

Chapter 10

CONSTRUCTION SAFETY MANUAL

ADMINISTRATIVE POLICIES

Appendix A. Code of Safe Practices

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A.1 Cranes

A.1.1 Scope and Application

Mobile cranes shall comply with the American National Standard B30 Safety Codes for Cranes, Hoists and Derricks and to the California Code of Regulations, Title 8, General industry Safety Orders, Cranes and Other Hoisting Equipment and [PUB-3000, Chapter 5](#).

A.1.2 Requirements

Subcontractor shall provide to the LBNL Construction Manager or LBNL Construction Safety Engineer the cranes current Annual Inspection Certificate and the Quadrennial Proof Load Test Certification before the crane is allowed to be placed into service.

All cranes must be equipped with the following items: Rated Load capacities, wind load ratings, and special hazard warnings.

All crane operators must have a valid license from an approved agency or union and meet the requirements of ANSI B30.

All rigging equipment shall be inspected weekly with a copy of the inspection report being submitted to the LBNL Project Manager.

Wedge sockets and fittings shall be the proper size to match the wire rope and shall move to wedge and hold the wire rope under load construction. The dead end shall be terminated according to ANSI B30.5 and shall 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.

Multiple piece lifts (Christmas Treeing) is **NOT** be permitted.

It is required that all subcontractors' using cranes must have a current on-site copy of the:

- Mobile Crane Operator's Manual
- Rigging Handbook

A.1.3 ALL CRANES used on LBNL projects must meet the following minimum criteria

A daily and monthly inspection shall be performed while the cranes are in use on the Project. These daily and monthly forms are to be maintained on file by the subcontractor, and made available to the LBNL Construction Manager or LBNL Construction Safety Engineer 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 shall be submitted to LBNL Construction Manager explaining method of coordination to be used between cranes to ensure the possibility of a collision is prevented.

Mobile cranes are only to be used with outriggers fully extended and tires off the ground unless manufacturer's recommendations allow otherwise.

If supporting ground for crane is soft, the lift shall not be made until firm bearing is provided including crane mats if necessary. No lift shall be made if the crane is not level.

If the full range of motion of the lift is not visible to the operator, signalmen or radio communication must be provided.

For multiple crane lifts, reduce the cranes rated capacity by not less than 25 percent.

A.1.4 Critical Lift Requirements at LBNL

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, upset, or collision of items could:

- Cause significant work delay.

- Cause undetectable damage resulting in future operational or safety problems.
- Result in significant release of radioactivity or other undesirable conditions.
- Present a potentially unacceptable risk of personnel injury or property damage.

In addition, any lift/move that requires the simultaneous use of both the main and auxiliary hoists of a given crane or the simultaneous use of two cranes shall be considered a high-consequence/high-value lift/move.

A.1.5 High-Consequence/High-Value Lift/Move Requirements

A detailed, step-by-step procedure in the form of an Engineering Note must be prepared for each high-consequence/high-value lift/move. A sample Engineering Note format may be obtained from the Engineering Division.

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.

Responsibility for preparing the high-consequence/high-value lift Engineering Note rests with the customer, typically the project engineer. The customer can discharge this responsibility by indicating on the Facilities Work Request that the scope of work should include preparation of the Engineering Safety Note and management of the move. It is the responsibility of the customer to notify all personnel whose approval is required early in the process. See “High-Consequence/High-Value Lift Procedure Approval” below. Approvers have special expertise and are available to provide guidance during the design of the lifting procedure. Please allow sufficient time for the review and approval process. There is no charge for the review and approval process.

The procedure 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, an LBNL identification number must be assigned by the PIC and affixed to the item.
- Surveillance procedures, checkpoints, and estimated instrument readings (if used) must be listed 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 that 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 of the load path with the expected height of the load at each point in the lift. Where appropriate, floor loading diagrams are to be included to provide for setting the load down at any point in the path if that should 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 Facilities Department Structural Engineering Group 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 where personnel involved in the lift verify that they are familiar with the contents of the procedure.
- Load tests and practice lifts, if required, shall be included in the procedure 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 as specified in this manual (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. A new checklist must be completed for each separate lift. However, when the items to be lifted are different (for example, if they are unbalanced and do not have the same center of gravity), then separate procedures must be written to specify the type of item to be lifted and the specific lifting equipment used. 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.

