPA – National Fire Protection Association  
OEL – Occupational Exposure Limit  
OSHA – Occupational Safety and Health Act, or Occupational Safety and Health Administration  
PFAS – Personal Fall Arrest System  
POC – Point of Contact

POD – Plan of the Day  
PPE – Personal Protective Equipment  
PTHA- Pre-Task Hazard Analysis  
RCRA – Resource Conservation and Recovery Act  
RFP – Request for Proposal  
RSO – Radiation Safety Officer  
SLM – Sound Level Meter  
SWPPP – Storm Water Pollution Prevention Plan  
TLV – Threshold Limit Value  
TWA – Time Weighted Average  
UL – Underwriter’s Laboratory  
USC – United States Code

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## 1.0 Introduction

The Construction Safety Requirements Manual (hereafter referred to as “this Manual”) has been developed to identify the minimum requirements for Construction Subcontractors and their lower-tier subcontractors (hereafter referred to as “Subcontractor”) which require personnel to perform construction activities at Lawrence Berkeley National Laboratory (hereafter referred to as “Berkeley Lab” or “LBNL”) sites.

### 1.1 Background

It is LBNL policy that all Construction Subcontractors must provide a safe and healthful workplace for their personnel. Each Subcontractor is responsible for ensuring compliance with “all applicable requirements” that govern their work at LBNL facilities, including any consensus standards incorporated therein by reference.

### 1.2 Definitions

**Competent Person:** One who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt, corrective measures to eliminate those conditions. A Competent Person is also one who has extensive training/knowledge/experience in a particular activity or job function. A Competent Person at LBNL must be capable of demonstrating the “knowledge and skill-sets” that match their “Competent Person” designation.

**Construction Activity:** Any combination of erection, installation, assembly, demolition, or fabrication activities involved to create a new facility or to alter, add to, rehabilitate, dismantle, or remove an existing facility. It also includes the alteration and repair (including dredging, excavating, and painting) of buildings, structures, or other real property, as well as any construction, demolition, and excavation activities conducted as part of environmental restoration or remediation efforts.

**Construction Subcontractor:** A person, corporation, or other entity, other than the prime contractor (LBNL), who furnishes labor, supplies, materials, equipment, or services under a construction or similar contract with LBNL including a task order agreement. A Construction Subcontractor's site tenure may vary depending on the nature of the project, and its employees are not considered a permanent construction workforce.

**Construction Subcontractor Safety Orientation Checklist:** An LBNL form used to document the project-relevant Environment, Safety & Health (ES&H) information conveyed to the Construction Subcontractor at the pre-construction orientation meeting. The Construction Subcontractor then has the responsibility to ensure that the content covered in the checklist/orientation is effectively flowed down to all of their employees and their lower-tier subcontractors prior to the start of any work.

**Construction Environmental Health and Safety Plan (CEHSP):** A document prepared by the Construction Subcontractor and submitted to the LBNL Environment/Health/Safety (EHS) Division for review and by the LBNL Project/Construction Manager for comment resolution and concurrence. Describes the Construction Subcontractor's Environment, Health & Safety Plan for a particular construction project and Job Hazards Analysis for each definable activity/feature of work.

**Construction Project/ Construction Manager (LBNL).** LBNL-delegated representative authorized to approve and accept work, provide technical liaison, and interpret LBNL plans and specifications on behalf of LBNL.

**Job Hazards Analysis (JHA):** A work control document that identifies the work tasks, hazards, and controls of the overall project and provides the basis for the development of the site-specific CEHSP.

**Subcontractor Safety Officer:** An employee of the Construction Subcontractor at the work site who is responsible for assisting in the implementation of the Construction Subcontractor's safety plan and compliance with applicable laws and regulations. The qualifications of the subcontractor's Safety Officer must be listed in the subcontractor's Construction Environment, Health & Safety Plan. For some projects, the project specifications may dictate that the Subcontractor have the full-time on-site services of a more highly qualified individual (e.g., Construction Health and Safety Technician, Certified Safety Professional, Certified Industrial Hygienist).

**Graded Approach:** Applying a level of rigor commensurate with the importance or significance of the activity, in relation to the associated hazards and consequences to ensure that available resources are used most efficiently and effectively.

**Hold Point:** A point of defined circumstances (i.e. needing to obtain an Excavation Permit) beyond which a construction activity must not proceed without the approval of a designated authority.

**Imminent Danger:** A condition or practice that could reasonably be expected to cause death or serious injury, severe property damage, or environmental impairment unless immediate actions are taken to mitigate the effects of the hazard created.

**Qualified Person:** One who by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated an ability to solve or resolve problems relating to the subject matter, the work, or the construction project.

**Subcontractor Administrator:** An LBNL employee who is authorized to award and administer a subcontract on behalf of LBNL.

**Surface Penetration** is defined as an opening made by drilling, cutting, hammering, or otherwise piercing a wall, floor, ceiling, or roof.

**Worker:** A leased worker, subcontractor, independent contractor/consultant, or other individual providing construction services to LBNL or working on LBNL sites.

## **1.3 Layout and Use of this Manual – Important Information**

### **1.3.1 Scope**

This Manual contains excerpts from, and references to, numerous regulations, codes, and standards, which are not presented in their entirety. Similarly, not all Environment, Safety & Health (ES&H) subject matter is covered in this Manual. Each Subcontractor is responsible for ensuring compliance with “all applicable requirements” that govern their work at LBNL facilities, including any consensus standards incorporated therein by reference. If the manual does not contain information relative to a particular ES&H topic, the Subcontractor must ensure that the governing regulatory provisions or national consensus standards as applicable are implemented as part of their project's CEHSP Plan.

### **1.3.2 Layout of this Manual**

The chapters in this Manual are arranged according to topic area and, in general, are laid out in the same format. The chapter will identify who the requirements apply to, the broad regulatory drivers and the Subcontractor's responsibilities pertaining to the specific subject area.

Each chapter will also identify any requirements that are specific to the LBNL site. Also presented in each chapter are issues of special emphasis that LBNL has identified or for which additional risk control mechanisms are required (i.e. – safety plans that must be submitted for review and approval by the LBNL EHS Division, or permits that must be obtained prior to performing work, etc.).

**It is the responsibility of the Subcontractor to know, understand, and plan for LBNL-specific requirements or special-emphasis programs.** The LBNL-specific requirements may affect what the Subcontractor includes in its Job Hazards Analysis, impact how the Subcontractor conducts its work, or may affect the project schedule.

## **2.0 Program Policy**

### **2.1 Applicability**

The requirements of this section apply to all Construction Subcontractors and lower-tier subcontractors (hereafter referred to as “Subcontractor”) performing construction activities on the LBNL site.

This section identifies requirements with which the Subcontractor’s ES&H policies must comply in order to provide all employees a safe and healthful workplace while also protecting the environment.

### **2.2 Regulatory Requirements**

The LBNL facilities are University of California or leased facilities and subject to Occupational Safety and Health Act (OSHA) and other worker safety and health requirements as identified below:

- Title 29 CFR, Parts 1904.4 through 1904.11, 1904.29 through 1904.33; 1904.44, and 1904.46, “Recording and Reporting Occupational Injuries and Illnesses.”
- Title 29 CFR, Part 1910, “Occupational Safety and Health Standards,” excluding 29 CFR 1910.1096, “Ionizing Radiation.”
- Title 29 CFR, Part 1926, “Safety and Health Regulations for Construction.”
- 10 CFR 851 Worker Health And Safety Program
- American Conference of Governmental Industrial Hygienists (ACGIH), “Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices,”
- (as identified by PUB-3000
- American National Standards Institute (ANSI) Z88.2, “American National Standard for Respiratory Protection,” (as identified by PUB-3000)
- ANSI Z136.1, “Safe Use of Lasers,” (as identified by PUB-3000)
- ANSI Z49.1, “Safety in Welding, Cutting and Allied Processes,” sections 4.3 and E4.3 (2012)
- National Fire Protection Association (NFPA) 70, “National Electrical Code,” (as identified by PUB-3000)
- NFPA 70E, “Standard for Electrical Safety in the Workplace,” (as identified by PUB-3000)

It must be understood that the Occupational Safety and Health Act provides the basic foundation for a worker safety and health program and that Subcontractors may need to go beyond the Act’s minimum requirements in establishing programs to protect workers from hazards associated with their activities. If there is a conflict between requirements, the Subcontractor is to apply the most stringent rule unless otherwise directed by the LBNL EHS representative. Subcontractors are always encouraged to apply best management practices in all of their endeavors.

### **2.3 General Subcontractor Responsibilities**

The Subcontractor must establish a Worker Safety and Health Program. Worker protection measures should be based on the use of a graded approach to ensure that available resources are used most efficiently and effectively. Worker safety and health programs must be integrated into other related site-specific worker protection activities and within the ISM system. There must be an open and continuous line of communication between the Subcontractor and LBNL to discuss any unsafe acts or conditions that

may arise during the project. The basis for the implementation of the Subcontractor Worker Safety and Health Program will be contained in the CEHSP.

The Subcontractor has overall accountability for the safety of its project and must allocate the resources necessary for implementing all required safety-related codes and contract/subcontract requirements. The Subcontractor must:

- Follow all LBNL site-specific ES&H requirements and associated permits as defined by this Manual and the implementing contract.
- Establish ES&H flow-down requirements in all subcontracts.
- Implement the appropriate requirements of this Manual into the CEHSP.
- Designate a Subcontractor Safety Officer/designated on-site safety representative to oversee all activities.
- Develop, implement, and/or adhere to JHAs and other pre-job planning documents required by this Manual.
- Provide training to employees in safe-work practices.
- Document all required training and have documentation available for review.
- Provide required personal protective equipment (PPE) to employees, training employees on how to use the equipment and enforcing its use in the field.
- Monitor the workplace for unsafe conditions and take immediate action to correct unsafe conditions, acts, and other deficiencies identified during inspections.
- Perform necessary personal exposure monitoring.
- Coordinate and conduct pre-job planning with subcontractors, field supervisors, affected lab managers, and others, as required.
- Conduct a daily walk-around safety inspection and document this inspection.
- Instruct all employees, initially and periodically, on matters pertaining to employee safety and health rights, protections, obligations, and responsibilities.

## **2.4 LBNL Specific Requirements**

### **2.4.1 Construction Environmental Health and Safety Plan (CEHSP)**

Each Subcontractor performing construction work at LBNL is required to develop a CEHSP prior to conducting any work activities on site. The Subcontractor must ensure that the requirements in this Manual are incorporated into their CEHSP and the associated Job Hazards Analysis (JHAs). The CEHSP must be submitted in accordance with the contract requirements document and undergo a review and concurrence by the LBNL EHS Division POC and the LBNL Project/Construction Manager prior to the Subcontractor being allowed to start work. An electronic CEHSP format is provided for contractor use and is available at the [LBNL Construction Safety Reference website](#).

LBNL provides each Subcontractor with an electronic copy of the CEHSP template that must be utilized for their Plan. A new CEHSP must be submitted for each construction project, regardless of whether the Subcontractor has performed prior work at LBNL. The template is provided in electronic format to enable cut-and-paste functions for those subcontractors whose basic data remains unchanged, yet tailor the hazard and controls information to the particular activities/materials/location of the project at-hand. Similarly, the core safety management mechanism, the Job Hazards Analysis (JHA) template is provided in electronic format to make production of the JHA as easy as possible yet project-specific (see Section 4.3).

LBNL recommends using a graded approach in the development of CEHSP's. This approach determines the level of rigor for implementing the work planning and control attributes based on the importance/significance of the activity in relation to the associated hazards and consequences. The level

of detail within each CEHSP and corresponding JHA should be commensurate with the size, complexity and risk level of the construction project.

Field changes (i.e., red line, pen/ink changes) to the CEHSP are acceptable. The updated CEHSP must be reviewed and the change accepted and initialed by the LBNL Construction Manager. All affected Subcontractor personnel involved in the work being performed must review the CEHSP and any subsequent changes. The CEHSP must be kept at the worksite and available for review.

#### **2.4.2 Training and Documentation**

All individuals who will be working on construction sites must attend a site-specific ES&H orientation in accordance with [Section 4.3.9](#), Subcontractor Employee ES&H Orientation, of this appendix. This orientation will be documented by having each affected worker sign the Subcontractor Safety Orientation Checklist.

For work activities in which specific training is required by safety regulations (e.g., OSHA mandated), the subcontractor must maintain records on-site, showing proof of current training records for any particular qualified individual(s). Designated “Competent Persons” are expected to have a higher level of experience, training and qualification. Subcontractors must have in place a mechanism to verify that the Competent Person(s)’ knowledge and skill-sets match their Competent Person designation (i.e., written test). All persons designated as a fall protection Competent Person will be subject to a one on one interview and confirmation by the LBNL Fall Protection Subject Matter Expert (SME). Contact the Project Construction Manager to arrange an interview.

Evidence of training and the designation of Competent Persons will be provided to LBNL on Subcontractor company letterhead prior to assignment. Photocopies of training certificates, certification cards, wallet IDs, etc. identifying the individual, the specific training, who conducted the training and the date completed (and/or expiration date) are accepted in lieu of originals.

In addition, LBNL may require some projects to have specific qualifications for their designated on-site safety representative (e.g., 10- or 30- hour Construction Safety, Construction Health and Safety Technician, Board of Certified Safety Professionals Certification), depending upon the complexity of the project and the hazards involved. LBNL will identify this requirement in the request for proposal.

#### **2.4.3 Safety Bulletin Boards**

The Subcontractor is responsible for installing and maintaining a safety bulletin board at the location where the majority of their workers report to work. Workers must be advised of the location of the nearest bulletin board. Workers must be responsible for reviewing the bulletin board to keep informed of safety-related information. Safety bulletin boards must be sufficient size to display and post safety bulletins, newsletters, posters, accident statistics, and other safety educational material. At a minimum, the safety bulletin board must display:

- DOE Occupational Safety and Health Poster (Your Rights as a Worker)
- DOE Occupational Safety and Health Complaint Form
- Requirements, provisions and number of the Employee Concern Program Hotline (Whistleblower Protection)
- Citations and notices as appropriate
- OSHA 300A form during February 1 to April 30
- LBNL-furnished safety bulletins and publications
- Storm-water discharge permit notice (as applicable)

Suggested additional items to be posted include:

- Topical Safety & Health posters
- Minutes of safety meetings
- Information on accidents and Lessons Learned
- Hazard communication information.

#### **2.4.4 Permit Board**

The 1<sup>st</sup> tier Subcontractor should have a size “D” drawing or other effective project drawing available. All active permits must be clearly identified on the permit board. The permit board must be maintained on a daily basis and must be referenced during the Plan of the Day (POD) meeting to communicate co-located hazards.

#### **2.4.5 Incident Response and Notification**

The Subcontractor must report all incidents and near misses, no matter how minor, to the LBNL Construction Manager as soon as the scene is stabilized, but in all cases notification must be made within one hour of occurrence. This reporting time frame is necessary so that LBNL can evaluate the applicability of further reporting requirements and so that any necessary accident investigation, scene security, cleanup, traffic rerouting, etc. may begin.

**For all emergencies at the LBNL site, the Subcontractor must contact emergency assistance by:**

- **Dialing extension 7-9-1-1 from a building land-line or**
- **Calling (911) from any outside line (cell phone)**

### **2.5 LBNL Special Emphasis**

#### **2.5.1 Integrated Safety Management (ISM) System**

The Subcontractor must incorporate the elements of Integrated Safety Management (ISM) into their CEHSP that conforms to LBNL ISM requirements. An effective ISM plan establishes a single system that integrates requirements into the work planning and execution process to protect the workers, public, and the environment. LBNL implements the following five core ISM functions for work activities that could potentially affect workers, the public, or the environment, and applies them as a continuous cycle with the degree of rigor appropriate to address the type of work activity and the hazards involved.

- **Define the Scope of Work.** Translate missions into work, set expectations, identify and prioritize tasks, and allocate resources.
- **Analyze the Hazards.** Identify, analyze, and categorize hazards and potential environmental impacts associated with the work.
- **Develop and Implement Hazard Controls.** Identify and agree upon standards and requirements, identify controls to prevent/mitigate hazards, establish the ES&H parameters, and implement controls.
- **Perform Work Within Controls.** Confirm readiness and perform work safely and in the prescribed manner to protect workers, the public, and the environment.
- **Provide Feedback and Continuous Improvement.** Gather feedback on the adequacy of controls from workers and appropriate stakeholders, identify and implement opportunities for improvement, and conduct line management and independent oversight.

Subcontractor program flexibility is understood and encouraged as long as the Subcontractor's program tenets adequately address the spirit and intent of the ISM provisions. For specific information on instituting an ISM program, contact your LBNL Project/Construction Manager.

### **2.5.2 Stop Work Authority**

If unanticipated/unsafe conditions are identified or non-compliant practices are observed during construction activities, workers must be instructed to stop the work immediately and notify their supervisor and the Subcontractor Safety Officer of this action. All workers at LBNL sites have the authority to stop work. Work may not proceed until the circumstances are investigated and deficiencies corrected.

## **2.6 References**

- 10 CFR 851, Worker Safety and Health Program
- 29 CFR 1926, Safety and Health Regulations for Construction
- 29 CFR 1910, Occupational Safety and Health Standards for General Industry

## **3.0 Construction Hazard Identification and Control Process**

### **3.1 Applicability**

The requirements of this section apply to all Construction Subcontractors and lower-tier subcontractors (hereafter referred to as "Subcontractor") performing construction work activities on LBNL sites unless otherwise specifically exempted by LBNL. This section provides the requirements for establishing a method for identifying, controlling, and documenting hazards associated with Subcontractor work activities and communicating this information to all affected workers.

### **3.2 Regulatory Requirements**

Subcontractor methods for identifying, controlling, and documenting hazards associated with subcontractor work activities must be conducted in accordance with the following statutory requirements:

- 10 CFR 851 Worker Health and Safety Program
- 29 CFR 1926, Safety and Health Regulations for Construction
- 29 CFR 1910, Occupational Safety and Health Standards for General Industry

### **3.3 LBNL Specific Requirements**

All Subcontractor work activities must meet the following specific LBNL requirements for hazard identification and control.

#### **3.3.1 General Requirements**

The Subcontractor is responsible for understanding the scope of work in sufficient detail to ensure that the work is effectively planned for each definable work activity, the hazards associated with the work are identified and the planned protective measures are implemented. This must be accomplished utilizing specific JHAs. A JHA must be developed for each phase of the project by the GC and responsible subcontractor. A Pre-Task Hazard Analysis (PTHA) must be developed by the work crew as described in [Section 3.3.4](#) below. These analyses must be listed in the CEHSP.

### 3.3.2 Job Hazards Analysis

The Job Hazards Analysis (JHA) is developed by the General Contractor as a baseline description of the projected hazards based on anticipated means and methods to be applied by their prospective subcontractors. This document provides LBNL with a means of understanding the safety issues that are likely to arise during the evolution of the project. This provides LBNL with the opportunity to query the means and methods proposed, such as the intent to sand-blast a foundation wall in preparation for waterproofing versus adopting an alternate approach of priming the walls which would eliminate the potential for exposure to high concentrations of silica.

For each separately definable construction work activity (e.g., excavations, foundations, structural steel, roofing, electrical, mechanical, etc.) the Subcontractor must develop a JHA prior to commencement of the associated work/definable feature. A definable work activity is a task which is separate and distinct from other tasks and has separate control requirements. A definable work activity may be identified by different trades or disciplines, or it may be work by the same trade in a different environment. Within each definable work activity there may be other sub-phases of work which warrant separate JHAs. It will be the responsibility of the Subcontractor to determine the best break-down of separately definable activities and the subsequent work steps in order to produce clear, concise, and effective JHAs. The Subcontractor's JHAs must be kept at the worksite and available for review by LBNL.

The General Contractor is responsible for assisting its subcontractors with developing JHAs and may provide its Subcontractors with relevant sections of its general / baseline JHA as a starting point. An electronic JHA form and instructions are provided for the contractor's use and is available from the [LBNL Construction Safety Resource website](#).

### 3.3.4 Pre-Task Hazard Analysis

The POD differs from the PTHA Briefing in that the POD is focused on all activities at the job-site and the PTHA Briefing is focused on a single crew or group of workers performing the same tasks.

LBNL recommends using a graded approach in the development of Pre-Task Hazard Analysis (PTHA); however, the Subcontractor's PTHAs must be developed in sufficient detail to preclude confusion and misunderstanding and must be commensurate with the size, complexity and risk level of the work to be performed. When used appropriately, the graded approach will incorporate the level of rigor for implementing the work planning and control attributes based on the importance/significance of the activity in relation to the associated hazards and consequences. An [electronic PHTA form](#) is provided for the contractor's use and is available from the [LBNL Construction Safety Resource website](#)

The PTHA must contain and/or meet the following elements as applicable to the activity:

- Identify the definable work tasks.
- Identify the job steps for each work task.
- Identify the foreseeable hazards for each step/activity and the planned protective measures to include appropriate engineering controls.
- Identify Competent Persons required for workplace inspections of the construction activity, where required by OSHA standards.
- Identify Emergency Response Action relative information. (e.g., gas shutoff valve location, etc.).
- Identify project-required hold-points or other logistical requirements.
- Address additional hazards revealed by supplemental site information (e.g., site characterization data, as-built drawings).

- Provide drawings and/or other documentation of protective measures for which applicable OSHA standards require preparation by a Professional Engineer or other qualified professional.
- Review and approval of the PTHA by the Subcontractor's Management.
- Made available for review to the LBNL Project Manager and LBNL EHS Division prior to the start of work activities.
- Places for signatures of the involved workers to signify that they have been briefed on and understand the requirements of the PTHA, and acknowledge their intended compliance with the PTHA. Attach additional signature pages as needed.

The completed and signed PTHA must be made available for review to the LBNL Project/Construction Manager/designee and LBNL EHS Division POC.

The subcontractor must conduct a pre-task meeting that discusses the corresponding PTHA, the work tasks, and associated procedures and hazards with all affected parties to identify and coordinate logistics, controls and communications required for the activity. Each worker involved in that work must sign the PTHA prior to performing work. All PTHAs must be kept at the work site to be available for review by workers and oversight personnel.

**Special Emphasis** If, while working, it is discovered that the controls addressed in the PTHA will not/do not provide adequate protection then **the task at hand must be stopped and not be conducted until the hazards have been re-assessed**, the PTHA updated, and adequate controls implemented. In these instances, the Subcontractor may utilize field changes (i.e., red line, pen/ink changes) as needed to reflect changing conditions associated with the activity. All affected contractor personnel involved in the work being performed must review each PTHA and subsequent updates/changes. The updated PTHA must be made available for review to the LBNL Project Manager and EHS Division POC.

### **3.3.5 Worker Training**

The Subcontractor must ensure that affected workers are made aware of the foreseeable hazards and the protective measures described within the activity analysis prior to beginning work on the affected activity.

### **3.3.6 Record of Training**

The Subcontractor must ensure that workers acknowledge being informed of the hazards and protective measures associated with assigned work activities and understand those requirements. Each worker involved in that work must sign the PTHA prior to performing work.

## **3.4 General Subcontractor Responsibilities**

### **3.4.1 Hazard Identification and Control Program**

The provisions of this Manual apply to the development and implementation of the Subcontractor's Hazard Identification and Control program. The Subcontractor must be responsible for implementing an effective Hazard Identification and Control program that:

- Identifies, evaluates, and controls potential and existing hazards/agents in the workplace through the pre-job safety planning process.
- Incorporates the controls into the Job Hazards Analysis (JHA).
- Determines that engineering devices, administrative controls, and personal protective equipment are available, appropriate, tested, and utilized by employees.
- Determines employees are trained as required.
- Contains provisions to manage and notify LBNL when there are changes related to the work

scope, materials, and/or processes that may introduce new or different hazards to the project.

## **4.0 ES&H Meetings, Inspections and Orientations**

### **4.1 Applicability**

The requirements of this section apply to all Construction Subcontractors and lower-tier subcontractors (hereafter referred to as “Subcontractor”) performing construction activities on LBNL sites unless otherwise specifically exempted by LBNL.

### **4.2 Regulatory Requirements**

Subcontractors will be responsible for implementing a system for conducting ES&H meetings, inspections and employee ES&H orientations that will facilitate compliance as applicable with the following statutory requirements:

- 10 CFR 851 Worker Health and Safety Program
- 29 CFR 1926, Safety and Health Regulations for Construction
- 29 CFR 1910, Occupational Safety and Health Standards for General Industry

### **4.3 LBNL Specific Requirements**

In addition to the requirements identified in Section 4.2 of this appendix, all Subcontractor ES&H meetings, inspections and orientations, as applicable to the scope of the construction work activities and supporting offices/facilities, must meet the following specific LBNL requirements.

#### **4.3.1 Contractor Plan of the Day Meeting**

The plan of the day (POD) process is required to maintain daily positive control over task level work and to establish a high level of communication between subcontractors prior to the start of construction activities for the day.

The basis of the POD process is in preplanning. First tier Subcontractors and any/all lower-tier subcontractors must identify all planned tasks on a POD and PTHA form. The level of detail must be appropriate to define all tasks that may present a hazard to people, property or environment. The listed tasks must include the corresponding PTHA. If the proposed task does not have a corresponding PTHA, then a new PTHA will need to be developed and reviewed prior to the work moving forward.

A representative for each subcontractor performing work that day must have submitted a proposed POD/PTHA to the 1<sup>st</sup> tier Subcontractor superintendent or designee prior to the start of the POD meeting. The 1<sup>st</sup> tier Subcontractor reviews completed POD and PTHA forms against conflicting operations, regulatory hold points, and required permits.

During the POD meeting, each subcontractor must present their planned work activities to the attendees to control co-located hazards. The 1<sup>st</sup> tier Subcontractor should have size “D” drawing or other effective project pictorials available that can be referenced during the POD meeting. The 1<sup>st</sup> tier Subcontractor must record what subcontractors were in attendance at the POD. Subcontractors that are not represented at the POD must not be authorized to perform work until their POD/PTHA is submitted and approved by the 1<sup>st</sup> tier Subcontractor.

POD briefings must be held each day prior to the start of work activities. Subcontractors may integrate these requirements into their daily work planning process as long as the required information is effectively provided to employees and documentation for these briefings and/or meetings is maintained. LBNL records of these briefings documenting the meeting content and attendance must be maintained. All crew members must acknowledge the information disseminated, by signing the attendance roster.

The briefing content must include at a minimum the following topics:

- ✓ ES&H pre-task planning for the day's work activities
- ✓ Changes in work practices or environmental conditions
- ✓ Required equipment/system daily inspections
- ✓ Previous day's incidents, near misses, lessons learned and/or other relevant issues as applicable
- ✓ Other ongoing activities that may have project ES&H implications or may impact LBNL operations
- ✓ New or modified site-wide procedures or requirements
- ✓ Review of JHA for new activities and/or revised existing JHAs
- ✓ Avoidance of potential safety impacts due to schedule pressures.

#### **4.3.2 Pre-Task Hazard Analysis Meeting**

Upon completion of the initial POD meeting, each subcontractor is then required to have breakout sessions (daily "tailgate" meeting) with each work crew member prior to the start of each work shift, or when an individual arrives at work. The meeting must include a discussion of the specific POD and corresponding PTHA for their work and additional safety topics of interest related to the site. All crew members must acknowledge the POD (daily "tailgate meeting") by signing an attendance roster for the POD/PTHA.

All construction work must be planned and controlled at a level that ensures all personnel understand:

- ✓ The authorized scope of work
- ✓ The hazards of performing the work
- ✓ The control measures that will be used to address the hazards
- ✓ The requirements to stop whenever the work changes from what has been authorized and the actions required to ensure that the change is incorporated into the work plan and can proceed safely.

The POD differs from the PTHA briefing in that the POD is focused on all activities at the job-site and the PTHA briefing is focused on a single crew or group of workers performing the same tasks. Each briefing must reinforce the requirement to stop and update the PTHA prior to making *any* changes in task assignments or locations that differ from that covered in the briefing and documented in the PTHA. Another Pre-Job Briefing addressing the change is required prior to implementing any changes that occur after the start of shift briefing.

#### **Important notes:**

- ✓ Only the work documented in the PTHA and discussed in the Pre-Job Briefing may be performed. Any change in scope or hazards during the shift requires an update of the PTHA and a re-briefing of the affected workers.
- ✓ If new workers join the task after the briefing, the new workers must receive the pre-job briefing prior to starting work.

If during the course of the day, additional task(s) need to be performed that are not identified on the POD, then the subcontractor responsible supervisor must add this task to the POD, revise the PTHA as necessary, receive approval from the 1<sup>st</sup> tier Subcontractor superintendent or designee and contact the LBNL Construction Manager for Authorization. If approved and authorized, the requesting subcontractor

will brief the affected crew of the work task changes and revised PTHA. Affected crew members must initial and date their re-review of the POD/PTHA.

During any given work shift there may be lessons learned. Lessons learned should be shared at PODs, safety meetings, and pre-job briefings in order to improve the overall performance of the job. Examples of lessons learned that should be identified and shared include:

#### **4.3.3 Contractor / LBNL Permit Meeting**

##### **As required by contract or change notice:**

A daily permit meeting must be held to facilitate upcoming work activities in a timely manner. The meeting must be attended at a minimum by the subcontractor's permit requestor and the project work planner/coordinator. Permit requests must be identified on the applicable LBNL Permit form. A workability walk down must be completed, a risk value assigned per the Work Planning and Control (WPC) Contractor procedure, and any required hold points identified. The completed information is submitted by the work planner/coordinator to the LBNL Site Manager for review and authorization through the LBNL coordination meeting.

#### **4.3.4 LBNL Coordination Meeting**

##### **As required by contract or change notice:**

Prior to the Daily POD Meeting a daily LBNL Coordination Meeting must be held to review project/task status and confirm readiness of the proposed work package, to include personnel (qualification tasking), tools, equipment, and required permit status. The minimum required attendees include: the LBNL Project Manager or designee, the Subcontractor's Superintendent, the Work Planner/Coordinator, and the Subcontractor's Safety Officer.

The meeting will verify the risk matrix and basis of safety of each proposed activity, adequately address any concerns, identify hold points, and schedule coordination actions to complete the preplanning activities. All items will be updated and only the line items confirmed as complete will be authorized for the next day's activities.

#### **4.3.5 Monthly ES&H Meetings**

A monthly construction ES&H meeting must be held for all projects exceeding thirty days and must include attendance by all site Subcontractor and lower-tier subcontractor personnel. LBNL reserves the right to increase the frequency of these meetings based upon project complexity/risk and/or Subcontractor ES&H performance. Supervisors, foremen or other designated personnel must conduct these meetings. Meetings can be held for the entire project or smaller breakout meetings can be held for each subcontractor and/or craft. A record of each meeting, documenting the meeting content and attendance must be maintained.

At a minimum, monthly ES&H meetings must include:

- ES&H, health, and job-related issues/concerns related to the particular operation.
- Summary of relevant lessons learned from LBNL and/or other Subcontractor projects as applicable
- As applicable, accident investigations conducted since the last meeting, to discuss if the cause of the unsafe acts or conditions were properly identified and corrected.
- ES&H inspection findings since the last meeting.
- Ad hoc ES&H or special emphasis training
- Other relevant ES&H subject matter as determined by the Subcontractor or LBNL

#### **4.3.6 Daily ES&H Inspections and Permits**

The Subcontractor must ensure a supervisor, safety Professional representative and/or competent person(s) conducts daily documented safety inspections of the general operations in project areas.