A.1.6 Approval of High-Consequence/High-Value Lift Procedures

The procedure must be reviewed and approved by:

- LBNL Customer Management

- LBNL Mechanical Engineering Department Designee;
- LBNL Facilities Department Structural Engineering Group;
- LBNL Facilities Department Rigging Supervisor;
- LBNL EH&S Division Occupational Safety Manager.

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.

A.1.7 High-Consequence/High-Value Lift Personnel

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

All reviewers/approvers are to be on site during the operation should the lift plan need to be modified.

A.2 Demolition

A.2.1 Scope and Application

LBNL will monitor and review the safety procedures during demolition processes to ensure the safety of all subcontractors. It is the sole responsibility of the subcontractor who conducts these processes to utilize and enforce the following procedures and meet all current DOE, federal, state, and/or local relevant to the operation(s).

A.2.2 Requirements

The LBNL Project Manager is responsible for developing detailed Utility Isolation Plans on all demolition projects to include drawings of all electrical and mechanical work.

The subcontractor shall be responsible for submitting a Job Hazard Analysis and all other work procedures to the LBNL 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, an engineering survey will be made by a qualified person designated by the subcontractor. This survey shall 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 LBNL Project Manager.

Demolition work shall at all time 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 when performing selective demolition operations. The subcontractors are solely responsible for this and any other required personal protective equipment.

Prior to beginning demolition operations, the LBNL Project Manager will obtain a site survey identifying the locations of asbestos- and lead-containing materials. The subcontractor shall employ a testing agency that can identify and/or verify areas suspected of containing these materials prior to their disturbance during the demolition operation at the subcontractor's own cost. The LBNL Project Manager shall be responsible for developing and documenting a detailed utility isolation plan.

All electric, gas, water, steam, sewer, and other service lines shall 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 shall be temporarily relocated and protected.

Before demolition begins, the building will be checked by LBNL 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 shall be removed.

All floor and wall openings, which pose a fall exposure, shall 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 shall be posted at each level, warning of the hazard of falling materials. Removal of the debris from the lower area shall 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. The floor-opening cover will be secured to prevent it from being incidentally moved.

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 shall be completely protected by sidewalk sheds, canopies, or both. Protection shall be provided from the face of the building for a minimum of 8 feet. Canopies shall 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.

A.2.3 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 shall have a substantial gate at or near the discharge end. The subcontractors designated Competent Person shall 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 shall 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.

A.2.4 Removal of Materials through Floor Openings

There is to be no removal of materials through floor openings unless approved by the LBNL Construction Manager.

A.2.5 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 will 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 will be placed so that a safe support is provided for the workers if the arch between the beams collapses. The open space between planks shall 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.

A.2.6 Removal of Material 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.

A.2.7 Storage of Materials

No demolition materials are to be stored inside the building without the permission of the LBNL Construction Manager and meeting Cal/OSHA standards.

A.2.8 Removal of Steel Construction

Steel construction shall be dismantled column length by column length and tier by tier. If cutting and burning is to be done on steel, then the steel must be checked for lead-based paint. If lead is found in the paint, then the proper precautions must be taken to prevent worker exposure. In addition, 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.

A.2.9 Demolition Using Mechanical Equipment

When demolition balls and clam buckets are used for demolition, no craft personnel will be allowed to enter an area where they can be adversely affected by this operation. Only those employees necessary for the performance of the operations will be permitted in this area at any other time.

The weight of the demolition ball shall not exceed 50 percent of the crane's rated load, or it will not exceed 25 percent of the nominal breaking strength of the line by which it is suspended, or 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 incidentally disconnected.

During demolition, continuing daily inspections by the subcontractor assigned Competent Person shall be made as the work progresses so that hazards that could result from weakened or deteriorated floors, walls, or loosened material are detected. No subcontractor employee will be allowed to work where such hazards exist until these hazards are corrected by shoring, bracing, or other effective means.

A.2.10 Training

Subcontractors are responsible for training their employees in all applicable demolition operations and all applicable DOE, federal, state, and local laws, codes, and standards.

A.3 Electrical

A.3.1 Scope and Application

Use of electricity on construction job sites poses serious hazards, such as electrocution, burns, fires, explosions and arc flash/blast. All construction work performed by LBNL employees as well as subcontractors shall comply with applicable local codes/regulations, federal and California state OSHA standards, and other codes/regulations such as, but not limited to, NFPA codes (i.e. National Electrical Code (NFPA 70), NFPA 70E, Standard for Electrical Safety in the Workplace, NFPA 79, Electrical Standard for Industrial Machinery), and the National Electrical Safety Code (ANSI C2). The most current versions and stringent requirements shall always apply. In addition, compliance with all elements of this section and PUB-3000 is required. Requirements specific to electrical are found in [PUB-3000, Chapter 8](#). Electricians and apprentices shall be certified in accordance with California law, and shall carry certification cards.