In addition, the Subcontractor must ensure a supervisor, safety officer, qualified person and/or competent person(s) issues and/or conducts any regulatory-required permits or documented inspections applicable to the worksite, materials and equipment. In addition, the Subcontractor must ensure that all LBNL required permits have been issued. These inspections and/or permits include but are not limited to:

- Cranes
- Confined space entry
- Excavations
- Material handling equipment
- Heavy equipment
- Scaffold systems
- Aerial lifts
- Hot work
- Building surface penetrations
- Environmental (As required)

The Subcontractor must maintain written inspection records and/or permits and make them available for review. The Subcontractor must prohibit the use of any machinery, tool, material, equipment or worksite condition that is not safe and/or does not comply with applicable requirements. Tools and equipment brought onto the site for use must be in new or like new condition.

During the weekly ES&H inspection(s), any identified defective or unsafe equipment, tools and/or worksite locations must be immediately corrected, tagged/barricaded, removed from the jobsite and/or other effective interim control measures taken.

#### **4.3.7 Weekly Site ES&H Inspections**

The Subcontractor must conduct and document regular (at least weekly) ES&H inspections of the worksites, materials, equipment, and construction operations. At a minimum, the Subcontractor superintendent/supervisor and the LBNL Project/Construction Manager must be part of this inspection. Coordination with the EHS SME must be made in advance of these inspections to afford EHS the opportunity to accompany the inspections. LBNL reserves the right to increase the frequency of these inspections based upon project complexity/risk and/or Subcontractor ES&H performance.

The following factors influence the frequency of inspections:

- Number and type of hazards involved;
- Total level of risk to workers, property, and environment;
- Previous experience with the Subcontractor;
- Duration of the project;
- Time elapsed since the last inspection; and
- Changes in scope of work.

The Subcontractor must maintain written inspection records and make them available for review upon request. The inspection report must document identified hazards and the corrective actions taken or the corrective action plan with closed or anticipated completion date(s). The inspection results must be

presented and documented in the minutes at the weekly construction coordination meeting or other LBNL accepted means as applicable to the project.

During the weekly ES&H inspection(s), any identified defective or unsafe equipment, tools and/or worksite locations must be immediately corrected, tagged/barricaded, removed from the jobsite and/or other effective interim control measures taken.

The following rating format will be used to evaluate the Subcontractor’s safety program performance:

<b>Rating</b>	<b>Description</b>	<b>Measure</b>
Superior	Subcontractor’s performance in a specific evaluation category was exceptional, and markedly exceeded LBNL expectations. The Subcontractor’s performance added value to the project and LBNL’s program. Any deficiencies noted during the ES&H inspection were minor, with no measurable adverse effect on overall performance	No more than <u>two</u> de minimis findings
Excellent	Subcontractor exhibited effective performance and was responsive to subcontract requirements in a timely manner. Communications with LBNL personnel were positive and constructive, with only minor deficiencies noted.	No more than <u>three</u> de minimis findings
Satisfactory	Subcontractor generally met the minimum acceptable subcontract requirements with adequate results. There were deficiencies noted with identifiable, but not substantial, effects on the overall performance.	No more than <u>four</u> de minimis findings
Unsatisfactory	Subcontractor did not meet minimum acceptable performance in one or more areas of an evaluation category. There were significant deficiencies that required prompt remedial action in a number of specific instances, which adversely affected overall performance. There was a failure to initiate immediate corrective action acceptable to LBNL.	More than <u>four</u> de minimis findings or any serious deficiency findings

### 4.3.8 LBNL Job Site Observations

EHS Division Construction Safety Engineers and Facilities Division Construction Management conduct routine observations of construction work sites to identify and correct unsafe workplace conditions and behaviors. Both "at-risk" and "safe" conditions and behaviors are identified during the observations. These conditions are recorded in a construction safety observation database that is used to track and report trends in construction-safety performance.

#### 4.3.8.1 Determining Classification of At-Risk Observations

- The observer classifies each at-risk condition or behavior as de minimis, low, medium, or high and enters it into the construction safety observation database.
- Classification of at-risk observations are assigned by the observer based on a risk-assessment methodology that uses a 4x4 matrix of impact and probability.

- The risk-assessment table is based on the Risk Registry Risk Assignment Matrix found in Appendix P of the Berkeley Lab Facilities Division, Construction Projects Department, *Project Management Manual*.

***At-Risk Observation Classification Risk Assessment Table***

	<b>No Injury</b>	<b>First Aid</b>	<b>Medium Severity</b>	<b>High Severity</b>
<b>High Probability</b>	De minimis	Medium	High	High
<b>Medium Probability</b>	De minimis	Low	Medium	High
<b>Low Probability</b>	De minimis	Low	Low	Medium
<b>No Probability</b>	De minimis	De minimis	De minimis	De minimis

**4.3.8.2 Construction Safety Observation Relationship to the Occurrence Reporting and Processing System (ORPS) and Noncompliance Tracking System (NTS) Reporting**

- All medium and high construction safety at-risk observations are reported to the appropriate responsible individuals for review as possible ORPS or Noncompliance Tracking System reportable events.

**4.3.9 Subcontractor Employee ES&H Orientation**

All Subcontractor employees working at LBNL are required to receive a Construction Subcontractor ES&H Orientation prior to the start of any work activities. The Subcontractor will receive a Construction Subcontractor Orientation by LBNL. At LBNL’s discretion, on large projects the Construction Orientation may be flowed down if so delegated. The Subcontractor must ensure that the content covered as part of this orientation and any other project relevant ES&H information is effectively flowed down to all Subcontractor employees prior to the start of any work. The Subcontractor must maintain a detailed outline of the orientation. A record of these orientations, documenting the meeting content and attendance must be maintained on-site by the Subcontractor and available for review by LBNL.

**4.4 LBNL Special Emphasis**

**4.4.1 Weekly ES&H Report**

Weekly ES&H reports must be compiled and maintained as part of the project record and made available for review by LBNL. The weekly ES&H report must be available by each Tuesday for the previous week’s activities. This report may be maintained as a hard copy report (on-site) or on the FTP/project website. The report must contain the following information as applicable for the week:

- Brief summary of significant ES&H activities
- Copies of daily, weekly and/or monthly ES&H meeting documentation and attendee sign-in sheets

- Copies of completed daily, weekly or monthly site inspections and corrective actions
- Copies of initial or any daily inspections performed such as excavation inspections, hoisting and rigging inspections, and vehicle or equipment inspections
- Copies of any integrated personal sampling results, including data sheets, laboratory analytical results, exposure calculation sheets, and direct reading monitoring results/reports
- Copies of any permits used for the week including excavation permits, hot work permits, lockout/tagout documentation, and confined space entry permits
- Copies of site orientation/briefing documentation and sign-in sheets for new site workers
- Copies of any approved changes to the CEHSP
- Copies of the site first aid log if there are new entries for the week
- Listing of man-hours, incidents and incident statistics as requested by the EHS Division POC

#### **4.5 References**

- 10 CFR 851 Worker Health and Safety Program
- Title 29 CFR 1910, Occupational Safety and Health Standards
- Title 29 CFR 1926, Safety and Health Regulations for Construction

### **5.0 Job Site Conditions**

#### **5.1 Applicability**

The requirements of this section apply to all Construction Subcontractors and lower-tier subcontractors (hereafter referred to as “Subcontractor”) performing construction activities on LBNL sites unless otherwise specifically exempted by LBNL.

#### **5.2 Regulatory Requirements**

29 CFR 1926.25

#### **5.3 LBNL Specific Requirements**

##### **5.3.1 Housekeeping**

Subcontractors are solely responsible for the cleanup of their immediate work areas on a daily basis. Subcontractors are required to participate in a general cleanup effort on a weekly basis.

During construction, alteration, or repairs, the subcontractor completing the work must keep work areas, passageways, and stairs in and around buildings or other structures clear of form and scrap lumber that contain protruding nails and other debris. Subcontractor storage areas must be kept free from materials that may cause tripping, fire, or harboring of rats and other pests. Combustible scrap and debris must be removed at regular intervals during the course of construction. Containers must be provided for the collection and separation of waste, trash, oily and used rags, and other refuse. Containers for garbage and other oily, flammable, or hazardous wastes such as caustics, acids, or harmful dusts must be kept covered.

Garbage and other waste must be disposed of daily. Safe means must be provided to facilitate removal of debris. Any dumpster in use must have a suitable manufactured access or have a proper step platform built up to its side.

If a subcontractor fails to complete housekeeping tasks, Berkeley Lab management may assign those duties to another subcontractor, and back-charge the failing subcontractor for all expenses incurred.

### **5.3.2 Material Handling and Storage**

All materials must be handled and stored with the utmost care and must not be haphazardly piled or strewn about in any work area.

The storage of material must not create hazards. For example:

- ✓ Bags, bundles, and other containers or materials must be stacked, blocked, interlocked, and limited in height so that they do not slide or collapse.
- ✓ Masonry blocks may not be stacked above two pallets, and blocks must be wrapped while stacked so they do not collapse.
- ✓ Stored materials must be kept out of walkways to prevent tripping hazards.

LBNL management will designate areas for storage of subcontractor's materials. The subcontractor is solely responsible for any materials brought onto the site and for ensuring that employees are properly trained in moving, lifting, grabbing, hoisting, team lifting, and any accessories for handling materials. Any equipment used to move and store materials must be in good condition, and must meet the manufacturer's specifications and all applicable federal, state, and local standards and codes. All personnel using such equipment must be properly trained in the operation of such equipment. The subcontractor is solely responsible for training and retraining, as required.

### **5.3.3 Floor and Roof Openings/Covers**

The Subcontractor is responsible for protecting workers from hazards associated with floor and roof openings and the covers placed over openings. Floor and roof openings must be protected by a standard railing or cover. All skylights must be protected in the same manner.

Covers must support without failure at least twice the weight of subcontractors, equipment, and materials placed on the cover at any one time. All covers must be secured so as to prevent displacement and must be clearly marked with the words "hole" or "cover."

Frequently, railings and covers are moved to allow material to be hoisted or other work to be performed, and then replaced. In either case, procedures and designs to facilitate swift and safe removal and replacement must be developed during pre-job or pre-operational planning and strict enforcement of those procedures required.

**100% positive fall protection is required and must be maintained during the installation and removal of these devices.**

### **5.3.4 Standard Guardrail**

When a guardrail is chosen as a form of fall protection, the Subcontractor must follow the below requirements.

- The guardrail may be constructed of wood, or in an equally substantial manner from other materials, and consist of a top rail not less than 39 inches or more than 45 inches in height measured from the upper surface of the top rail to the floor, platform, runway, or ramp level, and must have a midrail.
- The midrail must be halfway between the top rail and the floor, platform, runway, or ramp. Selected lumber, free from damage that affects its strength.
- A standard toe board must be 4 inches (nominal) minimum in vertical height from its top edge to the level of the floor, platform, runway, or ramp. It must be securely fastened in place and have not more than ¼-inch gap above floor level. It may be made of any substantial material, either solid, or with openings not over 1 inch in greatest dimension. Toe boards must be provided on all open sides and ends of railed scaffolds at locations where persons may work or pass under the scaffold and at all interior floor, roof, and shaft openings.
- Toe boards must be capable of withstanding, without failure, a force of at least 50 pounds applied in any downward or outward direction at any point along the toe board.
- For wood railings, the posts must be at least 2-x-4-inch stock spaced not more than 8 feet apart.
- When wood is used the top and mid rail must be of 2x4 stock.
- No double-headed nails are to be used in the construction of these railings.
- When wire rope is used for guardrails, the cables must be at least ⅜-inch minimum-diameter wire rope of 13,500 pounds minimum breaking strength. Wire rope rails must be flagged at least every 6 feet.
- Posts must not be more than 6 feet on center. For cable safety railings, cables must be looped and triple clamped at the connecting points. Single cables running past each other with one clamp are not acceptable.

**At no time will any guardrail be used as a horizontal anchorage for personal fall-arrest equipment unless specifically designed by “Subcontractor’s Fall Protection Qualified Person”.**

### **5.3.5 Impalement Hazards - Rebar Protection**

During the construction pipe ends, conduits, metals stakes, t-posts and similar rigid items create impalement hazards that must be protected in locations where personnel may be exposed to the hazard. Subcontractors are not permitted to work above vertical impalement hazards until they have been eliminated or protected to eliminate the hazard. Steel-lined, flat-head rebar caps, or other effective means of protection must be provided.

### **5.3.6 Safety Signs and Banners**

The Subcontractor is responsible for posting Warning, Danger, No Trespassing, and other signs and barricades as appropriate, around the work site to help protect the public and subcontractor employees from the hazards present within the work site.

#### **5.3.6.1 Signs**

The Subcontractor must post and maintain in good condition the proper signs wherever hazardous conditions exist. Keep a sufficient supply of the necessary signs on hand for replacement and to cover new hazards as they develop. Additional posting requirements to be completed by the subcontractors are found in 29 CFR 1926.200, Accident Prevention Signs and Tags. Such requirements include but are not limited to posting for lasers, powder-actuated tools, and overhead hazards.

### **5.3.6.2 Barricades**

All barricades must be posted as to the hazard and the name of the person responsible for the barricade. Two types of barricades include:

- ✓ Red Danger / Keep Out barricade tape – This tape must be used to delineate areas where all but specifically authorized personnel may enter. Red barricades must be posted with the responsible person's name and number along with information as to the hazard and the authorized personnel that may enter.
- ✓ Yellow / Caution barricade tape – This tape should be used where special precautions are necessary, but access by all personnel wearing the required PPE may enter without further authorization. The barricade must be posted with the name of the responsible person and the hazard to be aware of, i.e., overhead work.

### **5.3.7 Illumination**

The minimum lighting level for construction areas both indoors and outdoors must be an average of 5 ft candles measured 30 in. above the floor. Illumination for general construction plant and shop areas must maintain an average lighting level of 10 ft candles. Auxiliary lighting must be used when needed for task specific activities. Care must be exercised with the use of halogen lamps so that fire hazards are not created.

### **5.3.8 Ventilation**

Local exhaust ventilation is a primary engineering control and is required to reduce concentrations of hazardous, irritating, and odiferous air contaminants below allowable exposure limits (where feasible). The operability of such systems must be evaluated prior to the start of the work. The ACGIH's Industrial Ventilation manual is the reference of standard for the design, testing and operation of ventilation systems. Ventilation systems requiring HEPA filtration should be leak- or DOP-tested at least annually to verify their effectiveness.

### **5.3.9 Safety Showers and Eyewashes**

Suitable facilities for quick drenching or flushing of the eyes and body (eyewash/shower apparatus) must be provided within the work area for immediate emergency use where the eyes or body of any person may be exposed to injurious corrosive materials, (e.g., corrosives, skin sensitizers, etc.). An eyewash/shower apparatus must be located such that it would require no more than 10 seconds to reach from the hazard. Access must be free of any impediments. For battery handling areas, facilities for quick drenching of the eyes and body must be provided within 25 feet.

Employees who may have a need for an eyewash/shower apparatus must know where the nearest eyewash/shower apparatus is located and how to operate it. Monthly functional test or inspection (sealed unit) of eyewash/shower apparatus must be documented. The potable water provided for a portable eyewash/shower apparatus must be flushed or changed according to manufacturer's specifications.

## **5.4 References**

- ✓ Title 29 CFR 1926.200, Safety and Health Regulations for Construction, Accident Prevention Signs and Tags

## **6.0 Traffic Control**

### **6.1 Applicability**

The requirements of this section apply to all Construction Subcontractors and lower-tier subcontractors (hereafter referred to as “Subcontractor”) performing construction activities on LBNL sites unless otherwise specifically exempted by LBNL.

### **6.2 LBNL Specific Requirements**

Diversion of Berkeley Lab traffic for other than short-term movement of vehicles (e.g., turning or repositioning trucks) requires a Traffic Control Plan to be submitted by the subcontractor, to the project construction manager, for review and approval, prior to the work. When signs, signals, and barricades do not provide the necessary protection on or adjacent to a street or pedestrian way during construction operations, flagmen or other appropriate traffic controls must be provided by the subcontractor completing the operation.

Subcontractors must provide pilot car services for all vehicles greater than 40 feet in length, including vendor delivery vehicles, entering the Berkeley Lab site at or before the Blackberry Gate.

#### **6.2.1 Job Site Traffic**

All subcontractors receiving materials are solely responsible for traffic control during material unloading processes and must provide the necessary personnel to complete such tasks. All efforts must be made to ensure trucks are staged, loaded, or unloaded on the job-site clear of normal traffic or pedestrian paths. Pedestrian and equipment travel paths should be marked and kept separate to minimize interactions between site workers and site traffic.

#### **6.2.2 Flaggers**

Signaling directions by flaggers must conform to American National Standards Institute (ANSI) D6.1-1971. For hand signaling, flaggers must use red flags at least 18 inches square or sign paddles; in periods of darkness, they must use red lights. Flaggers must be provided with and must wear a reflective high visibility warning garment while signaling.

## **6.3 References**

- ANSI D6.1-1971

## **7.0 Hand and Power Tools**

### **7.1 Applicability**

The requirements of this section apply to all Construction Subcontractors and lower-tier subcontractors (hereafter referred to as “Subcontractor”) performing construction activities on LBNL sites unless otherwise specifically exempted by LBNL.

### **7.2 Regulatory Requirements**

29 CFR 1926.302

### 7.3 LBNL Specific Requirements

The subcontractor is responsible for the safe condition and maintenance of all tools and equipment to be used by all contractor employees. The subcontractor superintendent must ensure that his or her employees know how to safely use the tools they work with.

#### 7.3.1 General Requirements

Workers must:

- ✓ Know the application, limitation, and potential hazards of the tool used.
- ✓ Select the proper tool for the job.
- ✓ Remove adjusting keys and wrenches before turning on tools.
- ✓ Do not use tools with frayed cords or loose or broken switches.
- ✓ Keep guards in place and in working order.
- ✓ Have ground prongs in place or use tools marked "double insulated."
- ✓ Keep work areas free of clutter.
- ✓ Stay alert to potential hazards in the working environment such as damp locations or the presence of highly combustible materials.
- ✓ Use safety glasses; dust, or facemasks; or other protective clothing and equipment when necessary.
- ✓ Do not surprise or distract anyone using a power tool.
- ✓ Do not use hammers with broken or cracked handles, chisels and punches with mushroomed heads, wrenches with sprung jaws, or bent or broken wrenches.
- ✓ Handheld electrical tools must be equipped with a "dead-man" or "quick-release" control so that power is shut off automatically when the operator releases the control.
- ✓ Portable circular saws must be equipped with guards above and below the base plate or shoe. The lower guard must retract when the blade is in use and automatically return to the guarding position when the tool is withdrawn from work.
- ✓ All handheld portable electrical equipment must have a grounded frame or be double insulated and identified as such.
- ✓ All magazine-fed or powder-actuated tools must reference the *Powder-Actuated Fastening Tools* section of this Manual.

#### 7.3.2 Training

Subcontractors must provide training on safe tool usage and maintenance to their employees.

#### 7.3.3 Powder-Actuated Fastening Tools

To reduce the possibility of injuries, only **low-velocity powder-actuated fastening tools** may be used. The stud, pin, or fastener of these tools must be limited to a velocity of no more than 300 feet per second when measured 6½ feet from the muzzle. Subcontractor superintendents must enforce compliance with federal OSHA 29 CFR 1926.302 regulations governing the use of the tools, along with the contents of this section.

The use of powder-actuated fastening tools are governed by the following rules:

- ✓ Tools must meet requirements of the latest edition of ANSI A10.3.
- ✓ Only subcontractor employees qualified by instructions of the manufacturer's and/or licensed by state or local authorities may be assigned to use a powder-actuated fastening tool.
- ✓ All qualified employees must carry proof of training in the form of a training identification card at all times.
- ✓ Only cartridges and fasteners supplied by the tool's manufacturer may be used.
- ✓ Powder-actuated fastening tools must be handled with the same care as firearms. Horseplay by any contractor employee (i.e., pointing an armed or unarmed tool at anything other than the work, target practice, making safety devices inoperative, or other unsafe acts) will be grounds for immediate and permanent removal from the job site.
- ✓ All safety devices incorporated in the tool by the manufacturer must be used at all times.
- ✓ A sign, minimum 8 x 10 inches with 1-inch letters stating "Powder-Actuated Tool in Use" or equivalent, must be posted by the contractor in the area of use (ANSI A10.3).
- ✓ All used and unspent cartridges must be properly disposed of per manufacturer's recommendations.

#### **7.4 References**

- ✓ ANSI A10.3.
- ✓ 29 CFR 1926.302

## **8.0 Control of Hazardous Energy, Lockout/Tagout**

### **8.1 Applicability**

The requirements of this section apply to all Construction Subcontractors and lower-tier subcontractors (hereafter referred to as “Subcontractor”) activities (i.e., constructing, installing, setting up, adjusting, inspecting, modifying and maintaining/servicing equipment) where the unexpected release of hazardous energy (i.e., electrical, hydraulic, pneumatic, chemical, thermal, compressed gases, mechanical, and gravity) or startup of machines, equipment, and systems could cause injury to workers on LBNL sites.

### **8.2 Regulatory Requirements**

The Subcontractor’ control of hazardous energy program and associated work activities where the unexpected release of hazardous energy or startup of the machines, equipment, and systems could cause injury must be conducted in accordance with the following statutory requirements:

- 29 CFR 1910.147, Occupational Safety and Health Standards, The Control of Hazardous Energy (Lockout/Tagout)
- 29 CFR 1910.333, Occupational Safety and Health Standards, Selection and Use of Work Practices
- 29 CFR 1926, Safety and Health Regulations for Construction
- PUB-3000 Chapter 8, Electrical Safety

### **8.3 LBNL Specific Requirements**

It is Laboratory policy to prevent the unintended or unexpected startup or release of hazardous energy during servicing, maintenance, or modification activities. No person must install, service, remove, or perform maintenance on any equipment or machinery that may involve an energy hazard, until that equipment has been de-energized, locked, tagged, and verified to be in a zero-energy state in accordance with this document.

Subcontractors who work on equipment with hazardous energy source(s) (electrical, mechanical, pneumatic, chemical, hydraulic, water, steam, gas) must have a lockout/tagout (LOTO) plan approved by the LBNL EHS Division. The LOTO plan must comply with 29 CFR 1910.147, 29 CFR 1910.333, and the Berkeley Lab [Lockout/Tagout and Verification Program](#), at a minimum.

All subcontractors who perform work on hazardous electrical equipment must first be required to be accepted by the LBNL Electrical Safety Authority Having Jurisdiction (AHJ) for Safe Work Practices as Subcontractor Qualified Electrical Workers (QEWs) in accordance with Work Process F. This includes both live and de-energized work, for build, service, maintenance, and repair of equipment.

### **8.4 References**

- 29 CFR 1910.147, Occupational Safety and Health Standards, The Control of Hazardous Energy (Lockout/Tag out).
- 29 CFR 1910.333, Occupational Safety and Health Standards, Selection and Use of Work Practices.
- 29 CFR 1926, Safety and Health Regulations for Construction.
- PUB-3000 Chapter 8, Electrical Safety

## 9.0 Electrical Safety

### 9.1 Applicability

The Subcontractor is responsible for the development and implementation of an electrical safety program to be followed throughout all phases of the construction project. This program must apply to all Construction Subcontractor and lower-tier subcontractors (hereafter referred to as “Subcontractor”) activities performed on LBNL sites unless otherwise specifically exempted by LBNL.

### 9.2 Regulatory Requirements

The subcontractor electrical safety program must be conducted in accordance with the following statutory requirements:

- 29 CFR 1926, Safety and Health Regulations for Construction , Subpart K, Electrical
- 29 CFR 1910.333, Occupational Safety and Health Standards, Selection and Use of Work Practices
- 29 CFR 1910.147, Occupational Safety and Health Standards, The Control of Hazardous Energy (Lockout/Tagout).
- National Fire Prevention Association (NFPA) 70, *National Electrical Code*
- National Fire Prevention Association (NFPA) 70E, *2012 Standard for Electrical Safety in the Workplace*
- National Fire Prevention Association (NFPA) 79, *Electrical Standard for Industrial Machinery*
- ANSIC2, *National Electrical Safety Code*

**Note:** Whenever there is a conflict between any requirements contained or referenced in this chapter, the most stringent requirement must apply unless specifically exempted by the LBNL Electrical Safety AHJ.

### 9.3 LBNL Specific Requirements

In addition to the requirements identified in [Section 9.3.2.1, Subcontractor’s Electrical Safety Program](#), of this appendix must meet the following LBNL requirements as applicable. Specific information on the LBNL Electrical Safety Program can be found in the [PUB-3000 Chapter 8, Electrical Safety](#).

#### 9.3.1 General Electrical Work Safety Requirements

Subcontractors must identify the electrical hazards associated within each definable feature of work and establish the controls necessary to maintain an acceptable level of risk. To assist in the evaluation of electrical hazards, subcontractors must employ an Electrical Hazard Analysis consistent with requirements of NFPA 70E, Standard for Electrical Safety in the Workplace (Current revision as adopted by LBNL) for shock and arc flash hazards. The identified hazards and control measures must be documented in the associated Job Hazards Analysis (JHA) or other work control document that provides an acceptable level of hazard identification and control for the associated task or work sequence. See [Section 3.0, Construction Hazard Identification and Work Control Process](#), of this appendix for additional information on the JHA process.

The safe electrical work practices that are employed must prevent electric shock, burns, arc flash or other injuries that could result from either direct or indirect electrical contact. This may include specialized training, observing required approach distances, and the use of appropriate personal protective equipment (PPE) consistent with the requirements of NFPA 70E.

## **9.3.2 LBNL Specific Requirements**

In addition to the specific requirements identified below, see PUB-3000, Electrical Safety, [Appendix R, Subcontractors and Vendors: What You Need to Know About Performing Electrical Work and Lockout/Tagout at Lawrence Berkeley National Laboratory](#) for additional subcontractor requirements.

### **9.3.2.1 Subcontractor's Electrical Safety Program**

The Subcontractor's Electrical Safety Programs will be submitted to LBNL for evaluation of conformance to NFPA 70E (2012 edition or later), and to ensure and suitable controls are implemented for the type of work to be performed. Specific attention will be paid to the following areas:

- QEW approval process
- QEW training content and periodicity
- Shock approach boundaries and PPE selection
- Arc flash boundaries and PPE selection (if applicable to the type of work)
- Voltage glove testing program

### **9.3.2.2 Energized Electrical Work Permit (EEWP)**

The Subcontractor must ensure that an ESWP has been completed with the LBNL required concurrences and approvals before initiation of work on hazardous energized systems, or operation and maintenance/verification of electrical systems operating at greater than 600 volts. The permit being submitted must be task specific. Blanket, general, or open-ended permits are prohibited and will not be processed. After a permit has been approved, subsequent changes in the scope of work or associated hazards requires cessation of work and a timely reassessment of this permit. If necessary, additional controls will be established and a new permit issued.

An LBNL approved EEWP serves as the authorization basis to conduct energized electrical work on energized circuits.

### **9.3.2.3 Qualified Electrical Worker**

All subcontractors who perform work on hazardous electrical equipment must be required to be accepted by the LBNL Electrical Safety AHJ for Safe Work Practices as Subcontractor QEWs. This includes both live and deenergized work, for build, service, maintenance, and repair of equipment.

“Accepted,” as defined in the context of this section, means that the AHJ has reviewed the Subcontractor Employer's Statement of QEW Approval, accepted it as valid for use at LBNL, and the applicant has demonstrated proficiency by passing the practical certification examination. However, it is the responsibility of the Subcontractor Employer to approve their personnel as QEWs for their work, in accordance with their Subcontractor Electrical Safety Program.

These requirements cascade down to all sub-tiered contractors of a general contractor, including vendors, Original Equipment Manufacturer (OEM) representatives, etc. Sub-tiered contractors and others may apply for AHJ acceptance under another Subcontractor's Electrical Safety Program only if they were trained and qualified by that Subcontractor under the same plan. If this is not the case then the sub-tiered contractor must also submit their own electrical safety program for review.

In order to verify subcontractor QEW credentials, the Subcontractor Employer must provide a Statement of QEW Approval with supporting materials for each individual, which are then reviewed by the LBNL Electrical Safety AHJ for Safe Work Practices. These include:

- A copy of the Subcontractor's Electrical Safety Program, which LBNL will retain on file.
- Contact information (phone number and email) of the Subcontractor's safety representative who can address questions and concerns that might come up during the course of work at the Lab.
- A company letterhead, officially signed document stating that the named employees are considered by the Subcontractor to be Qualified Electrical Workers under the definition of OSHA and NFPA 70E. For each employee, the document should state:
  - Type and length of job experience, basically describing why the person is considered to have the required experience for the tasks in the scope of work.
  - Any restrictions on their scope of work (such as voltage or type of equipment).
  - Confirmation of NFPA 70E electrical safety training for each employee. The training must be of the classroom or on the job type, minimum 8 hours, taken within the last 36 months. Training must also include a practical demonstration of absence of voltage verification, with selection of an appropriately rated voltage detector and appropriately rated PPE.
  - Confirmation of current first aid/CPR training with expiration date.
  - State of California electrician's license number and type, if applicable. This certification must be for "general electrician" unless otherwise approved by LBNL for specific jobs where a general electrician's certification is not necessary.

The LBNL Deputy Electrical Safety Officer, or the Division Electrical Safety Officer, as applicable, will review the submitted documents. Suitable submittals will be forwarded to the AHJ with a recommendation for acceptance. More information may be requested about the supporting electrical safety program, training records, PPE specifications or a particular individual's experience. Accepted submittals will be entered into the LBNL EHS Division registry of Qualified Electrical Workers.

An apprentice may be submitted for AHJ acceptance to perform electrically hazardous work at Berkeley Lab, and must be considered a QEW for the performance of those specific duties, under the following conditions:

- The apprentice has received the appropriate level of electrical safety training for the task, and
- The apprentice has demonstrated an ability to perform specific duties safely at his or her level of training, and
- The apprentice is under the direct task supervision of a QEW Journeyman. Direct task supervision means that the QEW Journeyman is present on site and overseeing the work, and is close enough to the apprentice to physically intervene to prevent an unsafe act.

The Electrical AHJ for Safe Work Practices reserves the right to revoke a subcontractor's status as Qualified Electrical Worker at any time when actions and behaviors pose a risk to themselves or others, or otherwise cause a concern that the worker is not in fact qualified for the task being performed. This authority is also delegated to the Deputy and Division Electrical Safety Officers. Additionally, the Electrical AHJ for Safe Work Practices also reserves the right to revoke the Qualified Electrical Worker status for all of the Subcontractor's workers if systemic deficiencies with the effectiveness of the Subcontractor Electrical Safety Program are discovered during the course of work.

At a minimum, Subcontractor QEWs who are performing a one-time task must complete an EHS Division online class, *Subcontractor Electrical Safety Orientation at Berkeley Lab*. Subcontractor QEWs who perform more than just a one-time task must complete the EHS Division course, *Subcontractor*

*Electrical Safety Site-Specific Training.* This training will communicate in detail Berkeley Lab specific policies and procedures for the control of electrical work.

### **9.3.2.4 Ground Fault Circuit Interrupter (GFCI) Protection**

#### **9.3.2.4.1 Ground Fault Circuit Interrupters**

All 120-volt, single-phase, 15-, 20-, and 30-ampere receptacle outlets used by employees must be protected by approved *ground fault circuit interrupters* (GFCIs). Receptacles other than 120-volt, single-phase, 15-, 20-, and 30-ampere receptacles must be protected by approved GFCIs, or by continuous enforcement by one or more designated persons of a written assured equipment-grounding conductor program that ensures proper installation and maintenance of equipment-grounding conductors for all cord sets, receptacles that are not a part of the permanent wiring of the building or structure, and equipment connected by cord and plug. The program should conform to the requirements of OSHA Standard 29 CFR 1926.404(b)(iii).

Subcontractors must ensure that GFCIs are used on 120-volt circuits as specified below:

- In damp or wet (standing water) work areas outdoors
- For temporary power (e.g., extension cords) during construction, remodeling, maintenance, repair or similar activities -outdoor receptacles must be enclosed with weatherproof (preferably metal) covers
- When using portable, electric hand tools and equipment with cord/plug connectors.

The users of the GFCIs must test portable GFCIs using the test button provided before each use. If the GFCI breaker fails the test, tag it out of service with a "DANGER — DO NOT USE" tag and (if portable) remove from service. Tripped circuit breakers may not be re-energized until it has been determined that the equipment and circuit can be safely re-energized. Do not reset or operate facility circuit breakers. Contact the Building Engineer or your LBNL Project Representative.

#### **9.3.2.4.2 Electric Power Tools**

All subcontractors must have a system in place for routine testing and maintaining of electrical tools, equipment, extension cords, and other electrical equipment. The program must be in writing, with a copy provided to the LBNL Construction Safety Engineer for review. Tools with damaged cords or cord caps, missing or damaged covers, missing grounding pins, or other damage that may affect its safe use must be removed from the project. All electrical equipment (such as saws, hammers, drills, vibrators, and float machines) must bear the label of a Nationally Recognized Testing Laboratory (NRTL), such as Underwriters Laboratories (UL), CSA, ETL, or the like.

All tools must be of the grounding type. Cord-connected tools must be grounded through an approved grounding attachment plug. **Exception:** Tools identified as "Double Insulated" are not required to be grounded.

#### **9.3.2.4.3 Electric Equipment**

Stationary electric equipment with exposed metal parts like housings, boxes, and hoist frames must be grounded.

Test instruments, equipment, and their accessories must be rated for circuits and equipment to which they will be connected. All test equipment must be NRTL listed and labeled and must be Category III or IV rated. Test instruments and equipment and all associated test leads, cables, power cords, probes, and connectors must be visually inspected for external defects and damage before the equipment is used on any shift. If there is a defect or evidence of damage that might expose an employee to injury, the defective or damaged item must be removed from service, and not used until repairs and tests necessary to render the equipment safe have been made.

### **9.3.2.5 Flexible Cords and Cables**

Use UL-listed flexible cords suitable for conditions of and location of use. Flexible cord sets used with grounding-type equipment must contain an equipment grounding conductor. Protect flexible cords and cables from damage. When possible, hang extension cord sets appropriately overhead to avoid tripping hazards and damage caused by foot traffic and equipment. Avoid sharp edges, pinching, or improper storage. Cords sets that are damaged must be removed and discarded or repaired by a qualified person.

#### **9.3.2.5.1 Extension Cords**

Only heavy-duty cords identified as hard or extra-hard usage (see National Electrical Code [NEC] Table 400.4) (such as types S, ST, SO, STO) are acceptable. Cords must be maintained in their original designed configuration. Cords may not be repaired or taped in any manner.

All extension cords must be plugged into job-site power that has proper overcurrent and ground-fault protection.

All extension cords must be kept out of walkways and out of wet conditions on the floor.

#### **9.3.2.5.2 Temporary Wiring and Lighting**

The following requirements apply to temporary wiring and lighting:

- Upon installation, repair, or modification of job-site receptacles, the installing subcontractor must test each receptacle for proper polarity and GFCI operation.
- Temporary wiring must be cable assemblies or multi-conductor cords or cables identified for hard usage or extra-hard usage (see NEC Table 400.4).
- All wiring methods must suit the conditions and environment where installed. No single conductor cable will be permitted. Temporary wiring must be removed immediately upon completion of construction or purpose for which the wiring was installed.
- Temporary lighting must not be put on the same circuit as temporary receptacles.
- A separate lighting circuit for stairways and exit areas is required.
- The subcontractor(s) installing all wiring and lighting must be responsible for the maintenance of such materials.

#### **9.3.2.5.3 Working Near Overhead Electrical Lines**

The subcontractor performing the work must have adjacent overhead electrical lines de-energized, blanketed, or protected by other means from contact with equipment or personnel.

An unqualified worker and the longest conductive object that he or she may contact must not come closer to an energized overhead line than the following distances:

- 50 kV and below — 10 feet
- Over 50kV — 10 feet plus 4 inches per each 10kV over 50kV

Any qualified electrical worker working within the above clearances must have a work plan approved by the EHS Division.

#### 9.3.2.5.4 Electric Welding

The following requirements apply to temporary electric welding:

- The frame of a portable welding machine operating from an electric power circuit must be grounded.
- An electrical disconnect must be provided on or near the welding machine.
- The electrode holder and connecting cable must be fully insulated.
- Light holders must not be used for heavy work, and welders must avoid standing on damp or wet surfaces while welding.
- All equipment must be checked regularly to make certain that electrical connections and insulation on the holders and cable are in good order.
- Cables must be kept dry and free from oil and grease. Cables must be arranged in such a manner that they do not lie in water, oil, or ditches, or on bottoms of tanks.
- A licensed electrician must perform all electrical repairs and maintenance work on welding machines.
- Electric stubs must be placed in containers provided by the subcontractor for this purpose.
- Welders must keep welding cables in an orderly fashion and away from places where they could cause a tripping hazard or become damaged. Where possible, cables should be strung overhead, high enough to permit free passage of vehicles and persons.

#### 9.3.2.6 Personal Protective Equipment

Qualified workers who are potentially exposed to electrical hazards that cannot be controlled through some engineering means must be provided with and use PPE appropriate for the specific work to be performed and the associated hazard level. This includes testing, troubleshooting, and zero-energy verification tasks.

Subcontractors are responsible for identifying, providing, inspecting, and maintaining their own PPE. Maintenance of PPE includes the required testing and certification. Records of such testing must be made available for review.

PPE appropriate to the hazard present must be used. Electrical PPE requirements are specifically defined by [PUB-3000, Chapter \\*Electrical Safety Program](#), and NFPA 70E.

Electrical PPE may include:

- Insulated gloves
- Eye and face protection

- ✓ Non-conductive headgear
- ✓ Arc-flash protective clothing as required by NFPA 70E
- ✓ Hotsticks and similar insulated tools.

### 9.3.2.7 Two Worker Rule

Subcontractors must ensure that a second worker is present when hazardous energized electrical work is performed. The second worker functions as a safety observer and does not participate in the actual work. This worker must be trained in cardiopulmonary resuscitation and be prepared to initiate other emergency response procedures.

## 9.4 References

- ✓ 29 CFR 1926, Safety and Health Regulations for Construction, Subpart K, Electrical
- ✓ NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplace (version in PUB-3000 Chapter 8, Electrical Safety)

## 10.0 Excavations

### 10.1 Applicability

The requirements of this section apply to all Construction Subcontractors and lower-tier subcontractors (hereafter referred to as “Subcontractor”) performing excavation activities on LBNL sites unless otherwise specifically exempted by LBNL.

### 10.2 Regulatory Requirements

All Subcontractor excavation activities must be conducted in accordance with the following statutory requirements:

- ✓ 29 CFR 1926, Safety and Health Regulations for Construction, Subpart P, Excavations

### 10.3 LBNL Specific Requirements

1. Competent Person Responsibilities
  - a. A competent person must be identified and assigned by the subcontractor.
  - b. The competent person is responsible for the excavation and **must be at the excavation location during all operations relating to the open excavation.**
  - c. The competent person must be able to identify existing and predictable hazards in the surroundings, or working conditions that are unsanitary, hazardous, or dangerous to subcontractors.
  - d. The competent person is authorized to take prompt corrective measures.
  - e. The competent person in charge of the excavation work ensures that:
    - i. All preparatory work is conducted as described in this program before any excavation work begins.
    - ii. Excavation and trenching work is performed within the guidelines of this program.
    - iii. Soil classification is performed before subcontractors are allowed in the excavation.
    - iv. The competent person is responsible for ensuring that:
      - v. Excavated materials and stockpiled materials are placed a minimum of 2 feet from the edge of the excavation.

- vi. Loose soil or rocks are removed from the sides of excavation walls.
- vii. Excavations 4 feet in depth or greater have a stairway, ladder, ramp, or other safe means of egress within 25 feet of any employee in the excavation.
- viii. Proper handrails and toe boards are erected and maintained at the top of the excavation when required for fall protection.
- ix. The number of workers in the excavation is limited to only those persons required to perform the work.
- f. The competent person responsible for the crew working in the excavation must inspect the excavation throughout the work period, and stop operations when unsafe conditions exist.
- g. The competent person must inspect all excavations before entry:
  - i. At the start of each shift
  - ii. After heavy rains. Water must not be allowed to accumulate in excavations at any time. Pumps, drains, or other means must be used to remove water constantly.
  - iii. After freezing and/or thawing temperatures occur
  - iv. After any condition that can change the integrity of the soil
- h. The competent person must be able to identify conditions where hazardous material may exist.
  - i. Where oxygen deficiency (atmospheres containing less than 19.5 percent oxygen) or a hazardous atmosphere exists or could reasonably be expected to exist, such as in excavations in landfill areas or excavations in areas where hazardous substances are stored nearby, the atmospheres in the excavation must be tested before employees enter excavations greater than 4 feet (1.22 m) in depth.
  - j. When conditions change, such as with atmospheric conditions within the excavation, the competent person must immediately remove any person in harm's way, and immediately notify the Berkeley Lab Project Manager.
- 2. Effects of Excavating and Trenching on Adjoining Property
  - a. The subcontractor must evaluate the stability of adjacent structures before starting an excavation, and document and monitor their stability daily thereafter.
  - b. A review of the subsurface conditions (determined from on-site borings) and the plans of existing buildings (where available) are necessary to evaluate lateral and vertical integrity. Prior to (and possibly after ceasing) operations, the subcontractor must complete an inspection to evaluate the condition of adjoining/existing property.
  - c. The following criteria influence the degree of inspection:
    - i. The distance of the structures from the hazard
    - ii. The severity of the hazard
    - iii. The general condition of the structures
    - iv. Requirements by local laws, contract, and/or liability
  - d. Where job operations such as pile driving and blasting cause vibrations that may affect nearby structures, the subcontractor must make vibration measurements, making data available to the Berkeley Lab Project Manager. This enables the job to monitor and set up procedures to keep the energy ratio of the vibrations at a safe level.
  - e. Where settlement of the nearby street, utilities, and structures may occur because of excavation and foundation work, the streets, utilities, and structures must be regularly checked for vertical and horizontal movement, and a log maintained by the subcontractor. Any movement must be reported and investigated immediately.
  - f. All inspection reports will be copied to the Berkeley Lab Construction Manager.
- 3. Soil Classification
  - a. Soil classification is a method of categorizing soils and/or rock into categories. Soil classification must be made by the competent person or soils engineer.
  - b. All unclassified soil will be treated as Type C Soil. Type C Soil means:

- i. Cohesive soil with unconfined compressive strength of 0.5tsf (48 kPa) or less; or
  - ii. Granular soils including gravel, sand, loamy sand; or
  - iii. Submerged soil or soil from which water is freely seeping; or
  - iv. Submerged rock that is not stable; or
  - v. Material in a sloped, layered system where the layers dip into the excavation or a slope of four horizontal to one vertical (4H:1V) or steeper
4. Surface Encumbrances
- a. All surface encumbrances located so as to create a hazard to subcontractors must be removed or supported, as necessary, to safeguard workers in the excavation.

### **10.3.1 Subcontractor Excavation Plan**

The Subcontractor is responsible for submitting to the LBNL Construction Representative or authorized Project Manager an "Excavation Plan" for review and concurrence before any excavation activity begins. This plan must show the proposed boundaries on a site map, including depth of the affected areas and the safety precautions, which must comply with OSHA Standard 1926, Subpart P, Excavations.

The LBNL Project Manager will verify the Excavation Plan with the appropriate Engineering and Construction "As-Built" information provided by the LBNL Facilities Division.

### **10.3.2 LBNL Excavation Permit**

Subcontractors must obtain an approved LBNL Excavation Permit from the appropriate LBNL Construction Manager for all excavations including trenching, grading, drilling or cutting activities that will penetrate 1½ inches or deeper from a surface. A copy of this permit can be obtained from the LBNL Construction Manager. The Construction Manager must determine what sections of the Excavation Permit need to be satisfactorily completed in order to authorize excavation. At a minimum, the Construction Representative and/or the LBNL Project Manager and the Subcontractor must physically walk the proposed excavation site with a site drawing (minimum ANSI C size sheet) and compare to the site utility locate drawing and physical markings. Any deviations identified during this walk must be resolved prior to issuing the permit.

Subcontractors must obtain the permit through the Berkeley Lab Construction Manager a minimum of 10 days prior to the start of work.

**Work may not proceed unless there is an approved, signed permit posted at the job or project site.**

For excavations 20 feet or deeper, a registered professional engineer hired by the subcontractor must design all shoring, sloping, or benching. All designs must be submitted to the Berkeley Lab Project Manager and filed at the subcontractor's field office prior to the start of work.

### **10.3.3 Competent Person**

The Subcontractor is responsible for identifying and assigning an excavation Competent Person for all excavation work performed. The competent person must be able to identify existing and predictable hazards in the surroundings, or working conditions that are unsanitary, hazardous, or dangerous to subcontractors. The competent person is responsible for the excavation and **must be on site during all operations relating to the open excavation**

The competent person in charge of the excavation work ensures that:

- All preparatory work is conducted as described in this program before any excavation work begins.
- Excavation and trenching work is performed within the guidelines of this program.
- Soil classification is performed before subcontractors are allowed in the excavation.
- Excavated materials and stockpiled materials are placed a minimum of 2 feet from the edge of the excavation.
- Loose soil or rocks are removed from the sides of excavation walls.
- Excavations 4 feet in depth or greater have a stairway, ladder, ramp, or other safe means of egress within 25 feet of any employee in the excavation.
- Proper handrails and toe boards are erected and maintained at the top of the excavation when required for fall protection.
- The number of workers in the excavation is limited to only those persons required to perform the work.
- The atmosphere in the excavation is tested prior to entry and periodically throughout the operation

The competent person responsible for the crew working in the excavation must inspect the excavation throughout the work period, and stop operations when unsafe conditions exist. The competent person must inspect all excavations before entry:

- At the start of each shift
- After heavy rains. Water must not be allowed to accumulate in excavations at any time. Pumps, drains, or other means must be used to remove water constantly.
- After freezing and/or thawing temperatures occur
- After any condition that can change the integrity of the soil

When conditions change, such as with atmospheric conditions within the excavation, the competent person must immediately remove any person in harm's way, and immediately notify the Berkeley Lab Project Manager.

#### **10.3.4 Pot Hole Verification**

The LBNL Project Manager or assigned representative must work directly with the Subcontractor who will hand dig or otherwise safely "pot hole" (daylight) to verify location and depth of the various utilities and LBNL-owned underground facilities and/or lines which may conflict with the excavation activity.

When the Subcontractor excavating activities are within 5 feet of underground services, the LBNL Project Manager or designated representative will be physically present for on-site monitoring to ensure compliance with the LBNL accepted plan.

#### **10.3.5 Confined Spaces**

When the configuration of an excavation is such that the excavation is deemed to be a confined space, the provisions in [PUB-3000 Chapter 34, Confined Spaces](#), apply.

#### **10.3.6 LBNL Excavation Lockout/Tagout**

The LBNL Project Manager or designated representative will be physically present for on-site monitoring when excavating activities are within 5 feet of underground services to ensure compliance with the approved plan. All underground electrical (120 volts and above) and other systems covered by the lockout/tagout program must be de-energized and locked out during excavations within 5 feet of those systems unless otherwise approved in advance by the appropriate Construction Representative.

The lockout/tagout must be in accordance with an LBNL accepted Subcontractor Lockout/Tagout Program and the provisions contained in the LBNL Lockout/Tagout Procedure.

During excavation/construction activities, no locks or tags must be installed or removed on facility systems by Subcontractors without the written approval of the applicable Construction Representative or designated representative.

### **10.3.7 Subcontractor Training Requirements**

The Subcontractor is required to provide a qualified and competent person at the job site when excavations work is ongoing. Subcontractor excavation Competent Person(s) that are trained and knowledgeable about soils analysis, the use of protective systems, identification of existing and predictable excavation hazards and the requirements of 29 CFR 1926, Subpart P, Excavations, will be considered as meeting the necessary excavation competent person training for working at LBNL. The Subcontractor must provide proof of such training as requested by the Construction Representative. The Subcontractor must ensure that the “Competent Person(s)” can demonstrate that their knowledge and skill-sets match the excavation and protective system(s) that are in place. In addition, all Subcontractors working in or around excavations must receive general excavation hazards awareness training.

## **10.4 LBNL Special Emphasis**

### **10.4.1 Underground Services/Utilities**

A potential hazard on LBNL sites is the presence of underground services and structures such as utility lines (water, electric, sewer, gas, or communication), tanks, various gas and liquid process piping, and sewers. If these services or structures are damaged in any way as a result of excavation activities, there may be injury or death to workers, contamination or interruption of services, disruption of processes, and expensive programmatic delays. In order to prevent any incident regarding underground services, the Subcontractor must ensure all applicable provisions of the LBNL Dig Permit System are adhered to prior to any excavation work at LBNL.

### **10.5 Subcontractor Responsibilities**

The Subcontractor must be responsible for the following:

- ✓ Obtaining an approved LBNL Dig Permit from the Construction Manager
- ✓ Monitoring/daily inspections of excavation, trenching and shoring operations.
- ✓ Designating a Competent Person, who has had the training to act in this position and providing the competent person the authority to effectively discharge their duties.
- ✓ Ensuring the requirements of this section are effectively communicated and enforced to lower tier subcontractors.
- ✓ Investigating and reporting to the LBNL Project Manager all incidents involving excavations, trenching and shoring.

### **10.6 References**

- ✓ 29 CFR 1926, Safety and Health Regulations for Construction, Subpart P, Excavations

## **11.0 Fire Protection and Prevention**

### **11.1 Applicability**

The Subcontractor must be responsible for the development and implementation of a fire protection program to be followed throughout all phases of the construction project. This program must apply to all

Construction Subcontractors and lower-tier subcontractor (hereafter referred to as “Subcontractor”) activities performed on LBNL sites unless otherwise specifically exempted by LBNL.

## **11.2 Regulatory Requirements**

The Subcontractor’s fire protection and prevention program must be conducted in accordance with the following statutory requirements:

- 29CFR1926.24, Safety and Health Regulations for Construction, Fire Protection & Prevention
- 29 CFR 1926, Safety and Health Regulations for Construction, Subpart F, Fire Protection & Prevention
- 29 CFR 1926, Safety and Health Regulations for Construction, Subpart J, Welding & Cutting

## **11.3 LBNL Specific Requirements**

In addition to Section 11.2 of this appendix, the Subcontractor’s fire protection and prevention program must meet the following LBNL requirements as applicable.

### **11.3.1 Fire Safety Plan**

To reduce the possibility of fire damage and associated losses during construction, alteration, or demolition, the subcontractor must develop a fire safety plan to assure that the listed requirements in NFPA 241 (2013 edition), are addressed.

As directed by contract a project specific fire safety plan must be submitted to the Berkeley Lab Fire Marshal for review and approval.

Berkeley Lab employees and their visitors must abide by the subcontractor's fire safety plan, or if the work is being done by Berkeley Lab, they must support the Berkeley Lab fire safety plan for the construction, alteration, or demolition project.

### **11.3.2 Hot Work Permit**

Subcontractors conducting hot work will perform the hot work under the LBNL Hot Work Permit. The Hot Work Permit will be issued from the Berkeley Lab Fire Department. The subcontractor will be responsible for providing all the required materials, personnel and protective equipment to conduct all hot work.

Prior to the start of any hot work activity, the Subcontractor must perform a walk-down of the work to facilitate thorough hazard identification and control. The Subcontractor is ultimately responsible for compliance with the requirements of the permit. The Hot Work Permit is valid for the specified task noted on the permit and may not exceed 30 days in duration. Variance from the scope of work identified on the permit is prohibited.

The LBNL Hot Work Permit System and the associated Hot Work Permit Checklist can be obtained from the LBNL Construction Representative.

### **11.3.3 Working with Open Flame, Welding, Cutting, or Grinding**

The following requirements apply to Subcontractors conducting activities with open flames, welding, cutting, or grinding and other flame/spark producing tasks (hereafter referred to as “hot work”):

- The Subcontractor must perform hot work in accordance with a Hot Work Permit System as outlined in Section 11.3.2 of this appendix.

- The Subcontractor must ensure that all lower-tier subcontractors understand and comply with the requirements of the permit system.
- Subcontractor personnel who perform fire watch duties must be qualified. Individual(s) performing fire watch duties must be proficient in the use of fire extinguishers.
- Alternatives to performing hot work should be used where practical (e.g., saw cutting instead of grinding wheel or torch cutting; crimp-type pipe fittings instead of soldered fittings).
- Hot work should be performed in Subcontractor shops or designated areas (e.g., pre-approved weld booths or shop areas) where practical.
- The Subcontractor must ensure that hot work is not conducted during facility fire-sprinkler system outages.

#### **11.3.4 Hot Work Location Selection Hierarchy**

The location of hot work must be determined by utilizing the following priority list:

- If work must be conducted on site, combustibles must not be located within 35 feet of the work area.
- If work must be conducted on site and combustibles cannot be removed from within 35 feet of the work area, fire barriers such as screens or blankets must be used to protect combustibles.
- Protect openings in walls, floors, roofs, and ceilings where sparks can travel beyond the work area to inaccessible or unprotected areas. Openings or cracks in walls, floors, roofs or ceilings within 11 m (35 ft) of the site must be tightly covered with fire-retardant or noncombustible material to prevent the passage of sparks to adjacent areas.
- Beware of heat conduction through penetrations. Hot work that is performed on pipes or other metal that is in contact with combustible walls, partitions, ceilings, roofs, or other combustibles, must not be undertaken if the work is close enough to cause ignition by conduction.

#### **11.3.5 Fire Watch**

The subcontractor must establish a fire watch to protect the safety of workers and assets. The fire watch observes staff conducting the welding, cutting, or grinding operations and monitors adjacent areas. The worker assigned to this task of fire watch must have fire extinguishing equipment readily/immediately available.

The fire watch must observe the hot work area for 30 minutes (60 minutes for roof work) after the completion of hot work. For overhead work, a fire watch may be necessary on multiple levels. The fire watch may not be assigned any other duties during hot work operations. The fire watch must stop work if sparks travel beyond the area that fire watch can observe. Individuals assigned to fire watch duties must:

- Understand the requirements of the hot work permit system.
- Be knowledgeable about fire and emergency reporting procedures and fire alarm pull box locations in buildings, if applicable.
- Have means of emergency communications, such as cellular phones or radios, available when working in remote or outside areas.
- Be trained in the use of fire extinguishing equipment

Prior to leaving the site, the fire watcher must verify that the possibility of fire does not exist.

#### **11.3.6 Fire Protection Equipment**

Fire protection equipment must be sufficient for the hazards present. At a minimum, a 4A:60BC rated fire extinguisher is required. The fire extinguisher must be readily available in the immediate work area. Free

access must be maintained at all times to all exits, fire alarm boxes, fire extinguishing equipment, and any other emergency equipment. Free access means clear of all obstructions.

### **11.3.7 Hot Work Protective Clothing**

Subcontractors must ensure that the personnel protective clothing selected for hot work minimizes the potential for ignition, burning, trapping hot sparks, and electric shock as identified in ANSI Z49.1, "Safety in Welding, Cutting and Allied Processes," sections 4.3 and E4.3, current revision.

### **11.3.8 Hot Work Required Inspections.**

In addition to the fire watch requirements, the Subcontractor's authorized worker/permit holder must inspect the work area a minimum of once per day to verify compliance with permit requirements. Additionally, responsible Subcontractor personnel must also perform periodic inspections to ensure continued compliance with the requirements of the permit. When inspections identify unsafe conditions or the scope of work departs from that defined in the permit, the hot work must be stopped immediately.

### **11.3.9 Hot Work Outdoors**

The subcontractor must ensure that vegetation and other combustibles are removed, cut back, or otherwise protected to prevent ignition during hot work outdoors. A high level of caution must be exercised to prevent wild land fire. If wind speeds exceed a constant velocity of 10 miles per hour, hot work is not permitted outdoors.

### **11.3.10 Fire Protection System Outages and Impairments**

Subcontractors performing work must plan their work and take the necessary steps to minimize outages or impairments of fire suppression, detection, or alarm systems. When outages are necessary to perform a particular scope of work, they must be coordinated and approved by the LBNL Construction Representative. An LBNL Fire Protection System Outage Permit must be issued by the LBNL Construction Representative. Compensatory measures necessary to achieve a commensurate level of fire protection must be incorporated into the permit.

### **11.3.11 Exits and Exits Access**

The Subcontractor must ensure that a clear path of at least 44 inches is maintained to exits on indoor projects. Exits must be marked by a readily visible sign. Access to exits must be marked by readily visible signs in all cases where the exit or path to reach it is not immediately visible to the occupants. Firewalls, doors, automatic closing devices, and exit stairways are to be established as early as practical, and fire cutoffs must be maintained as long as practical.

### **11.3.12 Flammable and Combustible Liquids Storage**

Flammable and combustible liquids must be stored in approved containers and cabinets, such as those that are UL or FM listed, and quantities must be limited to minimize fuel loading in accordance with NFPA codes. Rags used to apply flammable liquids are to be disposed of in self-closing approved safety containers designed for that use. All fuel and solvent containers must be placed on drip pans.

All gas cylinders such as propane, oxygen, and acetylene must be stored and restrained in a vertical position in areas designated by Berkeley Lab Project Management. All stored cylinders must be capped. Oxygen may not be stored within 20 feet of type of fuel-gas. All gas cylinders in use must be retained in the vertical position and capped at the end of the working day. All oxygen and acetylene in use must be on a manufactured carts with required rated separations (or by 5 feet or a fire-rated wall) and with a fire extinguisher readily available

### 11.3.12.1 Oxygen

Compressed oxygen plus oil is explosive. No oil or grease of any kind may come in contact with the valve, regulator, or any other portion of the cylinder or apparatus.

Oxygen cylinders except those in actual use or required for the day's supply, must be stored in a place designated by Berkeley Lab Construction Management, where unauthorized persons will not tamper with them. Open flames of any description are not permitted in any building used for the storage of oxygen cylinders. If cylinders are stored on the ground or open platforms, such locations must not be adjacent to a large amount of combustible material. Oxygen cylinders must be stored in a vertical position with caps in place and chained.

### 11.3.12.2 Acetylene

When cylinders of acetylene are not in use, outlet valves must be kept tightly closed and valve caps replaced, even on cylinders considered empty. Cylinders must be stored in a safe, dry, well-ventilated place without undue exposure to the heat of the stoves, radiators, furnaces, or the direct rays of the sun. Cylinders of dissolved acetylene must be stored in an upright position, with the valve end up and capped and restrained. Oxygen and acetylene cylinders not in use must be separated by 20 feet or a half-hour fire-rated wall or a manufactured fire wall cart.

Cylinders must be handled carefully, never dropped, and placed so they will not fall or be struck by other objects. When transporting, moving, and storing compressed-gas cylinders, valve protection caps must be in place and secured. When oxygen and acetylene cylinders are hoisted, they must be secured on a cradle, sling board, or pallet. They must not be hoisted or transported by means of magnets or choker slings.

Partially used cylinders must be closed at the valves. When exhausted, cylinders must be returned as quickly as possible to the storage building or area, and from there to the manufacturer. Carts used to transport cylinders must have fire extinguishers attached.

Fuel and oxygen hoses, including couplings, must be inspected frequently to ensure they are not frayed or otherwise damaged. Compressed-gas hoses must be stored in a ventilated gang box.

### 11.3.13 Gasoline Powered Equipment

Most construction sites have gasoline-powered equipment and thus introduce the hazard of potential fire and dangerous fumes. All welding equipment, generators, and equipment that must be used inside the confines of an enclosed space must be propane or electric-powered unless otherwise approved by Berkeley Lab in writing.

Gas powered equipment must be shut down during refueling. A suitably sized (at a minimum 20-pound) ABC dry-chemical-type extinguisher must be available where flammable liquids such as fuels are handled Use only approved metal safety cans for filling engine tanks (must have an automatic safety-latch closer and flash arrestors). **No plastic cans.**

### **11.3.13.1 Fumes**

Gas engines exhaust carbon dioxide and carbon monoxide. Carbon dioxide is heavier than air; carbon monoxide (CO) is slightly lighter. A mixture of the gases usually is heavier than air, although heat may cause it to rise. Both have no color, taste, or smell. Low concentrations cause headache and nausea. Death is swift in high concentrations. A few minutes may be too long. Don't discount this hazard. If anyone exhibits symptoms, do not attempt rescue without proper personal protective equipment.

Do not run gas engines in pits, manholes, or confined spaces without positive ventilation. When an engine is in an enclosed space, always pipe gas-engine exhausts to outside air. Start the blower before starting the engine. If the engine stops, be sure the space is well blown out before sending anyone in to restart. Always check for CO gas with CO tester at least once per shift.

Danger spots are deep excavations, pits, manholes, shanties, pipe or crawl spaces under basement floors, and where gas heaters are used. Treat these spaces as confined spaces.

### **11.3.14 Smoking/Wildfire**

Smoking, if permitted by the Subcontractor, must be restricted to LBNL designated areas that incorporate appropriate facilities for the safe disposal of smoking materials. Due process and control must be employed to prevent wildfire. Open fires are prohibited.

### **11.3.15 Housekeeping/Trash**

The Subcontractor must monitor the work area frequently and maintain good housekeeping. Common garbage and other waste must be disposed of at frequent and regular intervals. Containers must be provided for the collection and separation of waste, trash, oily or used rags, and other refuse. Containers used for garbage and other oily, flammable, or hazardous wastes, (such as caustics, acids, harmful dusts or similar materials) must be equipped with covers. Chemical agents or substances, which might react to create a hazardous condition, must be stored and disposed of separately.

## **11.4 In the Event of a Fire**

In the event of a fire:

- Notify and evacuate all personnel.
- Call the Fire Department by dialing 7-9-1-1 from a Laboratory telephone or by operating a nearby manual fire-alarm station.
- If a telephone or manual fire-alarm station is not practical, cell phone users may call 911 to reach the Laboratory's Fire Dispatch Center (NOTE: This is an emergency number and the call will be treated as a 911. Use this number only to report a fire or life safety emergency!).
- A properly trained user, confident in his or her ability to use the extinguisher safely, may attempt to extinguish a small fire.
- Notify Berkeley Lab management.