A.3.2 Ground Fault Circuit Interrupters

All 120-volt, single-phase, 15-, 20-, and 30-ampere receptacle outlets that are in use by employees shall be protected by approved GFCIs. Receptacles other than 120-volt, single-phase, 15-, 20-, and 30-ampere receptacles shall be protected by approved GFCIs, or a written assured equipment grounding conductor program shall be continuously enforced at the site by one or more designated persons to ensure that 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 are installed and maintained properly. The program should conform to the requirements of OSHA Standard 29CFR 1926.404(b)(iii). Workers shall test GFCI receptacles according to the manufacturer's instructions before each use.

A.3.3 Electric Power Tools

All subcontractors shall have a system in place for routine testing and maintaining of electrical tools, equipment, extension cords, and other electrical equipment. The program shall be in writing, with a copy provided to LBNL Construction Safety Engineer for review.

Tools with damaged cords, damaged cord caps, missing or damaged covers, missing grounding pins, or other damage that may affect the safe use of the equipment shall be removed from the project. All electrical equipment (such as saws, hammers, drills, vibrators, and float machines) shall bear the label of a Nationally Recognized Testing Laboratory (NRTL), such as Underwriters Laboratories (UL), CSA, ETL, or the like.

All tools shall be of the grounding type. Cord-connected tools shall be grounded through an approved grounding attachment plug.

Exception: Tools identified as “Double Insulated” are not required to be grounded.

A.3.4 Electric Equipment

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

A.3.5 Extension Cords

Only heavy-duty cords identified as hard or extra-hard usage (see NEC Table 400.4) (such as types S, ST, SO, STO) are acceptable. Cords shall be maintained in their original designed configuration. Any cord that is damaged or has a grounding pin removed shall be removed from service.

The subcontractor shall remove cords that have been spliced or repaired from project site. There will be no repair or taping of cords in any manner. The gauge of wire of the cord shall be sized for the designated use, but in no case less than 14 gauge. For an overall length over 100 feet, one size larger than required for the connected load shall be used. All extension cords shall be plugged into job-site power that has proper overcurrent and ground-fault protection.

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

A.3.6 Temporary Wiring and Lighting

Upon installation, repair, or modification of job-site receptacles, the installing subcontractor shall test each receptacle for proper polarity and GFCI operation.

Temporary wiring shall be cable assemblies or multiconductor cords or cables identified for hard usage or extra-hard usage (See NEC Table 400.4). All wiring methods shall suit the conditions and environment where installed. No single conductor cable will be permitted. Temporary wiring shall be removed immediately upon completion of construction or purpose for which the wiring was installed.

Temporary lighting shall 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 shall be responsible for the maintenance of such materials.

A.3.7 Working Near Overhead Electrical Lines

It shall be the responsibility of the subcontractor performing the work to have adjacent overhead electrical lines de-energized, blanketed, or by other means protected from contact by equipment or personnel.

An unqualified worker and the longest conductive object that he or she may contact shall 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 shall have a work plan approved by EH&S.

A.3.8 Electric Welding

The frame of a portable welding machine operating from an electric power circuit shall be grounded. Switching equipment for shutting down the welding machine shall be provided on or near the welding machine.

The electrode holder and connecting cable shall be fully insulated. Light holders shall not be used for heavy work, and welders shall avoid standing on damp or wet surfaces while welding. All equipment shall be checked regularly to make certain that electrical connections and insulation on the holders and cable are in good order. Cables shall be kept dry and free from oil and grease. They shall be arranged in such a manner that they do not lie in water, oil, or ditches, or on bottoms of tanks. Electrical repairs and maintenance work on welding machines shall be done by a certified electrician. Electric stubs shall be placed in containers provided by the subcontractor for this purpose.

Welders shall be taught to keep welding cables in an orderly fashion and away from places where it could cause a stumbling hazard or become damaged. Where possible, it shall be strung overhead, high enough to permit free passage of vehicles and persons.