## **11.5 References**

- 29CFR1926.24, Safety and Health Regulations for Construction, Fire Protection & Prevention
- 29 CFR 1926, Safety and Health Regulations for Construction, Subpart F, Fire Protection & Prevention
- 29 CFR 1926, Safety and Health Regulations for Construction, Subpart K, Welding & Cutting

- ANSI Z49.1, “Safety in Welding, Cutting and Allied Processes,” Sections 4.3 and E4.3, current revision.
- NFPA 241: Standard for Safeguarding Construction, Alteration, and Demolition Operations 2013

## **12.0 Hoisting and Rigging**

### **12.1 Applicability**

The requirements of this section apply to all Construction Subcontractors and lower-tier subcontractors (hereafter referred to as “Subcontractors”) hoisting and rigging (H&R) activities on LBNL sites unless otherwise specifically exempted by LBNL.

The equipment covered under this procedure includes H&R devices and associated equipment such as slings, ropes, and chains, which provide mechanical assistance in raising and lowering a load. This includes either power or manually operated equipment.

### **12.2 Regulatory Requirements**

All Subcontractor hoisting and rigging (H&R) activities must be conducted in accordance with the following statutory requirements:

- 29 CFR 1926, Safety and Health Regulations for Construction, Subpart N, Cranes and Derricks.
- 29 CFR 1926.251, Safety and Health Regulations for Construction, Rigging Equipment for Material Handling (Rigging of loads being lifted by cranes).
- 29 CFR 1926.753, Safety and Health Regulations for Construction, Hoisting & Rigging (During steel erection activities).

**Exception:** This section does not include requirements for powered industrial trucks (PIT).

### **12.3 LBNL Specific Requirements**

In addition to [Section 12.2 of this appendix](#), all Subcontractor H&R activities must meet the following specific LBNL requirements as applicable.

Subcontractors bringing H&R equipment on site must be able to demonstrate that their equipment is properly maintained, in safe operating condition, and that operators are experienced and qualified. Subcontractor crane operators are not permitted to operate LBNL H&R equipment. All H&R equipment brought on site must be in a new or like new condition free of hydraulic or oil leaks.

#### **12.3.1 Cranes**

##### **12.3.1.1 Operator Training and Certification**

Crane operators must be qualified in the safe operation of cranes or hoisting apparatus. Subcontractors must submit documentation to LBNL verifying qualifications of the operators.

Crane signal personnel must be qualified through training. Subcontractors must submit to LBNL evidence of successful completion issued by the CURRENT employer’s qualified evaluator, or a third party (not a former employer) qualified evaluator.

Riggers must meet competent person requirements for rigging. Subcontractors must submit documentation to LBNL verifying competency.

Subcontractors who provide and operate H&R equipment, as part of a construction project or similar activity, must provide:

- **Proof of Training/Certification:** LBNL requires proof of training, such as an NCCCO license or other LBNL accepted licenses/certification. LBNL recognizes the NCCCO national certification program as demonstrating that the certified H&R operator meets CalOSHA's and LBNL's requirements for crane operator proficiency. This certification/license must be current for the crane type they will be operating (i.e., Mobile Crane Operator, Tower Crane Operator). Any other forms of crane certification must be accepted by the LBNL Construction Manager.
- **Medical Requirements:** Crane operators must complete a medical certification examination at least every three years in accordance with ASME B.30.5. A valid medical card must be provided to document this requirement.

#### **12.3.1.2 Equipment Compliance**

Mobile cranes must comply with CCR Title 8, *General Industry Safety Orders*, Article 93. Construction crane operations including assembly and disassembly must comply with 29 CFR 1926 Subpart CC.

Unless approved by the LBNL Rigging Supervisor, rigging equipment and devices must comply with American Society of Mechanical Engineers (ASME) B30.26, have legible load-rating markings that are traceable back to the manufacturer, and be made in the United States.

#### **12.3.1.3 Communication**

The subcontractor must require the use of ANSI B30.5 standard hand signals or voice/radio communications during the course of crane operations.

#### **12.3.1.4 Crane Lift Requirements**

A Crane Lift Plan must be submitted by the crane contractor to the LBNL Construction Manager and must be approved prior to any crane operation. Crane Lift Plans must include the following:

- A scope of work, including a description of the load to be lifted, and lift origination and termination points;
- Crane configuration (boom length, boom angle, load path of travel);
- Load weights;
- Capacity (with deductions) of crane in proposed configuration;
- Description of rigging, including lifting devices and attachment points;
- Drawings or aerial photos of the proposed crane location(s);
- Drawing of work area control;
- OSHA Annual Crane Certification;
- Operators' licenses;
- Proof of training for signal personnel;
- Riggers' qualifications;
- Name of qualified rigger in charge of assembly and disassembly (if assembled at LBNL);
- Assembly/disassembly procedure (if assembled at LBNL);
- Plan to safely work around overhead power lines (if applicable).

The following training and equipment requirements also apply:

- All crane operators must have a valid license from an approved agency or union and meet the requirements of 29 CFR 1926 Subpart CC.
- All crane signal personnel must meet the signal-person requirements of 29 CFR 1926 Subpart CC. Training certificates must be issued by a third-party qualified evaluator, or the **CURRENT** employer's qualified evaluator.
- All rigging personnel must meet the rigging competent-person requirements of 29 CFR 1926 Subpart CC. All cranes must be equipped with rated load capacities, wind load ratings, and special hazard warnings.
- All rigging equipment must be inspected prior to each use, as well as weekly, with a copy of the weekly inspection report submitted to the LBNL Construction Manager.
- Wedge sockets and fittings must be the proper size to match the wire rope and must move to wedge and hold the wire rope under load construction. The dead end must be terminated according to ASME B30.5 and must not be attached in any manner to the live side of the load line.
- An anti-two-block device or warning device is required on all cranes except pile-driving equipment.
- Unless approved by the LBNL Construction Manager, multiple-piece lifts (Christmas treeing) are NOT permitted.
- A daily and monthly inspection must be performed while the cranes are in use on the project.
- These daily and monthly forms must be maintained on file by the Subcontractor, and made available to the LBNL Construction Manager upon request for review and verification.
- If the crane manufacturer's rated load chart for the specific crane configuration is not available on the crane, the crane must be immediately taken out of service.
- When two cranes are working in the same area, a procedure explaining the method of coordination to be used between cranes to prevent a collision must be submitted to the LBNL Construction Manager.
- Mobile cranes must only be used with outriggers fully extended and tires off the ground unless the manufacturer allows otherwise.
- If the supporting ground for the crane is soft, the lift must not be made until a firm bearing is provided, including using crane mats if necessary.
- No lift must be made if the crane is not level.
- If the full range of motion of the lift is not visible to the operator or signal person, radio communication must be provided.
- For multiple-crane lifts, the cranes' rated capacity must be reduced by not less than 25%.

#### **12.3.1.5 Pre-Lift Meeting**

Prior to performing any lift, the Subcontractor must conduct a pre-lift meeting with workers involved in the work activity. The following items must be reviewed:

- The scope and sequence of work
- Roles and responsibilities
- Hazards and controls
- Other relevant information identified in the Hoisting and Rigging Lift Plan.

When performing lifts designated as critical and/or complex lifts, this meeting must be documented utilizing the LBNL Pre-Lift Meeting Checklist or other equivalent LBNL accepted checklist. A copy of the LBNL Pre-Lift Meeting Checklist can be obtained from the Construction Representative.

#### **12.3.1.6 Area Access Control**

The Subcontractor must cordon off or manually control the lift area to prevent access by unauthorized workers by deploying barricades and warning signs and/or utilizing personnel to monitor and control access to the area. The Subcontractor must cordon off the swing radius area for mobile cranes with warning tape or other barricade apparatus, such as cones.

#### **12.3.1.7 Protection of People**

Do not place people in jeopardy by moving a suspended load over people or an occupied section of a facility. Work beneath a suspended load is prohibited unless the load is supported by cribbing, jacks, or a solid footing that safely supports the entire weight. All personnel must remain clear of moving and shifting loads.

#### **12.3.1.8 Rated Load Capacity**

The rated load capacity of monorails and other H&R structural elements, such as jibs, must match, at a minimum, the rated load capacity of a hoist placed upon it.

Know the weight of the object being lifted or use a dynamometer or load cell to determine the weight. If the weight of the load is unknown, a minimum 50% safety factor must be employed. This means that the crane or hoist, slings, and rigging hardware must have twice the capacity of the estimated load.

Fully extend outriggers or reduce the crane's rated load capacity as directed and allowed by the crane manufacturer's operating manual.

#### **12.3.1.9 Rated Load Test**

Prior to initial use, all cranes in which load sustaining parts have been modified, replaced, or repaired must be load-tested by a qualified inspector or under the direction of that inspector. All rated load tests must be performed in accordance with manufacturer's recommendations.

#### **12.3.1.10 Electrical Distribution Lines**

Watch for overhead electrical distribution and transmission lines and maintain a safe working clearance of at least 10 feet or as otherwise required from energized electrical lines. Any overhead wire must be considered to be an energized line unless and until the LBNL Electrical Engineer or the electrical utility authorities indicate that it is not an energized line. Exercise caution when working near overhead lines having long spans as they tend to move laterally or vertically due to the wind, which could cause them to breach the safety zone.

#### **12.3.1.11 LBNL Critical (High Consequence/High Value) Lift Requirements**

High-consequence/high-value lifts are parts, components, assemblies, or lifting operations designated as such by the customer or program organizations because the effect of dropping, upsetting, or collision of items could:

- ✓ Cause significant work delay;
- ✓ Cause undetectable damage, resulting in future operational or safety problems during construction;
- ✓ Present a potentially unacceptable risk of personnel injury or property damage.

High-consequence/high-value lift/moves also include those lifts/moves that:

- ✓ Require the simultaneous use of both the main and auxiliary hoists of a given crane or the simultaneous use of two cranes;

- Are within 50 feet of energized overhead power lines;
- Meet or exceed 75% of the configured crane capacity.

A detailed, step-by-step procedure in the form of an Engineering Note must be prepared for each high-consequence/high-value lift/move. While high-consequence/high-value lift procedures are customarily prepared for one-time use, general high-consequence/high-value lift procedures may be employed to accomplish routine recurrent high-consequence/high-value lift operations. For example, a general high-consequence/high-value lift procedure may be used to lift shielding blocks or to lift a frequently lifted item in a shop.

The lifting procedure detailed in the Engineering Note must contain the following:

- Identification of the item to be moved;
- Identification of the person in charge (PIC) of all aspects of the lift;
- Special precautions;
- Weight of the item;
- Total hook load (all component parts of the item plus tackle and load-measuring devices);
- Determination of the center of gravity;
- A list of each piece of equipment and each accessory (e.g., slings, spreader bars, yokes) to be used in the lift. Each must be identified by type and rated capacity. If a portable item to be used has no manufacturer's serial number, a LBNL identification number must be assigned by the PIC and affixed to the item;
- A list of surveillance procedures, checkpoints, and estimated instrument readings (if used) to enable confirmation that the lift is proceeding as planned;
- Calculation of stresses to be generated in the item during lifting and determination of the adequacy and proper labeling of the attachment points of the item to be lifted.

A rigging sketch or sketches must include the following:

- Lifting points;
- Load vectors at all stages of the lift/move;
- Sling angles at all stages of the lift/move;
- Accessories used and rated capacities;
- Method(s) of attachment;
- Method of rotating about either horizontal axis, if applicable;
- Other factors affecting the capacity of the equipment or accessories;
- Identification of the capacity (or limit) of equipment and load;
- Identification of the expected load in each item of equipment and each accessory;
- A load-path sketch with the expected height of the load at each point in the lift. Where appropriate, floor-loading diagrams must be included to provide for setting the load down at any point in the path, should that be necessary;
- A travel sketch, either as a part of the load-path sketch or a separate sketch, indicating the planned travel path and lifting, travel speeds, and floor load capacity;
- An assessment of wind loading and weather concerns for all outdoor work. Obtain assistance from the LBNL CM/CSM for wind-loading concerns;
- A checklist detailing each step of the procedure, with each step to be initialed by the PIC as it is completed;
- A sign-off sheet for personnel involved in the lift to verify that they are familiar with the contents of the procedure;

- Load tests and practice lifts, if required, paying specific attention to wire ropes and breaks;
- Verification that all primary and secondary hoisting equipment is within the current inspection and test time requirements (for example, yearly periodic inspections and certification).

When particular types of lifts are to be repeated many times (for example, lifts of items with special lifting features that do not allow variation of the parameters listed above, such as center of gravity, lift point, sling angle, and maximum weight) and set procedures are established for them, no new procedures are required.

Where the design of the facility permits no significant variation in the travel path, the path does not have to be specified. The procedure must, however, clearly define the limits of the procedure. Also, when there is limited access to the crane operational view and control, the PIC's responsibility may be delegated to a specified operator.

#### **12.3.1.5.1 Approval of High-Consequence/High-Value Lift Procedures**

The procedure detailed in the Engineering Note must be reviewed and approved by LBNL technical experts. Any change to the procedure must be reviewed and approved as if it were an original procedure. All reviewers should be consulted early in the process to assure that their concerns are addressed, avoiding the need for later revisions to the procedure.

#### **12.3.1.5.2 High-Consequence/High-Value Lift Personnel**

A pre-lift meeting with all participating personnel must be held before a high-consequence/high-value lift to ensure that each person involved in the lift is familiar with the procedure before beginning work. All participating personnel must initial the procedure sign-off sheet to verify that they are familiar with the procedure.

The project CM must arrange for all reviewers/approvers to be available by phone, e-mail, or fax during the operation should the lift plan need to be modified and reapproved.

### **12.3.2 Environmental Factors**

Environmental factors, such as weather and terrain can adversely affect a lift. When performing outdoor lifts, the following environmental factors must be considered:

#### **12.3.2.1 High Winds**

Lifts must be suspended if prevailing wind conditions may adversely affect the lift. As a general rule, this applies to wind speeds of 25 miles per hour or more. However, based on the nature of the load – such as size, surface area, or fragility – a lower wind speed limit may warrant suspension of a lift. The H&R operator and/or lift master must evaluate behavior of the load in prevailing winds and the stresses placed upon H&R equipment to the extent necessary to safely complete the lift.

#### **12.3.2.2 Ground Conditions**

Check ground conditions around the hoisting equipment for proper support, including settling under and around outriggers, ground water accumulation or other similar conditions.

### **12.3.3 Crane Inspection, Maintenance & Testing**

#### **12.3.3.1 Crane Initial Inspection**

Prior to being placed into service, all Subcontractor owned and/or rented cranes must undergo an initial inspection. The LBNL Subcontractor Crane Inspection Checklist or equivalent accepted checklist must be utilized to document these inspections. When qualified third party inspections are performed to meet the

requirements of this inspection, a copy of the third party inspection must be attached to the Subcontractor Crane Inspection Checklist which will satisfy the crane physical inspection portion of the checklist. The LBNL Subcontractor Crane Inspection Checklist template can be obtained from the Construction Representative. The LBNL Construction Representative may elect to oversee the Subcontractor's initial inspection of the crane.

All crane inspection deficiencies must be identified and documented and the safety implications must be determined. The Subcontractor must maintain the original copy of the inspection report and provide a copy to the project file. The crane owner must take immediate action to correct the identified deficiencies.

- **Mobile Boom Cranes:** For wheel mounted or crawler type boom cranes, the Subcontractor competent person must inspect the crane. The Subcontractor may elect to utilize a qualified independent third party inspector to meet this requirement.
- **Lattice Boom or Tower Cranes:** Lattice boom and tower cranes require a thorough inspection prior to being placed into service on LBNL property. If the Subcontractor is utilizing a lattice boom or tower crane, the crane must undergo a thorough initial inspection prior to the start of work by a qualified independent third party inspector. The Subcontractor must bear the expense of this inspection.

#### **12.3.3.2 Daily Pre-Operational Inspections**

H&R operators must visually inspect the following items each day or prior to first use if the hoist has not been in regular service. Records are required.

- Functional operating mechanisms for maladjustment interfering with proper operation
- Deterioration or leakage in lines, tanks, valves, drain pumps, and other parts of air systems
- Hooks for cracks, deformation, latch engagement, and damage from chemicals
- Hoist rope for significant wear, kinking, crushing, bird-caging, corrosion, or broken strands or wires
- Hoist chains, including end connections, for excessive wear, twist, distorted links interfering with proper function, or stretch beyond manufacturer's recommendations
- Primary hoist upper-limit device for proper operation.

**Deficiencies:** H&R operators or other designated qualified workers must examine deficiencies and determine whether the equipment should be removed from service or if a more detailed inspection is required.

#### **12.3.3.3 Monthly Inspections**

Cranes active on the site for periods extending beyond 1 month must receive monthly documented inspections. The competent person must at a minimum visually inspect the following items for damage, wear, or other deficiency that might reduce capacity or adversely affect the safety of the crane.

- Critical items such as brakes and crane hooks.
- Hoist ropes.

Signed and dated inspection records must be kept on file and must be readily available. Before the crane is returned to service, correct deficiencies that could reduce its capacity or adversely affect its safety.

#### **12.3.3.4 Annual Inspections**

Annual crane inspections must conform to the requirements identified in 29 CFR 1926, subpart N and as recommended by the manufacturer. Documentation of these inspections must be available for review by LBNL. Construction cranes used by the Subcontractor must be State of California certified. A valid copy of such certification must be available at each crane or derrick and must indicate: 1) all required tests and/or examinations have been performed, 2) any defects found by such examination and tests have been corrected, and 3) that the equipment is in safe operating condition at the time of examination.

Cranes assembled/disassembled on site at LBNL must be done so under the direction of a competent rigger identified as the assembly/disassembly supervisor. An assembly/disassembly procedure written for the specific crane (written by the manufacturer, or the crane subcontractor) must be submitted to LBNL.

#### **12.3.4 Idle Equipment**

H&R equipment that is idle for a period of greater than one month (fully operational but not used) does not require monthly inspections. Idle H&R equipment must be removed from service and tagged with an administrative “CAUTION – Do Not Operate” label to alert potential users of the start-up inspection requirements to include the requirements contained in the daily and monthly inspections. Documentation of these inspections must be available for review by LBNL.

#### **12.3.5 Maintenance**

A preventive maintenance program must be established and based on the recommendation of the crane manufacturer. If equipment maintenance procedures deviate from published manufacturer's recommendations, the alternate procedures must be approved in advance by the manufacturer or another qualified person and be kept readily available. Dated maintenance records should be kept readily available to appointed personnel. Replacement parts must be at least equal to the original manufacturer's specifications.

#### **12.3.6 Rigging Safety Requirements**

##### **12.3.5.1 Rigging Component Procurement**

Rigging components must be obtained from reliable sources and must be rated for H&R applications. Do not use damaged or suspect rigging. Chinese shackles are not permitted to be used.

##### **12.3.5.2 Storage and Maintenance**

Rigging equipment must be stored and maintained in accordance with the manufacturer's recommendations. Protect rigging hardware from weathering and harsh environments. Rust, corrosion, and/or UV damage can degrade rigging performance.

##### **12.3.5.3 Labeling**

Rigging hardware must be labeled for identification purposes with a durable tag.

##### **12.3.5.4 Rigging Safe Work Practices**

The Subcontractor must ensure that the following safe work practices are utilized when rigging a load:

- Determine the weight of the load. Do not guess. The weight of the load must be within the rated load capacity of the rigging.
- Determine the proper size for slings and components. Refer to the manufacturer's literature. Select slings so that the rated load capacity is adequate when the appropriate de-ratings are applied based on sling angle and/or hitch angle considerations (chocker angle de-rating).

- Verify that shouldered eyebolts are installed in accordance with the manufacturer's recommendations. Beware of side pull applications. Eyebolts must be de-rated when subject to side loads.
- Do not use shoulder-less eyebolts for lifting purposes.
- Use safety hoist rings (swivel eyes) as a preferred substitute for eyebolts when possible.
- Pad sharp and small diameter edges to protect slings. Machinery foundations or angle-iron edges may not feel sharp to the touch but could cut into rigging when under load. Dense foam, tire rubber, or other dense, pliable materials may be suitable for padding.
- Do not use slings, eyebolts, shackles, hooks, or other hardware that appear to have been cut, welded, brazed, or is otherwise suspect.
- Determine the center of gravity and balance the load before moving it. Keep the attachment points of rigging accessories as far above the center of gravity as possible.
- Lift the load initially just a few inches to test the rigging and balance.
- Place blocks beneath loads prior to setting down the load to allow removal of the sling, where applicable.

### **12.3.7 Inspection Criteria for Slings, Below-the-Hook Lifting Devices and Rigging Hardware**

#### **12.3.7.1 Prior to Use Inspection**

At the beginning of each shift or prior to use, if it has not been in regular service, the competent person must visually inspect the rigging equipment (slings, below the hook devices and rigging hardware) in accordance with the appropriate ASME/ANSI standard or according to the manufacturer's instruction, whichever is more stringent. Defective rigging equipment must be removed from service and destroyed to prevent reuse.

#### **12.3.7.2 Periodic Inspections**

Rigging equipment must be inspected periodically in accordance with the appropriate ASME/ANSI standard or according to the manufacturer's instruction, whichever is more stringent. This inspection must be performed by a qualified inspector and have a documented inspection history, with records readily available.

### **12.3.8 Personnel Hoisting**

#### **12.3.8.1 Personnel Platform Lift Plan**

The use of H&R equipment to hoist workers onto a platform is generally prohibited, except when the use of a conventional means of reaching the work area, such as a ladder, scaffold, or man lift, would be more hazardous or is not possible. Personnel lifts must be properly planned and executed. The LBNL EHS Division must authorize this type of activity in advance of the lift. The LBNL Personnel Platform Lift Plan or other equivalent plan accepted by the LBNL EHS Division must be utilized to document these lifts. The LBNL Personnel Platform Lift Plan template can be obtained from the EHS Division.

#### **12.3.8.2 Pre-Lift Meeting**

A pre-lift meeting must be conducted prior to initiating a personnel lift. Workers involved in the work activity must attend the pre-lift meeting, including subcontractors, man basket occupants, and the H&R operator.

### **12.4 References**

- 29 CFR 1926, Safety and Health Regulations for Construction, Subpart N, Cranes and Derricks.

- 29 CFR 1926.251, Safety and Health Regulations for Construction, Rigging Equipment for Material Handling (Rigging of loads being lifted by cranes).
- 29 CFR 1926.753, Safety and Health Regulations for Construction, Hoisting & Rigging (During steel erection activities).
- ASME B30.5, Mobile and Locomotive Cranes -2007
- ASME B30.9, Slings -2006
- ASME B30.10, Hooks -2005
- ASME B30.20, Below-the-Hook Lifting Devices -2006
- ASME B30.26, Rigging Hardware -2004

## **13.0 Powered Industrial Trucks and Heavy Equipment**

### **13.1 Applicability**

The requirements of this section apply to all Construction Subcontractors and lower-tier subcontractors (hereafter referred to as “Subcontractor”) performing construction activities on the LBNL site.

### **13.2 Regulatory Requirements**

29 CFR 1926 Subpart O, Motor Vehicles, Mechanized Equipment, and Marine Operations

### **13.3 LBNL Specific Requirements**

#### **13.3.1 Forklift Trucks**

All forklift trucks must carry fire extinguishers, usually 1.1 kg (2½ lb) ABC, regardless of their location classification.

If the forklift truck is equipped with front-end attachments other than factory-installed attachments, the user must ensure that the truck is marked with a card or plate that identifies the current attachments, shows the approximate weight of the truck with current attachments, and shows the lifting capacity of the truck with current attachments at maximum lift elevation with the load laterally centered.

Documented inspections must be conducted at the beginning of each shift to ensure that the parts, equipment, and accessories are in safe operating condition. Repair or replace any defective parts or equipment prior to use.

Vehicles must:

- Have an operational service brake system, an emergency brake system, and a parking brake system in accordance with manufacturer's design
- Have working headlights, tail lights, and brake lights
- Have an audible warning device (horn)
- Have intact windshield with working windshield wipers
- As required equipment must have roll-over protection and protection from falling debris hazards as needed
- Vehicles loaded from the top (e.g., dump trucks) must have cab shields or canopies to protect the operator while loading
- Vehicles used to transport workers must have seats, with operable seat belts, firmly secured and adequate for the number of workers to be carried

- Any vehicle operating in reverse with an obstructed rear view must have a reverse signal alarm capable of being heard above ambient noise levels or a signal observer controlling the reverse movement

Any modification of the equipment's capacity or safety features requires the manufacturer's written approval.

### **13.3.2 Licensing and Certification**

All forklift / powered industrial truck operators be trained on the equipment they will use. All persons operating forklifts at the Laboratory are required to carry a valid Forklift Operator Certification. The Subcontractor Employer will certify operators using the [Self Certification Training Matrix](#) found on the Construction Safety Resource website.

## **14.0 Fall Protection**

### **14.1 Applicability**

The requirements of this section apply to all Construction Subcontractors and lower-tier subcontractor (hereafter referred to as “Subcontractor”) activities which require personnel to work or potentially be exposed to unprotected heights of six feet or more on LBNL sites unless otherwise specifically exempted by LBNL.

### **14.2 Regulatory Requirements**

The Subcontractor’s Fall Protection Program must be conducted in accordance with the following statutory requirements:

- 29 CFR 1926, Safety and Health Regulations for Construction, Subpart M, Fall Protection
- Fall protection during steel erection activities must also comply with the requirements of 29 CFR 1926.760(a)(2), perimeter safety cable and 1926.76(e), custody of fall protection

*Note:* The height allowances permitted for fall protection on Steel Erection (29 CFR 1926.760) and Scaffold Activities (29 CFR 1926.451) do not apply at LBNL.

Additionally, all workers who are constructing a leading edge six feet or more above lower levels must be protected from falling by guardrail systems, safety net systems, or personal fall arrest systems (PFASs). No exceptions allowed.

### **14.3 LBNL Specific Requirements**

In addition to Section 14.2 above, all work activities and/or potential personnel exposures to unprotected heights of six feet or more must meet the following LBNL requirements as applicable in Sections 14.3.1 – 14.3.4 of this appendix.

#### **14.3.1 Fall Protection Program**

Subcontractors must have in place a Fall Protection Program that ensures effective fall protection system(s) are in place anytime workers are exposed to falls at heights of six feet or more. The program must identify the following key personnel as identified in ANSI Z359.2 who maintain the requisite knowledge and responsibility for the successful implementation of the program at the project:

- Program Administrator
- Qualified Person
- Competent Person

Additionally, the subcontractor must ensure personnel who are required to utilize fall protection meet the qualification of an “Authorized Person” as defined by ANSI Z359.2. **Note:** Employees trained by a competent person in accordance with the requirements identified in 29 CFR 1926.503, Fall Protection Training Requirements will be considered as meeting the necessary fall protection training for an “Authorized Person.”

#### **14.3.1.1 Fall Protection Plan**

Subcontractors must develop and submit a Site Specific Fall Protection Plan (FPP) to the LBNL Project Manager and the EHS Division POC for concurrence prior to the start of work. The plan must be prepared by a fall protection qualified person or competent person for the Subcontractor and developed specifically for the activity and/or project where the work will occur. The FPP must be documented and contain the following elements at a minimum:

- Project/Job location/date(s).
- Project/Job description.
- Name of the Subcontractor Fall Protection Program Administrator, Qualified Person and the Competent Person(s) responsible for fall protection on this site/project.
- Fall hazard analysis(es) (FHA) conducted in accordance with Section 14.3.1.2 of this appendix for each activity or similar activity type/grouping associated with the project. (**Note:** For projects that cannot identify all activities that will require fall protection during the life of the project, the Subcontractor must ensure that a FHA is performed, reviewed and accepted as required by LBNL and attached to the project Site Specific Fall Protection Plan prior to performing the work).
- Identify the means to be utilized for the prompt rescue of employees in the event of a fall as necessary.
- Provide verification of training certification for personnel affected by the fall protection plan.
- Signature of the competent person preparing the plan and the Subcontractor Site Safety Officer.
- Document how the requirements of this plan will be flowed down to lower-tier subcontractors.

#### **14.3.1.2 Fall Hazard Analysis**

A fall hazard analysis (FHA) must be conducted for each activity or similar activity type/grouping prior to the start of work and must be included in the FPP or as part of the Job Hazards Analysis (JHA) for the subject activity and/or definable feature of work. The FHA must be performed by a competent person and/or qualified person. This analysis must identify one or more methods to eliminate or mitigate fall hazards. The analysis must be comprehensive, thorough, and address the following elements:

- Describe the fall hazards associated with the proposed activity.
- Identify the controls that will be in place to eliminate or mitigate the fall hazard. The controls must achieve 100% continuous fall protection. The selection of controls must be in accordance with Section 14.3.1.3, Fall Protection Hierarchy of Control and Mitigation Methods, below.
- As necessary, identify the means to be utilized for the prompt rescue of employees in the event of a fall.

The subcontractor may perform this analysis by using the LBNL Fall Hazard Analysis form or this analysis may be conducted and included as part of the JHA prepared for the subject project/activity. A copy of the LBNL Fall Hazard Analysis form can be obtained from the LBNL EHS Division. The FHA and/or JHA must be revised and accepted by LBNL when changes occur that render the analysis obsolete.

#### **14.3.1.3 Fall Protection Hierarchy of Control and Mitigation Methods**

The Subcontractor must incorporate the following hierarchy of control when selecting methods to eliminate or mitigate fall hazards:

- **Hazard Elimination.** First consider eliminating fall hazards. This might involve moving the work surface to ground level or changing a task so that workers do not approach the fall hazard.
- **Passive Fall Protection.** Take actions that isolate or effectively separate the hazard from workers, such as installing floor coverings or handrail/guardrail systems.
- **Fall Restraint.** Establish a travel restraint system that prevents a worker from accessing a position from which he or she could fall.
- **Fall Arrest.** Configure a PFAS designed to arrest a fall after it has begun.
- **Administrative Fall Protection System.** Establish controlled-access zones and safety-monitoring systems. Generally these controls are considered less effective and are prohibited at LBNL as stand-alone controls, unless specifically authorized by the EHS Division.

#### **14.3.2 Fall Protection Equipment System Requirements**

Fall protection equipment and systems must be used in accordance with the manufacturer's recommendations and the requirements of this procedure. Misapplication or use of this equipment in a way contrary to those requirements is prohibited. A competent person must supervise the work and verify that the fall protection system is properly established and maintained.

##### **14.3.2.1 Personal Fall Arrest System Strength Requirements**

Subcontractors must ensure that the strength and testing requirements for personal fall arrest systems, components and subsystems must comply with the provisions of ANSI Z359.1, Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components. All other applicable fall protection equipment and system requirements must at a minimum meet the requirements of ANSI A10.32 Standard for Personal Fall Protection used in Construction and Demolition Operations.

##### **14.3.2.2 Personal Fall Arrest System (PFAS) Inspections & Storage**

**Routine Inspection.** PFAS equipment must be inspected by the authorized person using the equipment prior to each use. Equipment inspections must follow the guidelines established by the manufacturer. Damaged or questionable equipment must be immediately removed from service and tagged accordingly. Equipment that cannot be repaired must be destroyed.

**Post-Fall Inspection.** PFAS components subject to a fall must be immediately removed from service and destroyed or returned to the manufacturer for inspection, repair, and re-certification. Contact the manufacturer to determine the available options.

**Periodic Inspection.** A competent person, other than the user, must periodically inspect PFAS equipment. This inspection must follow the intervals and guidelines established by the manufacturer but must not be greater than six months. The results of these inspections must be recorded and available for review by LBNL.

**Equipment Storage.** Fall protection equipment must be stored in a manner that protects it from exposure to adverse conditions, such as ultraviolet light or harsh weather, that could result in damage or diminished performance and/or other specific requirements established by the manufacturer.

#### **14.3.2.3 Safety Net Systems**

The use of safety net systems as the means of fall protection is not anticipated at LBNL unless used in conjunction with other accepted means of fall protection and compliance with other regulatory requirements (i.e., 29 CFR 1926, Subpart R, Steel Erection). Contact the LBNL EHS Division for additional information on safety net systems.

#### **14.3.2.4 Portable Ladders**

Ladders must be inspected prior to use.

Fall protection is not required when using portable ladders in compliance with the following requirements to ascend and descend.

- Portable ladders must be set up and used in accordance with OSHA 29 CFR 1926.1053 and manufacturer requirements and be a minimum Type I, Heavy Duty Classification. Light and medium duty class ladders are prohibited.
- Extension ladders must be tied off/secured to prevent displacement.
- Ladder users must maintain three-point control (three limbs maintain contact on the ladder), and a user's body must remain centered between the side rails.
- Ladder users are not subject to a fall to a level lower than the base of ladder from which they are working.

When a task requires working from ladders above 6 feet a PHTA must be completed prior to conducting the work. The PHTA must address the hazards and may or may not require fall protection based upon the unique task specific hazards.

When working from ladders, special consideration for fall-protection equipment must be taken when working near the building perimeter or open shafts.

- The use of ladders with broken or missing rungs or steps, broken or split rails, or other faulty or defective construction is prohibited.
- When ladders with such defects are discovered, they must be immediately withdrawn from service and tagged to prevent use, or destroyed.
- Extension ladders must be used at such a pitch that the horizontal distance from the top support to the foot of the ladder is about one-quarter of the working length of the ladder (the length along the ladder between the foot and the top support).
- Ladders must not be used in a horizontal position as platforms, runways, or scaffolds.
- Extension ladders and side rails must extend to least 36 inches above the landing. When this is not practical, grab rails, which provide a secure grip for an employee moving to or from the point of access, must be installed.
- Ladders must not be placed in passageways, doorways, driveways, or any location where they may be displaced by activities conducted on any other work, unless protected by barricades or guards.

- ✓ When ascending or descending a ladder, the user must face the ladder using at least one hand to grasp the ladder.
- ✓ An employee must not carry an object that could cause a loss of balance and a fall.
- ✓ Portable ladder feet must be placed on a substantial base, and the area around the top and bottom of the ladder must be kept clear.
- ✓ Extension ladders in use must be tied off, blocked, or otherwise secured to prevent their being displaced.
- ✓ Each subcontractor employee must be trained by a competent person to recognize the hazards relating to ladders.
- ✓ All ladders brought onto the job site or built on the job must meet all ANSI, OSHA requirements.
- ✓ Stepladders must only be used in an open (fully extended) position. The top and top step of a stepladder must not be used as a step.
- ✓ Portable metal/aluminum or wood ladders are not permitted on any project.
- ✓ The only exception to this policy is metal ladders designed and used specifically for attachment to scaffolds or skeleton steel during steel erection.
- ✓ The maximum length of single- and double-cleat ladders may not exceed 24 feet between supports (base and top landing).
- ✓ If ladders are to connect different landings, or if the length required exceeds the recommended maximum length, use two or more separate ladders staggered with a protected platform between each ladder.
- ✓ If ladders are to be used by masons or hod carriers, the length may not exceed 20 feet.
- ✓ All job-made ladders, landings, and lashings must be inspected at least every week by the creating subcontractor, and any defects must be corrected immediately.
- ✓ The 6-foot fall policy does not apply to moving up and down ladders.

### **14.3.3 Subcontractor Training Requirements**

Subcontractors that are trained in accordance with the requirements identified in 29 CFR 1926, Subpart M will be considered as meeting the necessary fall protection training requirements for working at LBNL. The Subcontractor must provide proof of such training as requested by the Construction Representative. The Subcontractor is required to provide authorized and competent persons for work performed on the site as defined in ANSI Z359.0.

#### **14.3.3.1 Fall Protection**

1. This section provides requirements for developing and implementing work controls required for fall protection. This section is applicable to all fall-protection activities covered by [ES&H Manual Chapter 30, Fall Protection Program](#). The subcontractor must use and enforce the following procedures and meet all current DOE, federal, state, and/or Berkeley Lab policies relevant to the operation(s).
2. Requirements
  - a. Any work task on a walking/working surface with an unprotected side or edge 6 feet or more above a lower level requires fall-protection hazard controls.
  - b. These hazard controls may include: guardrail systems, safety-net systems, personal fall-arrest systems, or other fall-protection measures.
  - c. "Fall protection" refers to any form of hazard controls that may include guardrail systems, safety-net systems, personal fall-arrest systems, or other fall-protection measures.

- d. Any work task on an aerial lift (boom, scissor, or one-man lifts) requires fall-protection hazard controls when working above the protection system at floor openings, unprotected perimeters greater than 6 feet, and whenever a fall of more than 6 feet could occur.
    - i. Exception: Use of a personal fall-arrest system is only required on scissor lifts when an engineered anchor point is provided by the manufacturer.
  - e. **Steel erectors and sheet metal installers must use 100% positive fall protection above 6 feet at all times.**
  - f. The work control procedure(s) for fall protection for construction and non-construction subcontractors must be documented on the subcontractor's approved Job Hazards Analysis.
  - g. The work control procedure(s) for employee (and subcontractors and guests using Berkeley Lab procedures) must be documented on the Berkeley Lab written Fall Protection Plan (LBNL Fall Protection Matrix Permit, provided by the Environment/Health/Safety (EHS) Division.
  - h. When active fall protections systems are in use, procedures for rescue must be documented in the Fall Protection Hazard Analysis.
  - i. Work tasks excepted from additional fall-protection hazard controls:
    - i. During scaffold erection and dismantling, the designated competent person overseeing the operation must determine the feasibility of positive fall protection. If it is deemed that positive fall protection is infeasible, the competent person must put a fall-protection plan in writing that meets the Cal/OSHA requirements found in the *Construction Safety Orders*, Section 1635.1-1667, and submit it to Berkeley Lab Project Management for review prior to commencing the operation.
    - ii. The 6-foot fall policy does not apply to climbing up and down ladders. However, when working from ladders above 6 feet, the employee must have a hazard assessment made by the competent person. The assessment will be documented on the PHTA to address the need for positive fall protection or whether the task can be performed by maintaining three-point contact (consisting of two feet and one hand) at all times.
    - iii. Double lanyards, nets, guardrails, or other means must be used to maintain the 100% positive 6-foot fall protection. The subcontractor is solely responsible for the development, implementation, and enforcement of this policy.
  - j. Emergency rescue equipment must be on site and readily available by the subcontractor.
3. Control Descriptions
- a. **Horizontal distance** OSHA has determined that there is no safe horizontal distance from an unprotected side or edged of a walking working surface that would render fall protection unnecessary. All tasks above 6 feet must be evaluated to establish appropriate controls. Exclusions: Ladders, Scissor lifts, Aerial lifts
  - b. **Free-fall** distance must not exceed 6 feet.
  - c. **Guardrails and parapets** must be 39 to 45 inches high, and must withstand 200 pounds at top. Guardrails must have midrails and toe boards if tools or materials could fall on others below. Cable must be a minimum ¼-inch diameter, and flagged at 6-foot intervals, with no sag under pressure below 39 inches. Pipe must be 1½-inch-diameter minimum, and wood must be 2x4 at minimum.
  - d. **Skylights** must be covered with minimum 200-pound-force covers, guardrails, or fall restraint/fall arrest.
  - e. **Warning line system** (low-slope roofs only):
    - i. **Construction:** "Non-Conforming Guardrail," a minimum of 15 feet from unprotected edge

- f. **Systems requirements:** Uprights withstand 16-pound force at 30 inches; line to be rope, wire, or chain of 500-pound strength; flagging at 6-foot intervals; height 34–39 inches; line attached to uprights; no slide-through.
- g. **Fall restraint:** Worker's center of gravity cannot fall over the unprotected edge **in any direction**.
- h. **Vertical lifelines** must be a minimum of ¾-inch manila rope or equivalent, secured above the point of operation to anchorage or structural member capable of supporting a minimum of 5,000 pounds. (Only one worker per lifeline.)
- i. **Horizontal lifelines** must be secured above the point of operation to anchorage or structural member capable of supporting a minimum of 5,000 pounds.
- j. **Lanyards** must be a minimum of 5/8-inch nylon rope or equivalent with a 900-pound shock-absorbing system and a maximum length to provide for a fall of no more than 6 feet plus deployed shock absorber. The rope must have a nominal breaking strength of 5,000 pounds.

## 14.4 LBNL Special Emphasis

### 14.4.1 Personal Fall Arrest System (PFAS)

The subcontractor must ensure that PFASs are employed when conventional systems are not feasible to achieve 100% continuous fall protection at working heights of six feet or more. If PFASs or conventional fall protection systems are not feasible, this justification must be documented in the fall hazard analysis and accepted by the LBNL Construction Representative with concurrence by the LBNL Fall Protection SME.

## 14.5 References

- ✓ 29 CFR 1926, Safety and Health Regulations for Construction, Subpart M, Fall Protection
- ✓ 29 CFR 1926, Safety and Health Regulations for Construction, Subpart R, Steel Erection
- ✓ ANSI A10.32-2004, Fall Protection Systems for Construction and Demolition Operations
- ✓ ANSI Z359-2007 Fall Protection Code.

## 15.0 Hearing Conservation

### 15.1 Applicability

The hearing conservation requirements of this section apply to all Construction Subcontractors (hereafter referred to as “Subcontractor”) on LBNL sites unless otherwise specifically exempted by LBNL.

### 15.2 Regulatory Requirements

The Subcontractor’s Hearing Conservation Program must meet or exceed the following requirements:

- ✓ American Conference of Governmental Industrial Hygienists (ACGIH), “Threshold Limit Values for Chemical Substances and Physical Agents and Biological Indices”, 2005
- ✓ 29 CFR 1910.95, Occupational Safety and Health Standards, Occupational Noise Exposure.

## **15.3 LBNL Specific Requirements**

### **15.3.1 Control Measures**

LBNL uses a hierarchy of control measures to reduce noise levels as low as feasible. The preferred hierarchy for controls implemented to mitigate hazards is as follows:

1. Elimination or substitution of the hazards
2. Engineering controls
3. Work practices and administrative controls that limit worker exposures
4. Personal protective equipment (PPE)

Every feasible effort must be made to “engineer out” noise exposures greater than or equal to an 8-hr time-weighted-average (TWA) sound level of 85 decibels (dBA) on the A-weighted scale prior to using personal hearing protection as a noise attenuation device. When controls are not feasible or fail to reduce noise to acceptable levels, hearing protection must be required. Additionally, if work is to be performed in an environment that is suspected to exceed the allowable noise exposures, mandatory hearing protection requirements must be implemented.

### **15.3.2 Noise Evaluation**

The Subcontractor must survey and evaluate suspected high noise areas and work efforts. Employees may observe surveys and evaluations, and the results must be made available to employees. Subcontractors must control employee exposures when noise levels exceed 85 dBA as an 8-hr TWA, or if impact/impulse noise exceeds 140 dBC. Maximum allowable noise exposure must not exceed the permissible noise exposures shown in 29 CFR 1910.95 or the ACGIH TLVs. Noise exposure must be determined without regard to hearing protection provided.

### **15.3.3 High Noise Area Posting**

High noise areas must be posted with appropriate warning signs at all entrances.

## **15.4 References**

- 29 CFR 1910.95, Occupational Safety and Health Standards, Occupational Noise Exposure
- American Conference of Governmental Industrial Hygienists (ACGIH), “Threshold Limit Values for Chemical Substances and Physical Agents and Biological Indices”, 2014

## **16.0 Industrial Hygiene**

### **16.1 Applicability**

The requirements of this section apply to all Construction Subcontractors and lower-tier subcontractor (hereafter referred to as “Subcontractor”) activities regarding industrial hygiene matters as they relate to the construction activities on LBNL sites unless otherwise specifically exempted by LBNL.

This section defines the requirements and responsibilities for anticipating, recognizing, evaluating, and controlling employee exposures to chemical, physical, and biological agents encountered during construction activities. The Subcontractor’s Industrial Hygiene (IH) program must address the following elements (as applicable to the project):

- Noise
- Lead
- Hazardous materials
- Hexavalent chrome

- ✓ Subcontractor work site dust control
- ✓ Sanitation
- ✓ Personal exposure monitoring
- ✓ Respiratory protection
- ✓ Temperature extremes
- ✓ Lighting and illumination
- ✓ Ventilation
- ✓ Asbestos
- ✓ Lasers
- ✓ Safety showers and eyewash apparatus
- ✓ Ionizing radiation
- ✓ Blood-borne pathogens
- ✓ Other significant project-related hazards

The Subcontractor must provide personnel adequately trained/qualified to manage and implement their industrial hygiene program to a level required for the scope of work.

### **16.2 Regulatory Requirements**

The Subcontractor's industrial hygiene program must be conducted in accordance with the following statutory requirements:

- ✓ 29 CFR 1926, Safety and Health Regulations for Construction
- ✓ 29 CFR 1910, Occupational Safety and Health Standards
- ✓ American Conference of Governmental Industrial Hygienists (ACGIH), "Threshold Limit Values for Chemical Substances and Physical Agents and Biological Indices," 2014

### **16.3 LBNL Specific Requirements**

In addition to the requirements in Section 16.2, above, the Subcontractor's industrial hygiene program must meet the following LBNL requirements as applicable.

#### **16.3.1 General Requirements**

The provisions of this procedure apply to the development and implementation of the Subcontractor's Industrial Hygiene Program. The Subcontractor must be responsible for implementing an effective IH program that:

- ✓ Identifies, evaluates, and controls potential and existing hazards/agents in the workplace through the pre-job safety planning process.
- ✓ Determines that engineering devices, administrative controls, and personal protective equipment are available, appropriate, tested, and utilized by employees.
- ✓ Determines employees are trained as required.
- ✓ Stops work that is not being safely performed.
- ✓ Reports occupational exposure data to affected employees in a timely manner

The subcontractor must perform monitoring as necessary to document employee exposures to chemical and physical hygiene hazards, and to meet regulatory requirements. Negative exposure assessments are encouraged even when not specifically required by a substance-specific standard. Workers must be informed of monitoring results within the OSHA-specified timeframe. Co-located workers (who have

similar exposure potential as those who were monitored) must also be informed of the results, after removing any personal/confidential information.

### **16.3.2 Identification of Health Hazards**

The Subcontractor must identify and document, as part of the Job Hazards Analysis (JHA), existing and potential physical, and chemical and biological health hazards. The JHA should include any additional hazards revealed by supplemental site information provided by LBNL (e.g., site characterization data, as-built drawings, information regarding adjacent operations, etc), and should be kept updated to reflect significant changes in exposure potential, new information, monitoring data, etc.

### **16.3.3 Control Measures**

The Subcontractor's industrial hygiene program must require that controls are implemented to eliminate or reduce employee exposures to below recognized occupational exposure limits (PELs & TLVs). Subcontractors should strive to maintain exposures to As Low As Reasonably Achievable (ALARA). Control measures to eliminate or reduce industrial hygiene-related exposures must be identified during the pre-job planning process, and delineated in the JHA.

The implementation of control measures must follow the following hierarchy:

1. Elimination or substitution of the hazards
2. Engineering controls
3. Work practices and administrative controls that limit worker exposures  
Personal protective equipment (PPE)

### **16.3.4 Exposure Assessment**

The Subcontractor must perform monitoring as necessary to document employee exposures to chemical, biological and physical hygiene hazards. Negative exposure assessments are encouraged even when not specifically required by a substance-specific standard. Exposure assessments may be performed using various methodologies (integrated sampling, direct-reading instrumentation, modeling, etc.), as appropriate for the material(s) of concern, the site conditions and the type of data needed.

### **16.3.5 Control of Hazardous Materials**

A hazardous material is any substance that presents a physical or health hazard to humans. Hazardous material exposures should be maintained at the lowest exposure levels practical. A chemical must not be used in any situation unless an individual has information indicating how the material can be used safely. Control measures to prevent overexposure to chemicals must be incorporated into the JHA as necessary.

### **16.3.6 Carcinogen Control**

The Subcontractor must make every attempt to substitute less hazardous substances for any carcinogenic material (as defined by OSHA in 29 CFR 1910.1200). If hazardous materials containing carcinogenic components are used, the Subcontractor must ensure that exposures are eliminated or effectively maintained ALARA.

Where the Subcontractor's use of carcinogens may impact LBNL workers, LBNL may impose additional, specific controls upon the Subcontractor.

### **16.3.7 Hexavalent Chrome**

The Construction Industry Chromium (VI) Standard (29 CFR 1926.1126) will apply to all work performed by the Subcontractor that may expose workers to airborne hexavalent chromium. The Subcontractor must be responsible for compliance with all requirements of the Standard.

### **16.3.8 Subcontractor Worksite Dust Control**

All Subcontractor projects must address dust control during pre-job planning. Outdoor areas to be cleared for construction must be limited to keep dust generation to a minimum. Earthwork activities must be suspended when winds exceed 30 mph. Fugitive dust emissions resulting from grading and/or wind must be controlled. Construction of permanent roadways and parking areas should be scheduled during the early stages of a project. During construction, frequent watering must be provided to roadways and disturbed areas that are not otherwise treated. Although visible outdoor fugitive dust emissions are limited to 20%, the Subcontractor may need to perform worker exposure monitoring at much lower levels to demonstrate negative exposures to silica.

During facility renovation activities, barriers are to be installed as needed to prevent dust migration from construction areas to other occupied space. Sufficient equipment must be kept at the jobsite to control dust whenever a nuisance or hazard occurs. Indoors, dry sweeping is discouraged.

### **16.3.9 Lasers**

Class 1 laser systems incorporated into commercially available devices for use by the general public are exempt from these requirements, unless opened, serviced or modified. Laser equipment must bear a conspicuously displayed label to indicate hazard classification.

Users of Class 1, Class 1M, Class 2, Class 2M, Class 3a, or Class 3R lasers must read and abide by the safety documentation provided in the operator's manual. Only qualified and trained personnel may service, adjust, or repair laser equipment. Employees, when working in areas in which a potentially hazardous exposure to direct or reflected laser radiation exists, must be provided with anti-laser protection devices.

#### **Class 3B and Class 4 Laser Use**

Class 3B and 4 laser equipment must not be used without the express written permission of the LBNL Laser Safety Officer.

### **16.3.10 Other Health Hazards**

Other hazards that may be present during the course of the Subcontractor's work which is not specifically addressed in this manual must be identified by the Subcontractor and addressed in their JHA(s).

Subcontractors are encouraged to discuss their potential hazards in advance with LBNL Construction Representative and/or the LBNL Project Manager to help ensure minimal impact to the project schedule and the smooth coordination of logistics.

### **16.3.11 Monitoring Results**

The subcontractor must notify the LBNL Construction Representative of the results of monitoring as soon as they are obtained, and provide LBNL with copies of the results, field notes and other associated documentation along with the weekly ES&H report defined in [Section 4.4.1](#) of this appendix.

Non-emergency work is curtailed when the ECT in the work area is below -25°F.

Workers who experience physical illness or injury from cold exposure are to be immediately moved to a warm area, and then examined by a physician.

#### **16.4 LBNL Special Emphasis**

Some chemicals are considered by LBNL to be extremely hazardous and have additional requirements for bringing on LBNL property and/or specific worker exposure monitoring requirements (see [Section 37.3](#) of this appendix for a listing of extremely hazardous chemicals).

Additionally, subcontractors performing work on LEED projects are required by their contract to use low-emitting indoor paint and coating materials in accordance with the identified LEED criteria in order to reduce the quantity of indoor contaminants that are odorous, irritating and or harmful to the comfort and well-being of installers and occupants.

Subcontractors performing work on projects that are not LEED, are also encouraged to utilize LEED criteria as a best management practice during the selection and application of indoor paint and coatings when applicable to their scope of work.

#### **16.5 References**

- 29 CFR 1910, Occupational Safety and Health Standards
- 29 CFR 1926, Safety and Health Regulations for Construction
- 29 CFR 1910.1200, Occupational Safety and Health Standards, Hazard Communication
- American Conference of Governmental Industrial Hygienists, “Threshold Limit Values for Chemical Substances and Physical Agents and Biological Indices”, 2014
- American Conference of Governmental Industrial Hygienists manual, “Industrial Ventilation”, current edition.

#### **17.0 Asbestos**

Asbestos can be found in many common building materials. Examples of building materials at LBNL facilities that may contain asbestos as part of construction, renovation and demolition projects include, but are not limited to: pipe and boiler insulation, taping compound on gypsum wallboard (including gypsum wallboard itself in Building 70), 9”x9” and 12”x12” floor tiles and mastic, building exterior paints/coatings, roofing material, transite wallboard, and fire rated doors (both wooden and metal) in offices, shops, labs, mechanical rooms, etc.

Consequently, walls, floors, ceilings or other suspect Asbestos Containing Material (ACM) should not be disturbed or damaged without determining whether ACM is present. If ACM is found or suspected, special procedures will be required to ensure proper employee protection, prevention of environmental contamination, and proper waste disposal.

#### **17.1 Regulatory Requirements**

The Subcontractor conducting asbestos-related work must be responsible for compliance with the OSHA Construction Standard 29 CFR 1926.1101, and the requirements below.

#### **17.2 LBNL Specific Requirements**

No disturbance of suspect or known asbestos-containing materials must take place unless performed by trained, certified and LBNL-authorized entities. If suspect asbestos-containing materials are unexpectedly encountered during the course of construction activities, the Subcontractor must immediately cease work

and contact the LBNL Project Manager or LBNL Construction Representative. Asbestos-containing construction/building materials must not be brought on-site without the express, advance and written consent of LBNL.

The Asbestos Abatement Subcontractor must:

- Submit an Asbestos Work Plan which provides detailed information on how the work is to be performed. Type of information to be included is critical barriers, work practices, removal/disturbance methods, and signs and labels to be used; air monitoring to be performed; and waste handling procedures (packaging, disposal site). This plan must be submitted to the LBNL EHS Division for review and concurrence prior to starting work. Work must comply with the requirements set forth in 29 CFR 1926.1101.
- Submit notification to the State of California if the amount of material to be removed is > 260 linear feet or the volume is equivalent of one 55 gallon drum. Provide a copy of that notification if required to the EHS Division.
- Work must be performed in a Regulated Area.
- Maintain copies of Asbestos Worker Certification at the site for inspection by the EHS Division.
- Provide copy of Asbestos Supervisor Certification to the LBNL EHS Division.
- Provide copy of General Abatement Subcontractor Certification to the LBNL EHS Division.
- Provide copy of workers respiratory protection certification to the LBNL EHS Division.
- Provide proof of insurance covering asbestos abatement activities that extends the length of the project to the LBNL EHS Division.
- Provide copies of all air monitoring results to the LBNL EHS Division once received.
- Request the LBNL EHS Division to review and sign the Waste Disposal Manifest prior to removing waste from the site and provide a copy of the manifest to the LBNL EHS Division. Asbestos waste may not be combined with waste from other projects. It must be shipped directly to a landfill and may not be stored in an intermediate satellite storage location.
- Prepare a Job Hazards Analysis (JHA) for the asbestos abatement activity and submit to the LBNL Project Manager and the LBNL EHS Division POC for review and concurrence.

### **17.2.1 General Requirements**

Subcontractors' superintendents must immediately stop work in the affected area and inform the LBNL Construction or Project Managers if asbestos is suspected to be present at a location or in a specific building material.

Subcontractors must not touch, remove, demolish, or in any other manner disturb materials that are suspected to contain asbestos.

LBNL's asbestos specification (028200) and LBNL's Asbestos Management Plan (PUB-3000, Chapter 4) must be followed in order to perform actual asbestos abatement activities.

Non-asbestos abatement workers (i.e., construction trade workers) must be provided asbestos awareness training per Cal/OSHA's Asbestos in Construction Regulation (8 CCR 1529) and a minimum level of asbestos training (e.g., OSHA Class III 16 hour or 4 hour specialized trades training) for incidental disturbance of asbestos containing building materials related to performing trades work. Alternatively, this work may be subcontracted to an asbestos abatement subcontractor.

### **17.3 References**

- 8 CCR 1529, Asbestos in Construction

### **18.0 Blood-borne Pathogens**

Blood-borne pathogens are disease-causing organisms transmitted through contact with infected blood and other bodily fluids. Viruses such as the Human Immunodeficiency Virus (HIV) and Hepatitis B are among the most common forms of blood-borne pathogens. Any exposure to an infected individual's body fluids may result in transmission of blood-borne pathogens, which could lead to disease or death.

#### **18.1 Regulatory Requirements**

The Subcontractor conducting construction-related work must be responsible for compliance with the OSHA General Industry Standard 29 CFR 1910.1030, and the requirements below.

#### **18.2 LBNL Specific Requirements**

Employees who may reasonably be expected to be exposed to blood or other body fluids must comply with OSHA requirements relating to this subject. First-aid kits must contain "Universal Precaution" items, including chemical splash goggles, medical gloves, cardiopulmonary resuscitation (CPR) masks (with one-way valve), antiseptic hand cleaner, drying cloths, and red bags labeled "BIOHAZARD." Medical waste generated as a result of first-aid response must be placed in labeled red bags, and disposal coordinated through LBNL's Occupational Health Services.

##### **18.2.1 General Requirements**

When dealing with blood or other bodily fluids, subcontractor employees are required to follow Universal Precautions. According to the concept of Universal Precautions, all human blood and other human body fluids are treated as if known to be infectious for HIV, Hepatitis B, and other blood-borne pathogens.

All subcontractor employees certified in first aid are required to wear disposable latex gloves and eye protection while performing first aid on an injured individual. If rescue breathing or CPR is performed, a resuscitation mask must be provided by the Subcontractor for the protection of the injured and the person providing aid.

All blood spills must be immediately contained and cleaned with an anti-viral solution, or by a solution of bleach and water by the Subcontractor.

Any material saturated with blood must be considered Regulated Waste, including liquid or semi liquid blood or other potentially infectious materials; contaminated items that would release blood or other potentially infectious materials in a liquid or semi-liquid state if compressed; and items that are caked with dried blood or other potentially infectious materials. Discarded Band-Aids and gauze containing small amounts of blood products are not considered regulated waste.

The clean-up and disposal of all regulated waste must be the sole responsibility of the Subcontractor under their blood-borne pathogens control program.

At least one person from each subcontractor's on-site personnel pool must be trained in first aid and CPR, and they must also be trained in the decontamination of blood spills. Subcontractors are solely responsible for this training.

### **18.3 References**

29 CFR 1910.1030 Bloodborne pathogens

## **19.0 Carbon Monoxide**

Carbon monoxide is formed by the incomplete combustion of carbonaceous materials such as coke, oil, gasoline, and natural or manufactured gas. It is flammable, toxic, non-irritating, tasteless, odorless, and heavier than air. When inhaled it combines with hemoglobin of blood, excluding oxygen from the tissues, ultimately resulting in asphyxia. Some of the common symptoms of carbon monoxide poisoning are shortness of breath, headache, dizziness, muscular weakness, and nausea.

Temporary heaters and/or gasoline motors used where people are working in confined and/or depressed areas produce the greatest carbon monoxide poisoning exposures and are prohibited in these cases.

### **19.1 LBNL Specific Requirements**

#### **19.1.1 Subcontractor Testing Requirements**

Use of any device that discharges the products of combustion inside a work area requires testing defined below:

- The air supply must be monitored at intervals sufficient to prevent carbon monoxide in the breathing air from exceeding 25 ppm and engineering controls must be in place and adjusted when levels reach 10 ppm.
- Several different points within the area at the breathing heights of an employee must be sampled and tested.
- Record of these tests, noting the date, time, and result of each test, must be maintained.

Remove the employees from the area if the concentration of carbon monoxide reaches 25 PPM.

Ventilation must be provided and in place when levels reach 10 ppm and must maintain the concentration below 25 ppm. The use of local exhaust ventilation at the generation source, including equipment exhaust pipes, should be the primary means for eliminating carbon monoxide, and other sources of combustion gases and or particulates. Dilution ventilation, exhaust scrubbers, and use of newer equipment that uses cleaner, reformulated fuel may also be required in addition to local exhaust ventilation.

#### **19.1.2 Recordkeeping**

Copies of all subcontractor atmosphere testing, entry logs, training, and any medical records must be given to LBNL Project Manager for record retention.

### **19.2 References**

1926.55 App A Occupational Health and Environmental Controls

## **20.0 Chemical Spills**

LBNL employees responding to or involved with a chemical spill are required to follow LBNL's Chemical Hygiene & Safety Plan spill requirements. Subcontractors involved with a chemical spill involving commercial products or chemicals used as part of the construction trades are also required to respond to spills in a responsible and safe manner. Subcontractors are not allowed to attempt to clean-up

chemical spills involved in LBNL research labs, shops, or as part of other LBNL activities, even if caused by a subcontractor, unless, after careful work planning, the Project Manager or Construction Manager has given direction to the subcontractor. Under no circumstances will subcontractors be allowed to clean-up mercury spills, either from commercial products or associated with LBNL property, equipment, building contamination, etc.

LBNL's primary concern is to protect the workers and the environment in the event of an incidental spill on construction project sites.

## **20.1 Requirements of Subcontractor**

If a spill occurs at a project site, the spill must be isolated and contained to prevent contamination of the surrounding area, waterways, sewer systems or any other environmental impact.

The Subcontractor is responsible for all the costs associated with the clean-up and disposal of the contaminated / hazardous materials caused by the Subcontractor.

If a spill occurs, the Safety Data Sheet (SDS) for the chemical will provide the emergency information necessary to address the spill. Also, the emergency clean-up team will need a copy of the SDS in order to begin the clean-up process.

The Subcontractor must immediately notify the LBNL Project Manager or Construction Manager in the event of any spill.

In addition to the requirements listed in the Subcontractor's health and safety plan, the following conditions also have to be met before a spill can be cleaned-up by a subcontractor:

- ∗ There is no potential for release to the environment.
- ∗ There are no personal injuries resulting from the spill.
- ∗ The chemical hazards are known.
- ∗ The clean-up procedures are known and the proper spill clean-up materials are available.
- ∗ The proper PPE is available.
- ∗ The spill does not involve elemental mercury. Special clean-up and monitoring procedures are required for mercury spills. Moreover, mercury contamination is easily tracked to other areas.

**If ALL the above requirements are not met or if the subcontractor has any doubts about his or her ability to safely and effectively clean-up the spill, then**

- ∗ Leave the immediate area.
- ∗ Close the door.
- ∗ Stay close by and control access – Post the entrance with a warning such as “Spill - Do Not Enter” and contact the LBNL Project Manager or Construction Manager.

## **20.2 Training**

All subcontractors must have trained employees assigned to the project who are capable of handling spills associated with their trade. Whenever chemicals are brought on site, the SDS must be reviewed by the Subcontractor and communicated with all personnel exposed to the chemical's usage.

## 20.3 Recordkeeping

All Subcontractor records regarding spills must be copied and given to the LBNL Project Manager for filing.

## 21.0 Broken Fluorescent Lights

Compact fluorescent lamps (CFLs) and fluorescent tubes are used throughout LBNL and are commonly included in the scope of work for many projects. CFLs and tubes contain a very small amount of mercury (on average about five milligrams) sealed within the glass tubing. No mercury is released when the lamps are intact (not broken) or in use, but these lamps can break and release mercury vapor if dropped; however, the airborne levels are well below occupational exposure limits and not expected to lead to occupational related health effects. Carefully recycling mercury containing lamps prevents the release of mercury into the environment and allows for the reuse of glass, metals and other materials that make up fluorescent lights.

### 21.1 LBNL Specific Requirements

LBNL follow the EPA's clean-up and disposal guidance listed below for broken CFLs and fluorescent lamps, including lamps broken on construction sites.

Before Clean-up: Air Out the Room

- Don't let anyone walk through the breakage area.

Clean-Up Steps for Hard Surfaces

- Carefully scoop up glass pieces and powder using stiff paper or cardboard and place them in a sealable container or in a sealed double plastic bag. Do not touch broken glass pieces. Wear safety glasses during this task.
- Use sticky tape, such as duct tape, to pick up any remaining small glass fragments and powder.
- Wipe the area clean with damp paper towels or disposable wet wipes. Place towels in the sealable container or double plastic bag.
- Do not use a vacuum or broom to clean up the broken bulb on hard surfaces.

Clean-up Steps for Carpeting or Rug

- Carefully pick up glass fragments using hand protection that offers cut resistance and place them in a sealable container or in a sealed double plastic bag.
- Use sticky tape, such as duct tape, to pick up any remaining small glass fragments and powder.
- If vacuuming is needed after all visible materials are removed, open a window to increase ventilation and limit the vacuum time to just enough to vacuum the area where the bulb was broken.
- Remove the vacuum bag (or empty and wipe the canister), and put the bag or vacuum debris in a sealed plastic bag.

Disposal of Clean-up Materials

- Wash your hands after disposing of the sealable container or plastic bags containing clean-up materials.
- Place a label on the container or bags, label the material to warn of sharp, broken glass.
- Contact the Facilities Lighting Crew to pick up the material for disposal as universal waste. Do not toss the material into the regular trash.

Special regulations also affect the disposal of fluorescent lamp ballasts that contain PCBs. Subcontractors who plan to perform work with fluorescent lamps must get prior approval from the LBNL Construction Manager.

## **21.2 LBNL Specific Requirements**

### **21.2.1 Safety Data Sheets**

Subcontractors and their second-tiered subs are responsible for obtaining and maintaining the on-site file of all SDSs supplied by distributors, manufacturers, and subcontractors. While all SDSs may not be uniform in appearance, they must convey the same message:

- Identity of the product
- Known acute and chronic health effects
- Exposure Limits
- Threshold Limit Values (TLV)
- If the product is a suspected carcinogen
- Personal protective equipment to be used
- Emergency and first-aid procedure
- Identification of the party responsible for the MSDS
- Target organ affected

### **21.2.2 Container Labeling**

Subcontractors and their second-tiered subs ensure that an SDS is obtained with each shipment of any material. If an SDS is not included with the shipment, the Subcontractor must follow-up with the parties involved to obtain one 72 hours prior to work commencing or immediately when requested by LBNL or as a result of an injury.

Subcontractors and their second-tiered subs and/or their designee must verify that all containers received for use, whether from the manufacturer or transferred to secondary containers, have:

- Been clearly labeled as to content and its primary hazard,
- Appropriate warnings noted, and
- Names and addresses of the manufacturers listed.

All secondary containers used with small quantities of a given material must also be properly labeled to include, at a minimum, the name of the product or chemical and its primary hazard. The labeling must be legible and easily understood.

Additional information may be provided to include the nature of the hazard, personal protective equipment needed, parts of the body affected, and emergency procedures to take.

### **21.2.3 Subcontractor Employee Training and Education**

All subcontractors are responsible to train their own employees regarding Hazard Communication.

Instruction must include, but is not limited to:

- ✓ How to read, understand and follow the information provided on the SDSs and labels supplied by the subcontractors and suppliers of the products that will be used on site, especially those sections or topics related to safe handling, PPE and other control requirements to prevent subcontractor employee exposures and exposures or odors from migrating into LBNL occupied areas.
- ✓ An overview of the requirements contained in the Hazard Communication Standard.
- ✓ Discussion of chemicals included in welding or burning, cement, cleaning solvents, gluing/adhesive processes, wood dust processes, painting/epoxy work and other such common items.

After attending the training session, each employee will sign a form to verify that they have been properly trained with regards to the Hazard Communication Standard, and that they understood the project's policy regarding this standard. The form is to be filed at the job site.

Training of all new subcontractors will take place as they are assigned to their respective position.

### **21.2.4 Hazardous Non-routine Tasks**

Periodically, employees are required to perform hazardous non-routine tasks. Prior to starting work on such projects, each affected subcontract employee will be given information by their employer (the Subcontractor) about hazardous chemicals to which they may be exposed during such activity. The information must include, but is not be limited to:

- ✓ Specific chemical or process hazards
- ✓ Protective safety measures that the employee will take to prevent exposure
- ✓ Measures the project has taken to lessen the hazard including engineering controls, administrative controls, and use of PPE.

### **21.2.5 Subcontractor Hazard Communication**

All Subcontractors are solely responsible to abide by the Hazard Communication Standard in regards to the training of their own employees, their SDS recordkeeping, their notification procedures, and any other aspects of the requirement.

## **21.3 References**

- ✓ 29 CFR 1910.1200, Sub Part Z Toxic and Hazardous Substances, Hazard Communication

## **22.0 Lead**

### **22.1 Applicability**

Most painted surfaces at LBNL have lead in some layer of paint at or beneath the surface. Though not currently used for painting at LBNL, lead was commonly used in the past as an ingredient in paints. Most

of these painted surfaces do not pose a significant health risk to LBNL employees or subcontractors unless lead aerosols are produced by disturbance activities that include, but are not limited to: sanding, grinding, welding or hot cutting painted metal surfaces. For more information, see [PUB-3000, Chapter 37, Lead Hazards and Controls](#). For actual lead abatement, or other lead generating activities such as lead related welding or hot cutting, lead dust disturbance/clean-up, etc., LBNL's Lead Specification (028300) must be followed.

Lead bricks used for shielding are another common source of lead at LBNL. Moisture can react with unprotected lead to produce lead oxide dust (white dusty appearance) on the surface. Because it can easily become airborne, this powdery material can become a hazard when these bricks are disturbed. Even when lead oxide and carbonate have not been produced; loose lead particulate can be spread when the brick surface is handled. Ingestion or inhalation of this dust can be hazardous.

Settled dust on horizontal and vertical surfaces in older buildings, including air handling systems, has the potential to contain some lead due to environmental lead from the use of lead in gasoline, as well as other sources, and should also be factored into work in these areas.

Subcontractors with concerns regarding lead safety must contact the LBNL Project Manager.

## **22.2 LBNL Specific Requirements**

Prior to performing work activities involving the use or potential release of lead, the Subcontractor must provide a Lead Compliance Plan to the LBNL Construction Manager and LBNL EHS Division for review and concurrence.

Subcontractors must not touch, remove, demolish, or in any other manner disturb materials (i.e., cold cutting, drilling sanding, welding/hot cutting, etc.) that are suspected to contain lead in any amount unless procedures have been approved by the LBNL Project Manager. Subcontractors are expected to take the necessary steps to protect their employees from settled lead dust. Workers performing disturbance activities must wear respiratory protection and perform personal air sampling to ensure controls are adequate.

Subcontractors' superintendents will immediately stop work in the affected area and will inform LBNL's Project or Construction Manager if lead, or other heavy metal or hazardous materials, are suspected to be present at a location or associated with a piece of equipment.

## **23.0 Respiratory Protection**

### **23.1 Applicability**

LBNL is committed to maintaining an injury-free workplace, and makes every effort to protect all employees and contractors from harmful airborne substances. Whenever it is feasible to do so, subcontractors are to accomplish this through engineering controls such as ventilation or substitution with a less harmful substance, and through administrative controls limiting the duration of exposure. When these methods are not adequate, or if the exposures are brief and intermittent, or simply to minimize employee exposure to airborne substances, subcontractors are to provide respirators to allow their employees to breathe safely in potentially hazardous environments, especially when performing general demolition or renovation work as part of lab or shop remodels.

LBNL recognizes that respirators have limitations, and their successful use is dependent on an effective respiratory protection program. Subcontractors are required to follow their own OSHA compliant written Respiratory Protection Program to cover all aspects required for the proper use, care, and maintenance of the equipment. Refer to LBNL's Respiratory Protection Program (PUB-3000, Chapter 4) for additional information. Subcontractor management must provide leadership by example and demonstrate interest by ensuring that adequate resources are available for effective implementation of their company's written respiratory protection program.

## **23.2 LBNL Specific Requirements**

### **23.2.1 General Respiratory Protection Submittal / Work Practice Requirements**

The following are general respiratory protection related submittals that must be reviewed and accepted by LBNL prior to subcontractors performing work. These submittal requirements apply to work that involves materials, substances, agents, minerals, ingredients, etc., which have workplace exposure limits associated with them, where respirators are used.

- Written respiratory protection program that contains the elements listed in 29 CFR 1910.134.
- Medical approval that indicates employee is medically qualified to wear respiratory protection without restrictions.
- Employee respirator training records.
- Employee respirator fit test records, as described below and in OSHA's Respiratory Protection Regulation, 1910.134(m)(2), that lists the manufacturer, model name or number, size of respirator, and indicates whether the respirator passed/failed, and include the fit factor for quantitative tests.
- For all types of respiratory protective devices (e.g., elastomeric type, disposable dust masks, etc.) used for "voluntary use" purposes, a copy of the company's written respirator program document, evidence of training and medical qualification are required as submittal items.

Respirators used at LBNL sites must be elastomeric type vs. filtering facepiece type (e.g., dust mask).

The Subcontractor's health and safety professional must determine the distance from the hazardous agent generation point source, and demarcate this area as necessary, that requires the use of respiratory protection for either support personnel or other construction trades in adjacent work areas. Factors that the subcontractor's health and safety professional must use to make this determination include type of activity, type of occupancy, engineering controls, wind or mechanical ventilation conditions, historical or existing exposure data, area air sample for the existing tasks/project, and professional judgment.

## **23.3 References**

29 CFR 1910.134

## **24.0 Silica Dust**

### **24.1 Applicability**

Silica is the main component found in sand, quartz, and granite rock. Excessive amounts of silica dust may be generated during activities including, but not limited to, sandblasting, rock drilling, grinding concrete, stonecutting, drilling, quarrying, brick concrete cutting, gunnite operations, asphalt grinding,

opening and pouring bags of cement products, demolition operations, jackhammering, chipping and sweeping concrete or masonry dust.

Silica can cause silicosis, a serious and sometimes fatal respiratory disease. Silicosis develops from breathing silica dust on the job. Symptoms of silicosis can either be chronic, appearing after 5 to 10 years of being exposed to invisible silica dust without using respiratory protection. Symptoms can also be acute appearing after only a few weeks of working in thick clouds of silica without respiratory protection.

Silica is also capable of causing lung cancer with prolonged heavy occupational exposures. Workers with impaired lung function due to silica exposure are also more susceptible to other respiratory disease such as tuberculosis.

## **24.2 LBNL Specific Requirements**

The Subcontractor is responsible for keeping worker exposures to silica at, or below, the ACGIH TLVs, or the limits as calculated in OSHA's 1910.1000, Table Z-3, whichever is lower. In general, engineering controls such as wet methods or ventilation should be employed whenever dust-producing activities are anticipated. See also [Section 16.3.8, Subcontractor Worksite Dust Control](#).

### **24.2.1 General Requirements**

In order to determine whether a product contains silica, the Safety Data Sheet must be obtained and inspected by the Subcontractor or LBNL Project Manager, Construction Manager or work lead/supervisor. In the event silica is present in the products, the following safe working procedures must be followed to eliminate or control silica dust exposure:

- Engineering controls must be utilized to eliminate the hazard whenever feasible.
- Air tests or historical data are required to confirm the controls in place are working and whether personal protective equipment, and type, is adequate.

After working with products that contain silica, each individual will be required to thoroughly wash their hands and face before eating, drinking, or smoking. Eating, drinking, or smoking near silica dust is strictly prohibited.

Wet down dry materials and surfaces before cutting, chipping, grinding, sanding, sweeping, or cleaning. All block-cutting operations must be performed by the wet cut method.

Use power tools with built-in dust extraction units to capture the dust before it is released into the air.

For abrasive blasting, replace silica sand with safer materials. LBNL does not allow the use of sand or any abrasive material that contains more than 0.1% crystalline silica. Garnet, slags, steel grit and shot may be good substitutes.

### **24.2.2 Control of Crystalline Silica Dust**

The Subcontractor must use engineering controls and respiratory protection at the work site to keep worker exposure to crystalline silica dust within the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) of 0.025 mg/m<sup>3</sup>. This requirement applies to all tasks

that either disturb building materials that contain crystalline silica or when products are used / applied that contain crystalline silica.

Dust control measures require either spraying / misting with water or the use of HEPA filtered local exhaust engineering controls at the dust generating points. Controls also require the use of respirators, disposable coveralls to protect personal or work clothing in some cases, industrial grade HEPA vacuums, and HEPA filtered negative air machines. See Table 1.0 below for additional information.

HEPA vacuums (new or used) used to control silica dust in indoor or outdoor environments where lab employees, guests, passers-by, etc., may be exposed due to the risk of leaky vacuums, must be challenge tested by emery oil aerosol or equivalent and certified as in "passing" condition prior to work commencing. The requirement for determining if vacuums need to be tested ultimately rests with the LBNL Project Manager or Construction Manager. EHS Division Construction Field Support is available for consultation in making this determination.

The testing must be performed by subjecting the negative air machines and HEPA vacuums to a 100% concentration of the challenge aerosol. To achieve this, the equipment must have a tight fitting hose connection on the aerosol generator. The other end of this hose connection is open ended and waved directly in front of the negative air machine filter area, over the entire surface area, including edges where seals are located. The open ended hose is placed directly into the HEPA vacuum hose. Vacuum testing must include checking around the exhaust vents and the canister/filter housing seals. Vacuums must not be tested if there is tape or any other type of material used to aid vacuum seals.

The equipment used for testing must be properly calibrated per the manufacturer's recommendations and equipment must be in good working condition with no missing parts. Copies of calibration and testing certifications for each negative air machine/HEPA vacuum must be provided to LBNL.

Testing must be completed at Berkeley Lab outside of buildings in unoccupied areas. Unlike the vacuum testing requirements for asbestos and lead, the LBNL EHS Division is not required to be present during the testing and repairs may be made on vacuums used for silica outside of buildings in unoccupied areas as long as the vacuums have not been used for previous asbestos or lead projects and the workers performing the work are adequately protected.

For ongoing projects, HEPA vacuums and other HEPA equipment used for indoor silica filtration related work must be tested every three months, and immediately after changing HEPA filters, and remain on site during the duration of the project. If the vacuum or other equipment leaves the LBNL site, it must be retested regardless if the testing was within three months of its last test. HEPA vacuums and other equipment must not be used for indoor work after changing HEPA filters or bags until it's been determined by the LBNL Project or Construction Manager if they require challenge aerosol testing.

Examples of construction / demolition operations known to cause the release of silica dusts, including with or without controls, include, but are not limited to:

- Chipping, sawing, grinding, hammering, or drilling of concrete, rock, brick, etc.,
- Work with cementitious materials or other products that may contain silica such as grout, masonry mortar, stucco, gunnite, shotcrete, plaster, sheetrock joint/taping compound, etc.
- Dry sweeping or sanding of materials that generate dust originating from concrete/cement, rock, or sheetrock joint/taping compound.

In order to assist Facilities project managers, construction managers, and LBNL Facilities trades with determining the appropriate level of controls and PPE for silica related work, the LBNL EHS Division

has conducted exposure or hazard assessments, including the application of professional judgment, for various tasks involving building and construction materials that contain crystalline silica. A summary of the common tasks performed at LBNL and subcontractors, and their respective controls, are listed in Table 1.0.

LBNL EHS Division Construction Field Support staff can be contacted if there are questions about the level of control required for tasks not covered below. At the discretion of the LBNL Project Manager and the EHS Division, subcontractors' exposure assessment data may also be considered for determining the appropriate level and type of PPE. Any other tasks not specifically listed below require at a minimum, ½ mask, air-purifying, negative pressure respirators for outdoor work and full facepiece, air-purifying, negative pressure respirators for indoor work, wet methods or HEPA filtered local exhaust ventilation, and use of disposable coveralls if clothing is anticipated to become contaminated with crystalline silica. These controls can be downgraded at the discretion of the LBNL Project Manager and the EHS Division.

**Table 1.0**

**Common Silica Tasks & Controls**

<b>Task*</b>	<b>Engineering Control</b>	<b>PPE<sup>1,2,3</sup></b>	<b>Comments</b>
Drilling holes in walls or floors.	Wet method or HEPA filtered vacuum attachment at drill point.	½ mask for >100 holes, up to ½” diameter and up to 3” deep holes per day per employee.	Any number of holes greater than ½” diameter or 3” deep requires at least ½ mask until further exposure assessments are performed.
Drilling holes in ceilings.	HEPA filtered vacuum attachment, or drill manufacturer’s dust capture system, at drill point.	½ mask, with appropriate eye protection, for >10 holes, up to ½” diameter and up to 3” deep holes per day per employee.  Disposable coveralls recommended to keep silica off work clothing for overhead drilling.	Any number of holes greater than ½” diameter or 3” deep requires at least ½ mask.
Core Drilling	Wet method or HEPA filtered vacuum attachment at core point.	Respiratory protection recommended.	Applies to any size, depth and amount until further exposure assessments are performed.
Roto-hammering	Wet method or HEPA filtered	½ mask for outdoor work and full	

<b>Task*</b>	<b>Engineering Control</b>	<b>PPE<sup>1,2,3</sup></b>	<b>Comments</b>
	vacuum attachment at hammer point.	facepiece for indoor work.  Disposable coveralls if clothing becomes contaminated.	
Bushing	Wet method or HEPA filtered vacuum attachment at hammer point.	PAPR <sup>4</sup> respirators for indoor work. Minimum full facepiece for outdoor work.  Disposable coveralls if clothing becomes contaminated.	
Grinding	Grinder manufacturer's shroud attached and connected to HEPA filtered vacuum. Additionally, use of water may be required if visible dust is present with shroud system.	PAPR <sup>4</sup> respirators for indoor work. Minimum full facepiece for outdoor work.  Disposable coveralls if clothing becomes contaminated.	HEPA filtered negative pressure enclosure may be necessary in indoor environments to limit migration of silica dust, to help reduce airborne concentrations, and to help prevent overloading of respirator filters. Subcontractor area air sampling to verify controls are adequate.
Jackhammering with portable unit operated by worker OR attached hoe ram to Bobcat.	Wet method, local exhaust boot system, or other control method.	PAPR for indoor work. Minimum ½ mask for outdoor work.  Disposable coveralls to keep silica off work clothing for indoor work. Disposable coveralls to keep silica off work clothing for outdoor work if clothing becomes contaminated..	Other factors should be considered include the number of jackhammers, and proximity to each other, exterior environment and it's respective openness or relatively enclosed environment, etc.
Jackhammering using hoe ram	Wet method, local exhaust boot	Respiratory protection	

<b>Task*</b>	<b>Engineering Control</b>	<b>PPE<sup>1,2,3</sup></b>	<b>Comments</b>
attachment to large excavator.	system, or other control method.	recommended for outdoor work, ½ mask for indoor work.	
Spraying gunnite, shotcrete, fireproofing, or other cementitious material or product that contains silica.		½ mask for outdoor and indoor work.  Disposable coveralls to keep silica off work clothing.	
Walk Behind Wet Saw Cutting Concrete	Wet method at saw blade during all steps of process.	½ mask for indoor and outdoor work.	
Walk Behind Wet Saw Cutting Asphalt	Wet method at saw blade during all steps of process.	½ mask for indoor and outdoor work when duration of cutting exceeds a total of 4 hours per day.	Unless there is concrete below the asphalt, in which case ½ masks are needed for any duration.
Portable Saw Cutting	Wet method at saw blade during all steps of process.	½ mask for outdoor and full face for indoor work.  Disposable coveralls if clothing becomes contaminated except where rebar may be cut.	
Track Saw Cutting	Wet method at saw blade.	½ mask for outdoor and full face for indoor work.  Disposable coveralls if clothing becomes contaminated except where rebar may be cut.	
Broadcasting	Natural or	½ mask for indoor	

<b>Task*</b>	<b>Engineering Control</b>	<b>PPE<sup>1,2,3</sup></b>	<b>Comments</b>
Silica Grit For Flooring Purposes	mechanical dilution ventilation.	and outdoor work.	
Opening, pouring / mixing bags of cementitious materials in 55 gallon drums	Natural or mechanical dilution ventilation along with misting with water during pouring.	½ mask for indoor and outdoor work for >10 bags total for all employees per day.  Disposable coveralls if clothing becomes contaminated.	
Opening, pouring / mixing bags of cementitious materials or products that contain silica, into mixing hoppers (e.g., for fireproofing, tie back processes, etc).	Natural or mechanical dilution ventilation along with misting with water during pouring or locally exhausted system at hopper face.	Full face mask for indoor and outdoor work for any amount without personal air sampling data.  Disposable coveralls to prevent work clothing from becoming contaminated.	
Drywall joint compound sanding	Drywall sanding pole with HEPA filtered local exhaust, wet sanding method, substitution of product that contains <0.1% crystalline silica or other effective control.	½ mask for walls. Full face for ceilings. If exhausted sanding pole is used for ceilings, then ½ mask for ceilings is acceptable.  Disposable coveralls for walls and ceilings where products contain >0.1% crystalline silica and work clothing is anticipated to become, or has become, contaminated.	Controls are for both total respirable dust and respirable crystalline silica.
Dry sweeping dust that may contain	Natural or mechanical dilution ventilation and use	½ mask for indoor and outdoor work where visible	

<b>Task*</b>	<b>Engineering Control</b>	<b>PPE<sup>1,2,3</sup></b>	<b>Comments</b>
crystalline silica dust	of water misting or dust control sweep product.	airborne dust exists.	

\* Substrates include any cementitious materials including, but not limited to: concrete, stucco, plaster, gunnite, etc., where asbestos is not present.

1. Respiratory protection is required in cases where it may not normally be required if controls are not effective.

2. Disposable coveralls must be worn in a safe manner (i.e., may require removal of shoe covers or taping of suit at ankles, wrists, etc., to prevent excess fabric from causing potential falls or slips from ladders, and are not allowed with tasks that generate sparks or other tasks that may cause the fabric to burn, etc.).

3. Respiratory protection refers to air-purifying, negative pressure type unless otherwise noted.

4. Powered Air Purifying Respirator (PAPR).

## **25.0 Radiation Areas**

### **25.1 LBNL Specific Requirements**

Radioactive materials, sealed steel active sources, or devices that generate ionizing radiation must not be brought on the LBNL site without express written permission of the LBNL X-Ray Safety Officer. Any Subcontractor needing to bring radioactive material, sources or radiation-generating devices onto LBNL property must allow sufficient lead time in their schedule for LBNL's review of their program, documentation, training records, other submittals, etc.

The EHS Division must be notified before work begins in areas where workers may be exposed to ionizing radiation from LBNL operations.

Workers may be required to use a personal dosimeter and attend radiation safety training provided by the LBNL EHS Division before beginning work. Training will be handled on a case-by-case basis. The length of this training will range from 15 minutes to one hour, depending on the facility in which work is to be done.

Dosimeters issued to subcontractor personnel must be returned at the designated times and at the conclusion of the job.

## **26.0 First Aid/CPR**

### **26.1 Applicability**

The requirements of this section apply to all Construction Subcontractors and lower-tier subcontractors (hereafter referred to as "Subcontractor") performing construction activities on LBNL sites

### **26.2 LBNL Specific Requirements**

All subcontractors must have at least one person certified in first aid and CPR at the job site at all times. Subcontractors are solely responsible to ensure the required and proper training of their employees.

Subcontractors must provide an ANSI (Z 308.1) approved first-aid kit on this job site. The Subcontractor site superintendent is responsible for ensuring that the kit is properly stocked and maintained, and inspected weekly per OSHA 29 CFR 1926.50 (d)(2) . Only trained personnel must administer first aid at the job site.

This first aid kit will also contain equipment and materials to be compliant with Cal/OSHA, General Industry Safety Orders, Section 1593 – Blood-borne Pathogens, including mouth-to-mouth resuscitation devices, powdered bleach, and latex disposable gloves.

### **26.3 References**

- OSHA, 29CFR1926.50 –Occupational Health and Environmental Controls
- ANSI Z 308.1

### **27.0 Return to Work**

#### **27.1 Applicability**

The requirements of this section apply to all Construction Subcontractors and lower-tier subcontractors (hereafter referred to as “Subcontractor”) performing construction activities on LBNL sites unless otherwise specifically exempted by LBNL.

#### **27.2 LBNL Specific Requirements**

In order to provide prompt quality medical services and to return injured employees back to work on the project as soon as possible, each subcontractor must establish a "light duty" or "restricted duty" policy for their employees in the event they are injured on this project and cannot perform their normal daily duties. This applies to all subcontractors on this project.

Restricted Duty must be an assignment provided to an employee who, because of a job-related injury or illness, is physically or mentally unable to perform all or any part of his/her normal assignment during all or any part of the normal workday or shift.

##### **27.2.1 Return to Work Procedures**

All work-related injuries must be reported to LBNL Project Management immediately.

If any employee has any doubt as to where to go for medical treatment for a job-related injury, they must contact LBNL Project Management.

The policy is to return subcontractor employees to work as soon as possible after a job-related injury or illness has occurred. All possible opportunities will be considered to provide Restricted Duty Assignments. Restricted Duty Assignments will also be considered for employees injured off the job whenever possible by the subcontractor.

When an injured employee returns to work, all physical and mental limitations must be evaluated so that additional injury or aggravation does not occur. The safety of other employees working with the injured individual must also be considered.

Injured employees may return to work on Restricted Duty under the following circumstances.

- The employee's attending physician has determined the physical restrictions.
- The subcontractor has a task that can be assigned that meets the restrictions
- The relevant Project Managers, Supervisors, and Foremen are informed of the restrictions.

The employee must receive full medical release from a physician before resuming normal work activities. No employee on Restricted Duty will be allowed to work more than 40 hours per week.

The injured employee will remain on the project where the injury occurred while on Restricted Duty.

### **27.3 References**

29 CFR 1904.07

## **28.0 Epoxy and other Coatings**

### **28.1 Applicability**

Working with epoxy material and other coatings, including paint products, has the potential to involve several health and safety hazards including respiratory hazards, skin irritation, eye hazards, odor migration problems, flammability hazards, permit required confined space hazards, and respiratory / skin sensitization hazards. Employees working with epoxy and other coatings can become “sensitized” from repeated exposure to epoxy components, especially those that contain isocyanate compounds. Becoming sensitized means the sensitized employee may no longer be able to work with the material because of immediate allergic type reactions that can occur even with extremely small doses. For instance, walking into a room where the material is being applied could trigger a respiratory or skin allergic type response for some individuals.

### **28.2 LBNL Specific Requirements**

#### **28.2.1 Required Controls**

*Respirators:* NIOSH approved, ½ mask, negative pressure, air-purifying with appropriate cartridges and filters, including water based products during spray applications or when working in enclosed areas without adequate ventilation. A higher level of protection (i.e., full facepiece or airline may be required depending on the job conditions such as higher airborne concentrations of epoxy / coating material, application method, type of chemical components, environmental conditions or work in confined spaces).

*Eye protection:* Chemical type splash goggles or substitution with a full facepiece respirator. Safety glasses may not be adequate due to splash hazards and sensitizing properties of epoxy and other coating materials.

*Skin protection:* Chemical resistant gloves, long sleeve shirts or other appropriate clothing to adequately protect skin from contact.

*Ventilation:* The contractor is required to supply their own industrial grade, high volume fans / exhaust blowers to adequately ventilate the work area. Attachable flex hoses should be readily accessible in case they are needed to ensure exhausting of odors occurs outside of buildings, work spaces, etc. In some cases, there may be the need to obtain and use explosion proof fans/blowers. Subcontractors and LBNL trades are expected to plan in advance of the work, to implement effective engineering and administrative controls, to prevent odor complaints and disruption to employees in adjacent work areas.

*Building air intakes:* Subcontractors and LBNL trades are required to work with a Facilities construction manager or supervisor/work-lead to identify the building air intakes in the surrounding work area to ensure epoxy and other coating odors exhausted from the work area are not affecting other buildings or passers-by.

*Eyewash and safety shower:* An eyewash, and in cases where a worker's body may become drenched with the product or chemical, must be located within 10 seconds travel distance, without having to go through doors, up or down stairs, etc., and be capable of providing 15 minutes of continuous flow. Hand held eyewash bottles and relying on open ended garden hoses are not acceptable.

### **28.3 References**

1910.1000 Subpart Z Toxic and Hazardous Substances Table Z

## **29.0 General Commercial Product / Chemical Use**

### **29.1 Applicability**

The requirements of this section apply to all Construction Subcontractors and lower-tier subcontractors (hereafter referred to as "Subcontractor") performing construction activities on LBNL sites.

There are many commercial products or chemicals that are used in the construction industry. These products must be handled and used in a safe manner to prevent employee exposures through skin absorption, inhalation, injection and ingestion. As mentioned previously, LBNL and subcontractor employees must be familiar with the products or chemicals they are using along with the controls to protect employees and the environment.

#### **29.1.1 Required Controls**

*Eyewash and safety shower:* An eyewash, and in cases where a worker's body may become drenched with the product or chemical, must be located within 10 seconds travel distance, without having to go through doors, up or down stairs, etc., and be capable of providing 15 minutes of continuous flow. Hand held eyewash bottles and relying on open ended garden hoses are not acceptable.

### **29.2 References**

ANSI/ISEA Z358.1-2009.

## **30.0 Welding & Hot Cutting**

### **30.1 Applicability**

The requirements of this section apply to all Construction Subcontractors and lower-tier subcontractors (hereafter referred to as "Subcontractor") performing construction activities on LBNL sites unless otherwise specifically exempted by LBNL.

There are many different types of welding and hot cutting processes, as well as base metals and consumables that can generate a variety of different types of chemical gas and fume hazards. Other factors that can affect exposure risk to workers include environmental factors such as working in an

outdoor environment with adequate ventilation vs indoors in an enclosed environment. Additionally, there are some OSHA substance specific agents, such as hexavalent chromium, that drive certain engineering, administrative and PPE requirements. This section applies to all types of construction related welding and hot cutting.

The Construction Industry Chromium (VI) Standard (29 CFR 1926.1126) will apply to all work performed by the Subcontractor that may expose workers to airborne hexavalent chromium. The Subcontractor must be responsible for compliance with all requirements of the Standard.

For lead related welding or hot cutting, follow LBNL's lead specifications (028300). Additional information may be found in LBNL's written Lead Program document (Pub3000, Ch. 4).

### **30.3 General Welding or Hot Cutting**

For general welding or cutting activities, including new steel / metal where coatings do not exist, the following controls are required:

*Respirators required:* NIOSH approved, ½ mask, negative pressure, air-purifying with appropriate filters. A higher level of protection (i.e., full facepiece or airline may be required depending on the job conditions such as higher airborne concentrations of welding or hot cutting fumes and environmental factors).

*Ventilation:* HEPA filtered local exhaust ventilation for indoor welding or hot cutting directed outside of buildings away from occupants / passers-by.

#### **30.3.1 Stainless steel (hexavalent chromium) welding / hot cutting:**

*Respirators required:* NIOSH approved, ½ mask, negative pressure, air-purifying with appropriate filters. A higher level of protection (i.e., full facepiece or airline may be required depending on the job conditions such as higher airborne concentrations of welding or hot cutting fumes and environmental factors).

*Ventilation:* HEPA filtered local exhaust ventilation for indoor welding or hot cutting directed outside of buildings away from occupants / passers-by.

### **30.4 References**

29 CFR 1926.1126 Toxic and Hazardous Substances Chromium (VI)

## **31.0 Mercury**

### **31.1 Applicability**

The requirements of this section apply to all Construction Subcontractors and lower-tier subcontractors (hereafter referred to as "Subcontractor") performing construction activities on LBNL sites. Mercury is found in many different types of temperature, pressure, water, gas and other types of switches, parts, equipment and devices, especially in older buildings at LBNL. Mercury may also potentially be found in laboratory and shop "p-traps", horizontal sewer lines downstream of p-traps (including outside the perimeter footprint of buildings), urinals and toilets in older buildings, in soil, catch basins, building

vacuum lines and vacuum holding tanks. Examples of devices where mercury may potentially be found include, but are not be limited to: boiler water level switches, general HVAC wall thermostats, relay switches, older fire suppression control boxes, CFL and fluorescent light tubes, ignitron tubes, diffusion pumps, thermometers, barometers, raw stocks of mercury and many other mercury devices.

Prior to construction, renovation or demolition projects, mercury containing devices need to be removed in a careful manner to prevent spilling the material. Spilled elemental mercury from devices, etc., can lead to spreading of mercury contamination to a large area, even as a result of a very small spill, such as from a broken thermometer or thermostat.

### **31.2 Regulatory Requirements**

29 CFR 1926 Subpart D

### **31.3 LBNL Specific Requirements**

If elemental mercury is spilled, do not attempt to clean it up. Contact the Project Manager or Construction Manager and do not leave the area if you feel you have walked through the mercury, unless the spill area is unsafe. Call for support via cell phone, local phone or two way radio. If you must leave the area for personal safety or to contact help, try to limit the distance of foot travel to prevent potentially spreading the mercury. Disposable gloves are required when handling mercury devices to prevent skin contact. Chemical type splash goggles are required if a splash hazard exists when handling the material. Respiratory protection is typically not required given the low vapor pressure of mercury, even during typical mercury containing device spills, unless the mercury is heated or the ambient temperature is elevated above room temperature.

For removing p-traps, horizontal or vertical sewer lines, the requirements listed below must be followed.

- Validate that the building is not subject to hazardous contamination in accordance with the EHS Active Radiological Work Locations Map and Legacy Radioactive Material Locations.
- Contact an LBNL EHS Division IH prior to disconnecting, cutting into or breaking/snapping sink traps or sanitary sewer lines/drain lines in laboratories, shop spaces and lines downstream of these areas, to check for elemental mercury. IH must be present during the removal to monitor for mercury. Always visually look for mercury beads in other technical areas as part of plumbing work.
- Place a must spill containment tray, or other form of secondary containment, to collect potential mercury beads that may spill from the plumbing system. Prevent potential beads from hitting floor and causing beads to be spread throughout the work space. Follow *Emergency Response Guide* (Red and white flip chart in labs & shops) if a mercury spill occurs.
- Place poly on ground below sanitary sewer/drain lines prior to breaking or snapping to collect potential mercury beads.
- Refer to LBNL Facilities Operating Procedures, “OPER-075 and OPER-076” for additional information.

### **31.4 References**

- 29 CFR 1926.55 App A
- ACGIH 2014 TLVs<sup>®</sup> and BEIs

## **32.0 Heat / Cold Illness Prevention**

### **32.1 Applicability**

The requirements of this section apply to all Construction Subcontractors and lower-tier subcontractors (hereafter referred to as “Subcontractor”) performing construction activities on LBNL sites.

### **32.2 Regulatory Requirements**

#### **32.3 LBNL Specific Requirements**

Provisions to prevent heat stress and cold stress must be incorporated into the project JHA(s) when work conditions may reasonably be expected to present such hazards. The Thermal Stress section of the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) must be the governing guidelines.

##### **32.3.1 Heat Stress**

Although the San Francisco Bay Area’s climate is generally mild and doesn’t experience excessively long durations of high heat index weather, there can be short periods of daily temperatures that do exceed 85 degrees F which can trigger Cal/OSHA’s Heat Illness Prevention regulation, 8 CCR 3395. Subcontractor and LBNL employees are required to comply with these requirements during construction related work. For additional information on responding to symptoms of possible heat illness, including how to contact emergency medical services, see PUB-3000, Chapter 4, *Heat Stress*.

The Subcontractor must provide for appropriate mitigating measures prior to heat stress becoming an issue. The American Conference of Industrial Hygienists (ACGIH) threshold limit value (TLV) guidelines must be followed for developing and implementing heat stress mitigation strategies. The use of heat stress controls must be addressed during the planning stages for all work that is to be performed in elevated temperature environments, and whenever impermeable clothing or multiple layers of clothing must be worn to conduct work.

##### **32.3.1.1 Provision of Water**

Employees must have access to potable drinking water. Where drinking water is not plumbed or otherwise continuously supplied, it must be provided in sufficient quantity at the beginning of the work shift to provide one quart per employee per hour for drinking for the entire shift. Employers may begin the shift with smaller quantities of water if they have effective procedures for replenishment during the shift as needed to allow employees to drink one quart or more per hour. The frequent drinking of water must be encouraged.

##### **32.3.1.2 Access to Shade**

- Shade is required to be present when the temperature exceeds 85 degrees Fahrenheit. When the outdoor temperature in the work area exceeds 85 degrees Fahrenheit, the employer must have and maintain one or more areas with shade at all times while employees are present that are either open to the air or provided with ventilation or cooling. The amount of shade present must be at least enough to accommodate 25% of the employees on the shift at any time, so that they can sit in a normal posture fully in the shade without having to be in physical contact with each other.

The shaded area must be located as close as practicable to the areas where employees are working.

- When the outdoor temperature in the work area does not exceed 85 degrees Fahrenheit, employers must either provide shade or provide timely access to shade upon an employee's request.

### **32.3.1.3 Rest Periods**

Employees must be allowed and encouraged to take a cool-down rest in the shade for a period of no less than five minutes at a time when they feel the need to do so to protect them from overheating. Such access to shade must be permitted at all times.

### **32.3.1.4 Training**

Effective training per 8 CCR 3395 must be provided to each supervisory and non-supervisory employee before the employee begins work that should reasonably be anticipated to result in exposure to the risk of heat illness.

### **32.3.1.5 High-Heat Procedures**

When outdoor temperatures exceed 95 degrees Fahrenheit (°F), subcontractor and LBNL employees must, to the extent practical:

- Ensure that effective communication by voice, observation, or electronic means is maintained so that employees at the work site can contact a supervisor when necessary. An electronic device, such as a cell phone or text messaging device, may be used for this purpose only if reception in the area is reliable.
- Observe employees for alertness and signs or symptoms of heat illness.
- Remind employees throughout the work shift to drink plenty of water.
- Closely supervise new employees by a supervisor or designee for the first 14 days of the employee's employment, unless the employee indicates at the time of hire that he or she has been doing similar outdoor work for at least 10 of the past 30 days for 4 or more hours per day.

Alameda County Fire Department has an on-site, 24-hour operational, firehouse that responds to emergencies at LBNL, including heat-related illnesses. In the event of an emergency, follow the requirements listed in [Section 2.4.5, Incident Response and Notification](#). Contact the on-site Fire Department by calling x7911 from Laboratory phones or 911 from cell phones if a heat illness event occurs.

### **32.3.2 Cold Stress**

The ACGIH Cold Stress Threshold Limit Value (TLV) is the prescribed standard for cold exposure. When work involves continuous employee exposure to an equivalent chill temperature (ECT) below 10° F, the following safe work practices must be observed:

- Workers are instructed on symptoms of frostbite and hypothermia, and appropriate preventive and first aid measures.
- Warming areas are conveniently available and workers must be allowed to access the warming areas at will.

- Work is conducted using the “buddy system” or under continued supervision.

## **32.4 References**

ACGIH 2014 TLVs<sup>®</sup> and BEIs

## **33.0 Decommissioning Laboratory and Shop Spaces**

To protect subcontractor and LBNL construction employees from chemical, physical and biological hazards, workspace hazards must be evaluated and controlled prior to construction projects commencing in laboratory, shop and other spaces where these hazards exist.

### **33.1 LBNL Specific Requirements**

The LBNL Chemical Hygiene and Safety Plan (CHSP) provides detailed information on the evaluation and cleaning process required prior to releasing spaces and equipment to subcontractors and LBNL craft employees. Facilities Project Managers, Construction Managers and general Facilities line management ensures spaces where construction work is occurring have been cleaned by the previous occupants prior to work commencing.

## **34.0 Housekeeping**

### **34.1 Applicability**

The requirements of this section apply to all Construction Subcontractors and lower-tier subcontractors (hereafter referred to as “Subcontractor”) performing construction activities on LBNL sites unless otherwise specifically exempted by LBNL.

### **34.2 LBNL Specific Requirements**

Housekeeping must be maintained on a daily basis. All work areas, shops and offices must be kept clean to the extent the nature of the work allows. Walking/working surfaces must be maintained, so far as practicable, in a dry condition. Waste receptacles that do not leak and may be thoroughly cleaned and maintained in a sanitary condition must be used. All sweepings, wastes, refuse, and garbage must be removed in a timely and sanitary manner. Cleaning and sweeping must be done in a manner, which minimizes the contamination of the air with dust or particulate matter. Building entrances and openings must be maintained to minimize the entry of vermin.

When provided, water facilities and containers must be maintained, cleaned, and sanitized in accordance with applicable regulations. Use of common utensils (e.g., sharing the same cup) is prohibited. Adequate and fully-equipped toilets and wash stations must be readily accessible to workers and maintained in a sanitary manner at all times.

## **35.0 Personal Protective Equipment (PPE)**

### **35.1 Applicability**

The requirements of this section apply to all Construction Subcontractors' and lower-tier subcontractors' (hereafter referred to as "Subcontractor") construction work activities on LBNL sites unless otherwise specifically exempted by LBNL. This section provides the requirements for the use of personal protective equipment, where substitution, engineering or administrative controls are inadequate to fully protect the worker's body (including eyes, face, feet, hands, head, and hearing) from hazards capable of causing injury, illness, or impairment of any bodily function.

### **35.2 Regulatory Requirements**

The selection, use, and design of PPE must comply with the following requirements:

- 29 CFR 1926, Construction, Subpart E; Personal Protective and Life Saving Equipment
- 29 CFR 1926, Construction, Subpart I; Personal Protective Equipment
- 10 Code of Federal Regulations (CFR) 835, Occupational Radiation Protection
- Applicable American Standards Institute (ANSI) Standards.
- Manufacturers' recommendations

### **35.3 LBNL Specific Requirements**

#### **35.3.1 General Requirements**

Personal protective equipment (PPE) is not a substitute for engineering and administrative controls. These controls must be implemented, to the extent feasible, to mitigate the hazard so that the need for PPE is reduced or eliminated. Subcontractors must provide PPE to its employees in accordance with OSHA requirements.

At a minimum, all subcontractor personnel must wear sturdy work shoes, long pants, and shirts with 4-inch sleeves when performing field work. Personnel working on construction activities or in the field must also wear hard hats, safety glasses with rigid side-shields and reflective, high visibility (e.g., orange) traffic safety vests (minimum ANSI Class 2). Exceptions to these minimum requirements must be approved by the LBNL EHS Division and notated in the activity-specific JHA.

The subcontractor is responsible for supplying and requiring the wearing of appropriate personal protective equipment in all operations where there is an exposure to hazardous conditions and/or where this manual indicates the need for using such equipment to reduce the hazards to the employees.

#### **35.3.2 Training**

Subcontractors must provide training to each employee who is required to use PPE. Each affected employee must show understanding of training to their specific PPE. Retraining may be necessary if work activities change or the employee exhibits lack of understanding of the PPE.

#### **35.3.3 Specific Requirements**

##### **35.3.3.1 PPE Hazard Assessment and Selection**

The appropriated PPE for the work being performed must be specified in the applicable JHA. The PPE selection must be based on the hazard assessment results conducted for the work activity. Examples of applicable hazard assessment documentation include:

- Job Hazards Analysis
- Fall Protection Plan
- Confined Space Entry Permit

- Hot Work Permit
- Electrical Safe Work Permit
- Building Surface Penetration Permit
- Other work control documents

The JHA must address at a minimum following PPE requirements as applicable to the work activity:

- Foot protection
- Hand Protection
- Respiratory Protection
- Head Protection
- Eye and Face Protection
- Hearing Protection
- Body protection
- Fall Protection

## **Personal Protective Equipment**

1. Issuing Personal Protective Equipment (PPE)
  - a. Each individual subcontractor is responsible for issuing the PPE devices to their employees. All PPE must be used in a manner compliant with federal, state, and local safety rules.
  - b. Where available, use equipment approved by a National Recognized Testing Laboratory (NRTL).
  - c. Used PPE must never be given to an employee without having been cleaned and sterilized.
2. Requirements
  - a. PPE requirements must be posted at the main entrance to the job site.
3. Head Protection
  - a. All subcontractors and visitors must wear Z89.1 rated hard hats 100% of the time while on the job site.
4. Eye Protection
  - a. All subcontractors and visitors must wear ANSI Z87 eye protection with side shields 100% of the time while on the job site.
  - b. All subcontractors involved in pumping or pouring of concrete must provide their employees at the point of concrete discharge with a wire-mesh face screen along with required safety glasses to prevent caustic burns to the face.
  - c. Cup-type chipper goggles must be used by workers in heavy breaking or drilling.
  - d. Face shields must be worn for operations that produce flying particles produced.
    - i. Adapters for use with hard hats or caps are required.
  - e. Shaded spectacle glasses or shaded face shields must be worn by subcontractors engaged in oxyacetylene burning and welding and by subcontractors engaged as electric welders' helpers. Shades 7, 8, 9, or darker are required.
  - f. All workers performing electric or arc welding must use welding masks and hoods.
    - i. Subcontractors must consult suppliers for the exact shade to match the amperage tube used.
5. Respiratory Protection
  - a. Berkeley Lab is committed to maintaining an injury-free workplace, and makes every effort to protect all employees and contractors from harmful airborne substances. Whenever possible, subcontractors must accomplish this through engineering controls such as ventilation or substitution with a less harmful substance, and through

administrative controls limiting the duration of exposure. When these methods are not adequate, or if the exposures are brief and intermittent, or simply to minimize employee exposure to airborne substances, subcontractors must provide respirators to allow their employees to breathe safely in potentially hazardous environments.

- b. Berkeley Lab recognizes that respirators have limitations, and their successful use depends on an effective respiratory protection program.
  - c. In all instances, the subcontractor is to abide by his or her own company's respiratory protection program.
  - d. Responsibility
    - i. Subcontractor management must provide leadership by example and demonstrate interest by ensuring that adequate resources are available for effective implementation of their company's respiratory protection program and the project's program.
    - ii. Subcontractor employees exposed to dust, fumes, and/or gases must be provided proper respiratory protection designed to protect against the substance encountered. The subcontractor is solely responsible for the proper fit testing, training, and maintenance per 29 CFR 1926.103 OSHA standards, and to provide the appropriate equipment.
    - iii. All training documentation must be provided to Berkeley Lab management prior to start of work.
6. Hand Protection
- a. Various types of gloves are made to protect hands against particular hazards; task appropriate gloves must be provided and used for all tasks involving hazardous skin contact. This includes handling chemicals, building materials, concrete or concrete components, welding heat sparks and slag, or where repeated tool contact can lead to abrasions or blistering.
  - b. All subcontractor employees working with metal studs, sheet metal, metal decking, ceiling grids, and cleanup or housekeeping activities must wear cut-resistant gloves.
7. Foot Protection
- a. All personnel must wear sturdy work boots with durable sidewalls, toes, and soles. Soft shoes or sneakers are not permitted. Visitors must wear appropriate, sturdy shoes or be kept out of the construction area.
  - b. Workers must wear safety toe boots where exposed to equipment traffic, material handling, and other activities where falling objects could be dropped on one's shoes. Additional toe caps with metatarsal protection tested in accordance with American Society for Testing and Materials (ASTM) 2413-11 M I/75 C/75 must be worn when operating soil tampers.
  - c. Puncture resistant soles are recommended to protect against nail punctures during stripping operations.
8. Body Protection
- a. All construction personnel must wear shirts and long trousers to protect against the elements and work-site hazards. No sleeveless shirts, tank tops, mesh shirts, shorts, or sweatpants will be permitted. Sleeves must extend a minimum of 4 inches from the top of the shoulder.
  - b. Special clothing may be required when working in very hot, cold, or wet workplaces, where electric arc flash or other burn hazards exist, or when working with harsh chemicals. Subcontractors must provide their employees with the proper protective clothing when required.

### **35.4 Subcontractor Responsibilities**

The subcontractor must:

- Perform an assessment identifying hazards or potential hazards and determine necessary PPE for activities to be performed;
- Include PPE requirements in its JHAs, as applicable;
- Adhere to prescribed LBNL postings and/or LBNL pre-job planning documentation requiring use of PPE;
- Provide adequate PPE for all its employees;
- Properly maintain, use and store PPE;
- Remove damaged and/or defective equipment from service; and,
- Provide appropriate training to PPE users and document through site-specific training, and/or daily safety meetings.

### **35.5 References**

29 CFR 1910, Occupational Safety and Health Standards  
29 CFR 1910.134, Respiratory Protection  
29 CFR 1926, Safety and Health Regulations for Construction  
29 CFR 1926, Subpart E; Personal Protective and Life Saving Equipment  
29 CFR 1910, Subpart I; Personal Protective Equipment  
10 Code of Federal Regulations (CFR) 835, Occupational Radiation Protection  
ANSI Z87.1, Occupational and Educational Personal Eye and Face Protection Devices  
ANSI Z89.1, Protective Headwear for Industrial Workers  
American National Standards Institute (ANSI) Z88.2, “American National Standard for Respiratory Protection,” (1992).  
ASTM F2413-05 Standard Requirements for Protective Footwear.

## **36.0 Hazard Communication**

### **36.1 Applicability**

The requirements of this section apply to all Construction Subcontractors and lower-tier subcontractors (hereafter referred to as “Subcontractor”) activities involving hazardous materials as they relate to the construction activities on LBNL sites unless otherwise specifically exempted by LBNL.

This section defines the requirements and responsibilities for subcontractors who use, apply, store or generate hazardous materials at LBNL.

### **36.2 Regulatory Requirements**

The Subcontractor’s Hazard Communication program must be conducted in accordance with the following statutory requirements:

- 29 CFR 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Standards
- 29 CFR 1926.59, Hazard Communication, Safety and Health Regulations for Construction

The Hazard Communication Program must comply with the applicable statutory requirements of 29 CFR 1910.1200, Hazard Communication. Required components of a Hazard Communication Program include

hazard determination, Safety Data Sheets (SDS), labels and other forms of warning, employee information training, and a written Hazard Communication Program defining the above.

### **37.0 Hazard Communication**

The OSHA *Hazard Communication Standard* requires that all employers with employees potentially exposed to hazardous chemicals at their work site establish a hazard communication program.

#### **37.1 Applicability**

All subcontractors are solely responsible to abide by the *Hazard Communication Standard* in training their own employees, their SDS record keeping, their notification procedures, and any other aspects of the requirement.

All subcontractors must supply the Berkeley Lab Project Manager with a written copy of their hazard communication program along with the SDS or SDS for any chemical materials brought on to the job site.

Subcontractors must train their workers in accordance with their hazard communication program.

All containers must be labeled in accordance with the applicable program.

The exchange of SDS or SDS must take place initially when the subcontractor comes onto the site, at regular site-safety meetings, and/or at any other designated time by the Berkeley Lab Project Manager.

All workers on the job site, regardless of their employer, must be informed of the location of SDSs and have access to the SDSs for all chemicals in use on the site.

All subcontractors must abide by this exchange and are to immediately inform the Berkeley Lab Project Manager of any new chemical substances brought onto the job site.

#### **37.2 LBNL Specific Requirements**

In addition to the requirements in Section 37 of this appendix, the subcontractor's Hazard Communication program must meet the following LBNL requirements as applicable.

##### **37.2.1 General Requirements**

The subcontractor is responsible for maintaining an up-to-date chemical inventory and copies of Safety Data Sheets (only of those chemicals brought on site). These must be maintained at the task or project support facilities and made readily available for review by site workers, or LBNL employees. The list (inventory) may include a book of SDSs, appropriately labeled and periodically updated to reflect the workplace inventory.

Prior to using any newly introduce hazardous material or product, supervisors must obtain a copy of the appropriate SDS and review it with their employees. Project Hazard Task Analyses should be updated to reflect health and safety controls specific to chemical use.

Each original container of hazardous materials must have the manufacturer's label affixed to it or be labeled, marked, or tagged showing the identity of the hazardous chemicals, the appropriate hazard warning, and the name and address of the chemical manufacturer, importer, or other responsible party.

Secondary and subsequent containers of hazardous chemicals must be labeled, marked, or tagged prior to use with the identity of the hazardous materials and the appropriate hazard warnings. The only exception to this is for portable containers into which hazardous chemicals are transferred, which need no label if all of the following conditions are met:

- The contents of the portable container are for the immediate use of only the person making the transfer, and the container remains under their direct control; AND,
- The unlabeled portable container is used only within the work shift during which it was originally filled.

### **37.2.2 Specific Communication Requirements**

The subcontractor must determine if their use of hazardous materials may affect (expose, or pose a potential danger in the event of an emergency) other subcontractor or LBNL employees. If the hazardous materials form or the way it will be used creates a potential for affecting other employees, the subcontractor must take appropriate notification steps. The subcontractor must inform the other employer(s) of any precautionary measures that need to be taken to protect other subcontractor and/or LBNL employees from inadvertent/unnecessary exposure to the subcontractor's hazardous materials during normal operating conditions and in foreseeable emergencies.

Work areas where chemical and/or biological hazards are known to pose an exposure potential must be clearly designated as such (with signs, placards, postings, etc.) along with control requirements (PPE requirements, ventilation, authorization for access required, etc.).

### **37.3 LBNL Special Emphasis**

Some chemicals are considered by LBNL to be extremely hazardous and have additional requirements for bringing on LBNL property. Extremely hazardous materials at LBNL include the following classes of chemicals:

- Alkali metals
- Beryllium
- Perchloric acid and other peroxide-forming chemicals
- Unstable, reactive, pyrophoric or explosive chemicals
- Hydrofluoric acid
- Radioactive materials
- Highly toxic chemicals and reproductive toxins (depending upon the form, the quantity and method of application or use)
- Pesticides/herbicides
- Bio-chemicals

Use of these chemicals at LBNL may necessitate additional control mechanisms such as establishing dedicated use areas, specific postings/warning signs, notification to adjacent workers, ventilation controls, decontamination procedures, personal hygiene facilities, etc. It is the subcontractor's responsibility to notify the LBNL Construction Representative prior to bringing the material on site (preferably during the project planning stages) if intending to use extremely hazardous materials on their project, in order to ensure that the proper controls are built in.

### **37.4 Subcontractor Responsibilities**

The subcontractor must be responsible for:

- Administering their own Hazard Communication Program.

- ✓ Maintaining an on-site list of hazardous materials and SDSs to be used on the project.
- ✓ Determining the hazards of materials used in the workplace, making SDSs available to employees, labeling containers, and providing information and training to employees on hazardous materials.
- ✓ Developing work practice requirements for hazardous materials identified in the JHA, PHTA.
- ✓ Bringing on-site only those chemicals needed to perform the work for which they are contracted, and only in quantities needed for the job at-hand.
- ✓ Identifying when the subcontractor's use of hazardous materials may affect (expose, or pose a potential danger in the event of an emergency) other subcontractor's, or LBNL's, employees and taking appropriate notification steps.
- ✓ Storing chemicals in accordance with the manufacturer's instructions, applicable regulations and best management practices.
- ✓ Remove chemicals from the work area and properly dispose of them when no longer needed.
- ✓ Comply with exposure monitoring and medical surveillance requirements associated with chemical use.

### **37.5 References**

- ✓ 29 CFR 1926, Safety and Health Regulations for Construction
- ✓ 29 CFR 1910, Occupational Safety and Health Standards for General Industry

## **38.0 Confined Space**

### **38.1 Applicability**

The requirements of this section apply to all Construction Subcontractors and lower-tier subcontractors (hereafter referred to as “subcontractor”) activities which require personnel to work in permit-required and non-permit-required confined spaces on LBNL sites unless otherwise specifically exempted by LBNL.

### **38.2 Regulatory Requirements**

The subcontractor confined space entry program and the associated work activities conducted in permit-required and non-permit-required confined spaces must be accordance with the following statutory requirements:

- 29 CFR 1910.146, Permit Required Confined Spaces

### **38.3 LBNL Specific Requirements/Permits**

In addition to meeting the OSHA requirements in Section 38.0, all work activities conducted in permit-required and non-permit-required confined spaces must meet the following LBNL requirements, as applicable.

#### **38.3.1 Confined Space Work at LBNL**

If known at the time of contracting, LBNL will include information on the need for confined space entry in the request for proposal (RFP). LBNL will describe the confined space, whether it is permit-required or non-permit-required, the known hazards of the space, and the purpose for entry. LBNL will request and review a copy of the Subcontractor’s written confined space program. LBNL will require the Subcontractor to have a competent confined space person, workers who are properly trained in confined space entry, and all the necessary equipment to perform work in the confined space. Compliance verification is further described in [Section 4.3.6](#), Daily ES&H Inspections and Permits, of this appendix.

#### **38.3.2 Confined Space Classification**

LBNL has established a system for classifying (consistent with OSHA definitions) confined spaces as permit-required or non-permit-required based on the actual and/or potential hazards related to entry into the space. Prior to entry, all confined spaces will be evaluated and classified as either permit-required or non-permit based on the actual and/or potential hazards related to entry into the space while the confined space is in its normal operating condition. Confined space classification is performed in advance of entries by LBNL Construction Representative.

##### **38.3.2.1 Labeling and Signage**

When feasible, identified confined spaces are posted with a sign stating “Confined Space, Entry by Permit Only” or “Caution, Non-Permit Confined Space, Contact the LBNL Construction Representative Before Entering.” When signage is not feasible subcontractors will be informed of the location and classification of known confined spaces.

##### **38.3.3 New or Previously Unidentified Confined Spaces**

There is a possibility that construction activities may create new confined spaces (such as new utility vaults, manholes, ventilation ducts, tanks, sumps, and/or elevator pits). It is also possible that, during construction, Subcontractors may encounter a confined space that had not been previously identified. During project design, LBNL will attempt to identify situations that may result in the creation of new confined spaces; however it is not always possible to anticipate every potential confined space.

It is the Subcontractor's responsibility to watch for new or previously unidentified confined spaces and to inform the LBNL Project Manager whenever new confined spaces are identified or created.

#### **38.3.3.1 Identifying a Confined Space**

All subcontractors should be on the lookout for confined spaces. As defined by OSHA, a confined space is:

- Is large enough and so configured that an employee can bodily enter and perform assigned work; and
- Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry.); and
- Is not designed for continuous employee occupancy.

#### **38.3.3.2 Hazard Recognition**

Confined spaces must be considered hazardous until determined to be otherwise. Hazards will be identified and evaluated by a competent person prior to entry. The Subcontractor must be watchful of confined space work activities that may increase hazards – such as hot work, painting, cleaning or electrical work. Such work may change a non-permit-required confined space into a permit required confined space. The Subcontractor will continuously evaluate of confined space conditions and will stop work if hazards increase or change. Additional controls must be implemented to control the new hazards.

#### **38.3.4 LBNL Verification of Subcontractor's Compliance with Confined Space Entry**

LBNL will require verification that the Subcontractor is able to safely perform confined space entries. LBNL will verify that the Subcontractor has the following:

- a confined space competent person;
- the entry team/authorized personnel - adequate number of workers to staff an entry team including entry supervisor and that their training is current and documented;
- functioning, calibrated monitoring equipment and that their staff are familiar with the use of the equipment; and
- appropriate PPE, ventilation equipment, supplemental lighting if necessary, rescue equipment/plan.

LBNL and the Subcontractor will discuss acceptable entry conditions. LBNL may request a copy of the Subcontractor's Lockout Tagout program if energy isolation is necessary. LBNL and the Subcontractor will agree who's permit system will be used – either LBNL's or the Subcontractor's. The LBNL EHS Division may observe Subcontractor confined space entries until such time that LBNL is comfortable that all performance expectations are being met.

#### **38.3.4.1 Confined Space Entry Controls**

Entries into confined spaces must be controlled either through administrative controls for non-permit confined spaces or through the permit procedure for permit-required confined spaces. Controls for confined space entries include, but are not limited to:

- Mechanical ventilation;
- Use of isolation procedures (LOTO);
- Cleaning of confined space;
- Electrical precautions;
- Fire precautions;
- PPE; and
- Communication procedures.

#### **38.3.4.2 LBNL Confined Space Entry Experience/History Review**

LBNL Construction Representative must inform Subcontractors of LBNL's experience, if any, with the confined space being entered, by reviewing , Confined Space Evaluations, and associated confined space classification, and previous cancelled permits for the space in question, if available.

#### **38.3.4.3 Subcontractor Confined Space Post Entry Evaluation Review**

Subcontractors must inform LBNL Construction Representative of their experience with the permit-required confined space following the entry by utilizing the "Entry Review/Critique" section contained in the LBNL Confined Space Entry Permit or as part of the Subcontractor's accepted Confined Space Entry Permit. Completed LBNL permits or copies of the Subcontractor's permit must be made available to the LBNL EHS Division.

#### **38.3.5 Confined Space Entry Notification**

In general, the following coordination and notification is required for permit- and non-permit-required confined spaces prior to entry (The LBNL Project Manager will be responsible for providing the necessary phone numbers):

**Non-permit Confined Space:** Entries must be coordinated with the Construction Representative

**Permit Required Confined Space:** Entries must be coordinated with the Construction Representative

The LBNL Project Manager will provide phone numbers and will instruct the Subcontractor of specific notifications to be made. Exact notification requirements may vary from job to job, particularly in cases of new confined spaces arising during construction.

#### **38.3.6 Subcontractor Training Requirements**

Subcontractors that are trained in accordance with the requirements identified in 29 CFR 1910.146, Permit Required Confined Spaces will be considered as meeting the necessary confined space entry training requirements for working at LBNL. The Subcontractor must provide LBNL proof of such training upon request.

### **38.4 References**

29 CFR 1910.146, Permit Required Confined Spaces

## 39.0 Building Surface Penetrations

### 39.1 Applicability

The requirements of this section apply to all Construction Subcontractors and lower-tier subcontractors (hereafter referred to as “Subcontractor”) activities involving the penetration of building surfaces such as walls, floors, ceilings, and roofs, specifically with respect to preventing contact with hidden hazards such as live electrical conductors and other significant hazards such as natural gas, water lines, and compressed air as they relate to the construction activities on LBNL sites unless otherwise specifically exempted by the LBNL.

### 39.2 Regulatory Requirements

The subcontractor’s building surface penetration activities shall be conducted in accordance with the following statutory requirements as applicable:

- 29 CFR 1926, Safety and Health Regulations for Construction
- 29 CFR 1910, Occupational Safety and Health Standards

### 39.3 LBNL Specific Requirements/Permits

In addition to the requirements in Section 39.0 of this appendix, the subcontractor must conduct surface penetrations in accordance with the following LBNL requirements. (**Note:** All outside excavations including trenching, grading, or drilling activities must be performed in accordance with [Section 10.0, Excavations](#), of this appendix.)

Subcontractors are required to obtain an LBNL Surface Penetration Permit prior to performing any surface penetration inside existing LBNL building and/or facilities. A Surface Penetration is defined as an opening made by drilling, cutting, hammering, or otherwise piercing a wall, floor, ceiling, or roof.

The permit outlines the steps necessary for safe penetration of building surfaces such as walls, floors, ceilings, and roofs, specifically with respect to preventing contact with hidden hazards such as live electrical conductors. The LBNL Project Representative will issue the permit to the requesting Subcontractor. The Subcontractor will be responsible for providing all the required materials, personnel and protective equipment to conduct the surface penetration. These materials may include but are not limited to drill stops, GFCIs, dielectric gloves and mats,

**Note:** This permit is also necessary to identify the presence of other significant hazards such as natural gas, water lines, and compressed air.

Subcontractors performing surface penetrations in or on new building construction must be required to utilize an equivalent permit method when the potential exists to contact hidden hazards associated with live electrical conductors, natural gas, water lines, compressed air, etc. A copy of the LBNL Surface Penetration Permit can be obtained by contacting your LBNL Project Representative.

All work that requires excavating, drilling, or driving stakes or poles 2 inches or deeper into a surface requires a permit.

A permit is also required to penetrate any depth into existing concrete surfaces such as floor slabs, walls, beams, or columns.

The permit is issued by the Berkeley Lab Utilities Engineer.

Subcontractors may obtain the permit through the Construction Manager or Project Manager.

### **39.3.1 Surface Penetrations**

A **surface penetration** at LBNL is defined as an opening made by drilling, cutting, hammering, or otherwise piercing a wall, floor, ceiling, roof or other building surface. Subcontractors must ensure that the provisions and necessary steps are in place to provide protection against contact with unseen enclosed electrical lines, gas lines, waste lines, water lines, high pressure lines, or other utilities that, if disturbed, may injure workers or damage equipment.

The subcontractor will be responsible for providing all the required materials, personnel and protective equipment necessary to conduct safe surface penetrations.

#### **39.3.1.1 Surface Penetration Permit, Existing LBNL Buildings and Facilities**

Subcontractors conducting surface penetrations in existing LBNL buildings and facilities must perform this work activity in accordance with the LBNL Surface Penetration Permit System. Prior to performing any building surface penetrations, the subcontractor must coordinate the activity through the LBNL Project Manager and Construction Representative. The LBNL Project Manager/ Construction Representative will issue the surface penetration permit to the subcontractor.

In accordance with the requirements of the permit, the subcontractor must perform an initial evaluation to include a walk-down of the area with the LBNL Project Manager/ Construction Representative. The walk-down must identify:

- Any visible indications that utilities and equipment might be present
- Any utilities and equipment that might be disturbed during the work activity

#### **Pre-approved Surface Penetration Methods**

Based on the results of the walk-down, the LBNL Project Manager/ Construction Representative will make a determination if the subcontractor work activity falls within the category of a “Pre-approved surface penetration method”. LBNL pre-approved methods include the following:

- Hanging pictures or board where the length of the nail or screw will not fully penetrate the wall material.
- Penetrations into masonry block wall that do not exceed ¾” in depth.
- Penetrations in pre-cast tilt-up concrete walls to mount signs and facility accessories. The penetration cannot exceed the thickness of the wall.
- Penetrations in drywall, sheetrock, or similar construction material with a drill bit fitted with a stop to prevent penetration beyond the depth of the material. Once a hole is made just through the material, use a fiber optic scope to verify the absence of utilities prior to proceeding with work.
- Penetrations in drywall, sheetrock, or similar construction material with a utility knife where the blade is adjusted to prevent penetration beyond the depth of the material. If the size of the opening does not allow for visual verification, use a fiber optic scope to verify the absence of utilities prior to proceeding with work.
- Penetrations in drywall, sheetrock, or similar construction material with a non-conductive object.

If the size of the opening does not allow for visual verification, use a fiber optic scope to verify the absence of utilities prior to proceeding with work.

- Penetrations in drywall, sheetrock, or similar construction material with a laminate trimmer with the cutting bit adjusted to prevent penetration beyond the depth of the material. If the size of the opening does not allow for visual verification, use a fiber optic scope to verify the absence of utilities prior to proceeding with work.
- Penetrations into a single layer of drywall, sheetrock, or similar construction material where both sides can be visually inspected to verify the absence of utilities that may be disturbed

If it is determined that the surface penetration meets the requirements of a pre-approved method, then the LBNL Project Manager/ Construction Representative will issue the permit to the Subcontractor. The permit may include additional subcontractor project controls and work instructions as deemed necessary by the Construction Representative.

### **Non-pre-approved Surface Penetration Methods**

If the surface penetration does not meet the criteria for a “Pre-approved surface penetration method”, then one or more of following utility locate measures as determined by the LBNL Building Engineer Project Manager and Construction Representative must be applied:

- Review facility and the utility drawings.
- Perform nondestructive examination of the area with utility locate equipment.
- Interview individuals involved with the construction of the area to identify how utilities were laid out.
- Use typical construction practices as an indicator of the potential for utility system to be disturbed.
- Other as applicable

The subcontractor must incorporate the following electrical safety precautions as required by the permit:

- GFCI when using corded electrical power tools. Note: A CFGI is not required if a drill interrupter/ stop is used.
- Drill interrupter/stop.
- Wear dielectric gloves rated for the voltage:
- Eye protection:
- Dielectric mats.
- Wear dielectric rubber outer boots over required foot protection when using water coolant or in a

wet environment.

When utilities have been detected within the general area that the penetrations will be performed, the subcontractor must incorporate that following project controls and instructions as applicable and defined in the permit:

- Relocate planned penetration location.
- Maintain the distances from the identified and marked utilities as defined in the permit.
- Lock out/tag out the detected utilities prior to proceeding with the surface penetration activities.

In all instances , the subcontractor must immediately stop work if:

- Unexpected utilities are encountered
- The tools encounter unexpected resistance
- Utilities are damaged during the work activity.

#### **39.3.1.2 Surface Penetration Permit, New Building Construction**

Subcontractors performing building penetrations in or on new building construction must utilize their own surface penetration permit system that meets or exceeds the requirements of [Section 39.3.1.1](#). The subcontractor must utilize the permit when construction activities such as drilling, cutting, hammering, or otherwise piercing a wall, floor, ceiling, roof or other building surface. that have a possibility of contacting or penetrating energized unseen enclosed electrical lines, gas lines, waste lines, water lines, high pressure lines, or other utilities that, if disturbed, may injure workers or damage equipment.

The subcontractor surface penetration permit system must be included as part of the CEHSP when applicable to project scope.

#### **39.4 References**

- 29 CFR 1926, Safety and Health Regulations for Construction
- 29 CFR 1910, Occupational Safety and Health Standards

## **40.0 Environmental Requirements**

### **40.1 Applicability**

The requirements of this section apply to all Construction Subcontractors and lower-tier subcontractors (hereafter referred to as “Subcontractor”) activities which have the potential to affect natural resources that include storm water, wetlands, streams, air quality, vegetation and wildlife. Potential impacts to existing historical and archeological items as well as historical and archeological items unearthed during construction on LBNL sites are also addressed in this section. Any exceptions to these requirements must be approved by LBNL.

### **40.2 Regulatory Requirements**

Environmental protection is addressed through the following statutes/laws/regulations and guidance documents:

- National Environmental Policy Act (NEPA)
- Clean Water Act, Section 404
- National Historic Preservation Act
- Endangered Species Act
- Migratory Bird Treaty Act of 1918
- Bald and Golden Eagle Protection Act
- 40 CFR Part 122, Subpart B, National Pollutant Discharge Elimination System

### **40.3 LBNL Specific Requirements/Permits**

In addition to the regulatory requirements listed in Section 40.2 of this appendix, all work activities must meet the following LBNL requirements, as applicable:

#### **40.3.1 National Environmental Policy Act Requirements (NEPA)**

A provisional NEPA review may have been initially completed so that the project design could be completed. Once the details of the project have been described in the Preliminary Design, but before initiation of construction activities, additional environmental review may be required. Depending on the nature and scope of the activity, the environmental review process could take a few days to several weeks.

#### **40.3.2 Storm-water Discharge Requirements**

Storm-water discharges associated with construction sites that disturb greater than one acre at LBNL’s sites are regulated by the EPA via the EPA General Construction Permit. Subcontractors performing construction activities on these sites are responsible for obtaining coverage under the EPA’s Construction General Permit. This requires filing a Notice of Intent with the EPA and preparation of a Storm-water Pollution Prevention Plan (SWPPP). Subcontractors are required to utilize a template provided to them by LBNL EHS Division for preparation of the SWPPP. The LBNL EHS Division must review and accept the subcontractor SWPPP in advance of applying for EPA coverage and before beginning construction activities.

Construction activities that disturb less than one acre do not require coverage under the EPA Construction General Permit. However, the subcontractor must prepare a site specific erosion control plan that must be accepted by LBNL before construction activities can begin. SWPPP must include a spill prevention, response and cleanup plan.

#### **40.3.3 Air Emissions Requirements**

#### **40.3.3.1 Fugitive Dust**

The Subcontractor must adhere to LBNL's Particulate Emissions Control Plan for Construction Activities.

#### **40.3.3.2 Vehicular Emissions**

Construction vehicles, equipment, and subcontractor's personal vehicles must be operated to minimize emissions. Unnecessary idling of vehicles and equipment is prohibited. Idling of vehicles for occupant heating/cooling comfort is prohibited.

#### **40.3.4 Pipe Flushing**

Pipeline flushing of new water lines, storm and sanitary sewer lines, or fire line flushing requires preparation and approval by LBNL Construction Representative of a plan that describes the location and nature of activity to be performed, description of the discharge (duration, anticipated volume and rate, source of the water, potential pollutants in the water used), and the BMPs to be used to prevent potential pollutants from reaching the storm drainage system, a stream, drainage channel, ditch or groundwater.

#### **40.3.5 Trash, Construction Debris and Sanitary Waste**

The Subcontractor must provide waste storage and removal as required to maintain the construction site in a clean and orderly condition with periodic disposal of waste off-site. Open free-fall chutes and containers without lids are prohibited. Trash and debris is prohibited from migrating outside the construction area. All trash and debris is to be collected daily.

#### **40.3.6 Wastewater**

LBNL limits wastewater discharges to sewer or septic systems. LBNL does not permit other direct wastewater discharges to the environment, including land and surface water. Contact LBNL Construction Representative if such a volume is planned on a routine, periodic, or occasional basis.

#### **40.3.7 Hazardous Waste**

LBNL holds the necessary Resource Conservation and Recovery Act (RCRA) generator identification numbers to conduct waste generation and collection activities. LBNL prohibits treating (evaporation, neutralization, dilution, or reduction of volume or toxicity) or disposing of hazardous waste on site. The Subcontractor must contact the LBNL EHS Division prior to any construction activity that will generate hazardous or chemical waste. Special handling, storage, and labeling requirements may apply depending upon the type and quantity of chemical waste.

#### **40.3.8 Asbestos**

The use of Asbestos Containing Material (ACM) is not authorized. However it is possible that unidentified ACM may be discovered during excavation activities. Should ACM be discovered, the Subcontractor must stop the affected work and notify the LBNL Project Manager.

#### **40.3.9 Noise**

Construction projects are limited to permit conditions or 80 dBA for the period within which the construction is to be completed or a reasonable amount of time.

#### **40.3.10 Pesticide and Herbicide Use**

All pesticide and herbicide use must be approved by the LBNL Construction Representative prior to application.

#### **40.3.11 Vegetation**

Project design must attempt to minimize the elimination of existing trees/shrubs, which provide local wildlife habitat, reduce cooling needs in summer by providing shade, and remove carbon dioxide from the air, thus contributing to a reduction of greenhouse gases generated at LBNL. Those trees/shrubs that must be eliminated as a result of construction must be tagged/otherwise marked and noted on construction drawings to be reviewed by LBNL Construction Representative. Removal of existing trees/shrubs will require replacement. The Integrated Project Team (IPT) will determine replacement strategies (types of trees, number to be replaced, etc.). Work sites must be restored by reseeding per requirements specified in LBNL procedures.

#### **40.3.12 Natural Resources - Wildlife**

Natural resource protection at LBNL is guided by NEPA, the Migratory Bird Treaty Act, Division of Wildlife Recommended Buffer Zones and Seasonal Restrictions for Raptors, the Threatened and Endangered Species Act, and other applicable state and federal wildlife guidelines. The following topics represent areas that may impact individual project costs and schedules.

##### **40.3.12.1 Other Wildlife Species**

Subcontractors must avoid adverse impacts to other wildlife species, including coyotes, deer, salamanders, bats, small rodents, rabbits, squirrels, swarms of bees, and any other form of wildlife encountered. Concrete washout pits/utility vaults and other similar structures must be constructed and operated in a manner to preclude entrapment and drowning of wildlife. During construction and installation, such structures must be covered nightly or otherwise protected to prevent wildlife from falling in, entrapment, or drowning. For mustow pits (i.e., concrete washout pits), one approach is to place a large piece of wood at an angle into the pit so that an animal can climb out if it falls in. For utility vaults, the entire vault must be surrounded by plastic construction fencing at night and on weekends. The fencing should contact the ground as much as possible.

#### **40.3.13 Preservation of Historical Resources**

In the event potential archeological items are unearthed or discovered during construction, work in the area must stop. LBNL Construction Management will make a determination within 24 to 48 hours if work in the construction site can continue. Potential archeological items may not be moved or stockpiled upon discovery.

### **40.4 Subcontractor Responsibilities**

The provisions of this procedure apply to subcontractors performing activities which have the potential to affect natural resources that include storm water, wetlands, streams, air quality, vegetation and wildlife. The Subcontractor and all lower-tier subcontractors must be responsible for implementation and compliance with all federal, state and local laws as well as LBNL procedures as described above and referenced below.

#### **40.4.1 Contaminated Spills**

Berkeley Lab's primary concern is to protect the workers and the environment in the event of an incidental spill.

If a spill occurs, it must be immediately isolated and contained to prevent contamination of the surrounding area, waterways, sewer systems, or any other environmental impact.

The subcontractor is responsible for all costs associated with the cleanup and disposal of the contaminated/hazardous materials.

If a spill occurs, the SDS for the chemical will provide the emergency information necessary to address the spill. The emergency cleanup team will need a copy of the SDS to begin the cleanup process.

The subcontractor must immediately notify the Berkeley Lab Project Manager in the event of any spill.

All subcontractors must assign trained employees who are capable of handling spills. Whenever chemicals are brought on site, the SDS must be reviewed by the subcontractor and its information communicated to all personnel exposed to its usage. If special spill response materials or equipment are specified in the SDS then the subcontractor must be provided those materials or equipment in quantities adequate to address the largest potential spill of the material.

All subcontractor records regarding spills must be copied and given to the Berkeley Lab Project Manager for filing.

## **41.0 Demolition**

### **41.1 Demolition Procedures**

The subcontractor who conducts these processes has sole responsibility to use and enforce the following procedures and meet all current DOE, federal, state, and/or local relevant to the operation(s).

### **41.2 Regulatory Requirements**

29 CFR Part 1926, Subpart T, Demolition

### **41.3 LBNL Specific Requirements**

The Berkeley Lab Project Manager must develop detailed Utility Isolation Plans on all demolition projects; these plans must include drawings of all electrical and mechanical work.

The subcontractor will be responsible for submitting a Job Hazards Analysis and all other work procedures to the Berkeley Lab Project Manager for review and approval a minimum of seven days prior to the start of demolition for each phase.

Prior to permitting employees to start demolition operations, a qualified person, designated by the subcontractor, must make an engineering survey. This survey must determine the condition of the framing, floors, and walls, and will also determine the possibility of an unplanned collapse of any part of this structure. Adjacent structures will be checked for structural integrity. Written evidence of the results of this survey is to be given to the Berkeley Lab Project Manager.

Demolition work must at all times be under the immediate supervision of a qualified person with the authority to secure maximum safety for employees engaged in demolition work.

The subcontractors will be required to wear durable gloves, eye protection, steel-toe boots with steel shanks, and long-sleeved shirts in addition to their standard personal protective equipment (PPE) when performing selective demolition operations. The subcontractors are solely responsible for this and any other required PPE.

Prior to beginning demolition operations, the Berkeley Lab Project Manager will obtain a site survey identifying the locations of asbestos- and lead-containing materials.

The subcontractor must employ a testing agency that can identify and/or verify areas suspected of containing these materials prior to their disturbance during the demolition operation.

The Berkeley Lab Project Manager must be responsible for developing and documenting a detailed Utility Isolation Plan. All electric, gas, water, steam, sewer, and other service lines must be shut off, capped, or otherwise controlled outside the building line before demolition work is started.

If electric, gas, water, steam, sewer, or other utilities are necessary during demolition, their lines must be temporarily relocated and protected.

Before demolition begins, the building will be checked by Berkeley Lab management to determine whether any hazardous chemicals, gases, explosives, flammable materials, or similarly dangerous substances have been used in pipes, tanks, or other equipment on the property. If found, such substances will be decontaminated or eliminated before demolition is started.

Any hazardous glass fragments must be removed. All floor and wall openings that pose a fall exposure must be protected by guardrails and/or covers. If debris is dropped through holes in the floor without the use of chutes, the area onto which the material is dropped will be completely enclosed with barricades not less than 42 inches high, and not less than 6 feet back from the project openings.

Signs are to be posted at each level, warning of the hazard of falling materials. Removal of debris from a lower area will not be permitted until debris handling from above has ended. Floor openings not used as material drops will be covered with material that can withstand the weight of any potential load.

Floor-opening covers will be secured to prevent accidental movement.

Demolition of exterior wall construction and floor construction will begin at the top of the structure and proceed downward, except for the cutting of holes in floors or walls for chutes and material drops, preparation of storage space, and similar preparatory work.

Each story of exterior wall and floor construction will be removed and dropped into the storage space prior to removing exterior walls and floor construction in the story below.

Entrances to multistory structures being demolished must be completely protected by sidewalk sheds, canopies, or both.

Protection must be provided from the face of the building for a minimum of 8 feet. Canopies must be at least 2 feet wider (1 foot each side) than the opening or entrance being protected, and will be capable of sustaining a load of 150 pounds per square foot.

#### **41.4 Chutes**

Materials, chutes, or sections at an angle of more than 45 degrees from the horizontal will be entirely enclosed, except for openings equipped with closures at or about floor level where materials are inserted.

The openings will not exceed 48 inches in height as measured along the wall of the chute.

At all stories below the top floor, openings not being used will be kept closed or covered.

Each chute must have a substantial gate at or near the discharge end.

The subcontractor's designated competent person must control the operation of the gate and the backing and loading of trucks.

When operations are not in progress, the area surrounding the discharge end of a chute must be securely closed off.

A standard guardrail will protect any chute opening into which debris is dumped.

Any space between the chute and the openings in the floor through which the chute passes will be covered.

Where material is dumped from mechanical equipment or wheelbarrows, a securely attached toe board or bumper not less than 4 inches thick and 6 inches in height will be provided at each chute opening.

#### **41.4.1 Removal of Materials through Floor Openings**

Unless approved by the Berkeley Lab Construction Manager, materials must not be removed through floor openings.

#### **41.4.2 Manual Removal of Floor**

Openings cut in floors will extend the full span of the arch between supports.

Before demolishing a floor arch, debris and other material must be removed from the arch and other adjacent floor areas.

Planks not less than 2 inches by 10 inches in cross section, full-size undressed, will be used to stand on while breaking down floor arches between beams.

The planks must be placed to provide a safe support for workers if the arch between the beams collapses.

The open space between planks must not exceed 16 inches.

Safe walkways meeting federal OSHA standards — not less than 18 inches wide, formed of planks not less than 2 inches thick, if wood, and of equivalent strength, if metal — will be provided so that workers can reach any point without walking on exposed beams.

Planks will be laid together over solid bearings with the ends overlapping at least 1 foot.

Demolition of floor arches will not be started until the arches and surrounding floor area for a distance of 20 feet have been cleared of debris and any other unnecessary materials.

#### **41.4.3 Removal of Materials with Equipment**

Mechanical equipment will not be used on floors or working surfaces unless the floor or surface is strong enough to support the imposed load.

#### **41.4.4 Storage of Materials**

No demolition materials are to be stored inside the building without the permission of the Berkeley Lab Construction Manager and the meeting of Cal/OSHA standards.

#### **41.4.5 Removal of Steel Construction**

Steel construction must be dismantled column length by column length and tier by tier.

If cutting and burning is to be done on steel, the steel must be checked for lead-based paint.

If lead is found in the paint, a lead abatement plan is required in accordance with LBL lead abatement procedures specific guidance can be found at <http://www2.lbl.gov/ES&H/pub3000/CH37.html>

A fire permit along with a fire watch must be maintained for a minimum of 30 minutes after all cutting and burning has been completed.

## **41.5 Demolition Using Mechanical Equipment**

When demolition balls and clam buckets are used for demolition, no craft personnel are permitted in an area where they can be adversely affected by this operation.

Only employees necessary for the performance of the operations will be permitted in this area at any other time.

The weight of the demolition ball must not exceed 50% of the crane's rated load, or 25% of the nominal breaking strength of the line by which it is suspended, whichever is less. This is based on the length of the boom and the maximum angle of operation at which the ball will be used.

The ball will be attached to the load line with a swivel-type connection to prevent twisting of the load line, and attached so that the weight cannot become accidentally disconnected.

During demolition, the subcontractor-assigned competent person must make continuing daily inspections in order to detect hazards that could result from weakened or deteriorated floors, walls, or loosened material.

No subcontractor employee will be allowed to work where such hazards exist until these hazards are corrected by shoring, bracing, or other effective means.

## **41.6 Training**

Subcontractors must train their employees in all applicable demolition operations and all applicable DOE, federal, state, and local laws, codes, and standards.

## **42.0 Scaffolding**

### **42.1 Regulatory Requirements**

29 CFR1926.450 Subpart L

### **42.2 LBNL Specific Requirements**

The following rules are required during the erection and use of scaffolds by all subcontractors:

- All scaffolds are to be built under the direct supervision of a competent person.
- All rolling scaffolds must have the wheels locked while the scaffold is in use.
- Tubular welded rolling scaffolds require a horizontal/diagonal brace.
- All rolling scaffolds must be fully planked while in use and guardrails with toe boards must in place when the scaffold reaches a height of 6 feet.
- Baker-style scaffolds must have proper guardrails with toe boards when next to shaft openings and/or windows at all times, regardless of the scaffold platform height from the floor.
- Properly secured ladder access must be provided for all scaffolds.
- End rails must be part of the guardrail system on all scaffolds.
- Scaffolds must be secured to the structure when the scaffold height is four times the minimum base dimension and every 26 feet thereafter.
- Independent lifelines for each worker on a swing scaffold are required. They must be secured to a firm anchorage point separate from the scaffold anchorage.
- Scaffolds higher than four times their least base dimension must be tied off to a structure or use outriggers.

- Scaffolds must be constructed on a firm, stable base. If scaffolds are constructed on soft ground, proper mudsills are required.
- Never erect a scaffold without a base using screw jacks and sole plates.
- Never put an open pipe end directly on concrete, a wood support, asphalt paving, or soil, as it may shift during use.
- Fall protection must be provided at all heights above 6 feet regardless of scaffold type.
- The person who removes a guardrail must replace it.
- Scaffolds must be inspected prior to use.

### **42.3 Requirements for Fall Protection**

During scaffold erection and dismantling, the designated competent person overseeing the operation must determine the feasibility of positive fall protection. If positive fall protection is deemed infeasible, the competent person must put a fall-protection plan in writing that meets the LBL requirements found in the [PUB-3000 Chapter 35, \*Elevated Work — Aerial Work Platforms, Ladders, and Scaffolds\*](#), and submit it to Berkeley Lab Project Management for review prior to commencing the operation.

### **42.4 References**

29 CFR Part 1926, Subpart L, Scaffolds

### **43.0 Noncompliance**

To ensure compliance with the requirements of this safety program and all established OSHA standards, Berkeley Lab implements this procedure to address non-compliances by all subcontractors working on Berkeley Lab-controlled property. Non-compliances identified by LBNL are to be attributed to the offending subcontractor and timely corrective action is expected. Except in cases of clear negligence or willful violation by an individual worker, LBNL will not get involved in the disciplinary actions for individual subcontractor employees.

- LBNL expects all subcontractors to self-identify and correct non-compliances and unsafe conditions on the job site without prompting from LBNL.
- LBNL will recognize and reward subcontractor efforts to self-identify and correct non-compliances and unsafe conditions.
- LBNL EHS Division resources strive to work as partners with subcontractors to assure safe and compliant projects. LBNL EHS Division resources provide assistance to subcontractors and their workers in the understanding of LBNL and regulatory requirements. Cooperation and teamwork between all parties is welcome and is necessary to achieve the high level of safety performance desired by all.
- The LBNL Construction Safety Engineer, LBNL Construction Safety Manager, the Construction Manager, or the Project Manager may identify non-compliances with applicable environment, health, and safety requirements. The observation of work and the correction of non-compliances and unsafe behaviors is done to reinforce desired behaviors and conditions and correct unsafe conditions and behaviors.
- Day to day non-compliance issues that can be quickly addressed may be handled verbally and if corrected on the spot no written record is required except for issues resulting in an imminent danger to personnel or the environment.
- LBNL personnel perform work observations that are documented in a database for the purpose of tracking, trending, and improving job safety (see Work Process Q, Work Site ES&H Considerations).

- LBNL expects some level of noncompliance to arise due to misunderstandings, differences of opinion, misapplication of rules, poor judgment, and worker lapses. LBNL expects these noncompliance's to be identified and corrected with little fanfare or consequence.
- High risk offenses that put workers or the environment in imminent danger of serious harm will be stopped and will be recorded in writing to be followed up with a meeting between the responsible supervisor, subcontractor superintendent, and LBNL PM or CM to agree that the non-compliance has been sufficiently addressed and the work can be restarted. Some moderate and most high risk offenses require reporting the DOE via the DOE Occurrence Reporting and Processing System (ORPS) or the DOE Noncompliance Tracking System (NTS). Each subcontractor must cooperate with LBNL to gather and report the facts when ORPS or NTS reporting criteria are met.
- Non-Compliance and Safety Citation Procedure:
  - a. When partnering and working together fails to achieve the desired results, LBNL may implement this Safety Citation Procedure.
  - b. This procedure is established to enforce compliance, correct repetitive non-compliance issues, or to address noncompliance's in which a subcontractor has failed to adequately address the issues raised by LBNL or their own personnel.
  - c. It is LBNLs desire that this Safety Citation Procedure never be utilized.
  - d. The Berkeley Lab Project Team has sole authority in the execution of this procedure, but intends that this procedure is only implemented after other efforts to improve job site compliance fail to result in satisfactory performance.

#### **44.0 Source Requirements**

Subcontractors must comply with requirements; in case of conflict or overlap of the incorporated references, consider the most stringent provision as applicable and contact your project PM for confirmation.

#### **Source Requirements Documents**

- 10 CFR 851, Worker Safety and Health Program
- Occupational Safety and Health Act (OSHA)
- 29 CFR Part 1904, Recording and Reporting Occupational Injuries and Illnesses
- 29 CFR Part 1910, Occupational Safety and Health Standards, Department of Labor
- 29 CFR Part 1926, Safety and Health Regulations for Construction, Department of Labor
- 29 CFR 1910 Occupational Safety and Health Standards and ACGIH Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices
- National Electrical Safety Code, ANSI C2
- National Fire Protection Association (NFPA) 51B, Fire Prevention During Welding, Cutting, and Other Hot Work (2014 edition)
- NFPA 70 National Electrical Code; and (h) NFPA 70E Standard for Electrical Safety in the Workplace (version referenced in the LBNL ES&H Manual [PUB-3000])
- NFPA 241, Safeguarding Construction, Alteration, and Demolition Operations (2013 edition).
- Lawrence Berkeley National Laboratory Requirements and Policies Manual, [Construction Health & Safety policy](#)
- Lawrence Berkeley National Laboratory [Construction Safety Requirements Manual](#)
- Lawrence Berkeley National Laboratory [Electrical Safety Requirements Manual](#)
- 40 CFR Part 763, Asbestos
- Clean Air Act

- Clean Water Act
- Resource Conservation and Recovery Act
- Toxic Substances Control Act
- American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values for Chemical Substances and Physical Agents (most current version)

### Other Driving Requirements

California Code of Regulations:

- Bay Area Air Quality Management District (BAAQMD) Rules, Regulations, and Manual of Procedures, including Diesel Vehicle Idling Rules, On- and Off-Road Diesel Vehicle Regulations, and CEQA Guidelines
- California Department of Public Health
- East Bay Municipal Utility District Ordinances 40 CFR Parts 122 through 125, National Pollutant Discharge Elimination System (i.e., water quality). California's General Permit for *Storm Water Discharges Associated with Construction and Land Disturbance Activities* (Construction General Permit), as specified in the State Water Resources Control Board (SWRCB) Order No. 2009-0009-DWQ (as amended by 2010-0014-DWQ and 2012-0006-DWQ) and California's General Permit for *Storm Water Discharges Associated with Industrial Activities excluding Construction Activities*, as specified in the SWRCB Order No. 2014-0057-DWQ
- California Fire Code (2010 edition)
- Title 8, Division 1, Chapter 4, Industrial Safety Article 15
- Title 13, Division 2, Chapter 6, Hazardous Materials for Transportation by Commercial Carriers
- Title 17, Division 3, Air Resources
- Title 19, Public Safety
- Title 22, Divisions 4 and 4.5, Hazardous Waste;
- Title 23, Division 3, Water Quality
- Title 23, Division 5, Hazardous Materials
- ANSI Z359 Fall Protection
- ANSI Z88.2 Respiratory Protection
- ANSI Z136.1 Safe Use of Lasers
- ANSI Z49.1 Welding, Cutting, and Allied Processes

### Reference Documents

Document number	Title	Type
07.07.011.001	ES&H Manual, <i>Electrical Safety Program</i>	Program
07.07.020.001	ES&H Manual, <i>Lockout/Tagout and Verification</i>	Program
07.11.001.001	ES&H Manual, <i>Fire Prevention and Protection</i>	Program
07.07.024.001	ES&H Manual, <i>Personal Protective Equipment Program</i>	Program
07.07.008.001	ES&H Manual, <i>Cranes Hoisting and Rigging Program</i>	Program
07.07.008.001	ES&H Manual, <i>Forklifts and Other Powered Industrial Trucks</i>	Program
07.07.014.001	ES&H Manual, <i>Fall Protection Program</i>	Program

07.07.006.001	ES&H Manual, <i>Confined Spaces</i>	Program
07.07.002.001	ES&H Manual, <i>Asbestos Hazards and Controls Program</i>	Program
07.07.019.001	ES&H Manual, <i>Lead Hazards and Controls Program</i>	Program
07.07.001.000	ES&H Manual, <i>Elevated Work-Aerial Lifts, Ladders, and Scaffolds Program</i>	Program

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