A.3.9 Electrical PPE and Insulated Tools

PPE requirements are specifically defined by [PUB-3000, Chapter 8](#) and NFPA 70E. Qualified workers who are potentially exposed to electrical hazards that cannot be controlled through some engineering means must be provided with and use personal protective equipment that is appropriate for the specific work to be performed and the associated hazard level. This includes testing, troubleshooting and zero energy verification tasks.

Flame Resistant (FR) apparel used for protection from electrical hazards shall be inspected before each use. Clothing that is contaminated, or damaged to the extent their protective qualities are impaired, shall not be used. Protective items that become contaminated with grease, oil, or flammable liquids or combustible materials shall not be used. The garment manufacturer's instructions for care and maintenance of FR apparel shall be followed.

Rubber-insulating gloves shall be used with leather protectors. The rubber portion of Class 0 and 00 gloves shall extend ½-inch beyond the leather protectors, 1-inch beyond the leather protectors for Class 1 and an additional inch for each higher class. Rubber-insulating gloves shall be dielectrically tested every six months and stamped with the date tested or the date to be tested. Gloves shall be stored in a proper storage bag, as flat as possible (not folded), and shall not be stored with other materials. The qualified person shall inspect and inflate gloves before each use.

Qualified employees shall use insulated tools when working inside the Limited Approach Boundary of exposed live parts where tools or handling equipment might make accidental contact. Workers who are using insulated tools shall inspect them for damage before each use.

Insulated tools shall be protected from damage to the insulating material. Insulated tools shall be rated for the voltages on which they are used, shall meet ASTM F1505 requirements, and shall be labeled with the ASTM approval mark. Insulated tools shall be designed and constructed for the environment to which they are exposed and the manner in which they are used.

A.3.10 Electrical Test Equipment

Test instruments, equipment, and their accessories shall be rated for circuits and equipment to which they will be connected. All test equipment shall be NRTL listed and labeled and shall be Category III or IV rated. Test instruments and equipment and all associated test leads, cables, power cords, probes, and connectors shall 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 shall be removed from service, and not used until repairs and tests necessary to render the equipment safe have been made.

A.3.11 Electrical Safety Workbook and Permits

Any subcontractor performing testing or troubleshooting on exposed live parts greater than 50 volts is required to supplement their safety plan with a [Subcontractor Electrical Safety Workbook \(PUB-3000, Chapter 8, Appendix B\)](#), and an [Energized Electrical Work Permit \(EEWP\) \(PUB-3000, Chapter 8, Appendix A\)](#).

A.4 Control of Hazardous Energy (Lockout /Tagout)

It is Laboratory policy to prevent the unintended or unexpected startup or release of hazardous energy during servicing, maintenance, or modification activities. No person shall install, service, remove, or perform maintenance on any equipment or machinery that may involve an energy hazard, until that equipment has been deenergized, 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) shall have a Lockout/Tagout (LOTO) plan approved by EH&S. The LOTO plan shall comply with 29CFR 1910.147, 29CFR 1910.333 and [PUB- 3000, Chapter 18 \(Lockout/Tagout and Verification\)](#), as a minimum.

A.4.1 Subcontractor Construction LOTO WORKBOOK

Subcontractor Construction LOTO Workbook is a step by step questionnaire. The LOTO Workbook must be completed if you answer “YES” to any of the questions on Page 7 of the Safety Check List. The goal of the Workbook is to produce a lockout plan that closely correlates to the work you will be performing while working at LBNL. The LOTO Workbook must be signed off by the EH&S Electrical Safety Engineer and the Construction Safety Engineer prior to work starting.

The LOTO Workbook can be found online in PUB-3000, [Chapter 18, Section 18.19.5 \(Appendix 5: Subcontractor LOTO Workbook\)](#), on the LBNL EH&S website and in the Construction Start-up Kit available at the EH&S Construction Safety office. In addition to the Workbook, a LOTO permit is required for all LOTO. See PUB-3000 [Chapter 18, Section 18.19.6 \(Appendix 6: Subcontractor LOTO Permit\)](#).

A.5 Excavation and Trenching

A.5.1 Requirements

This section provides requirements to ensure the safety of all workers who are required to work in and around excavations, and to provide guidelines for obtaining the LBNL Penetration Permit.

The subcontractor shall be responsible for submitting a Job Hazard Analysis and work procedures to the LBNL Project Manager for review and approval a minimum of seven days prior to the start of excavation.

All work that will require excavation or drilling requires an LBNL permit. Permits are required when excavating or drilling will penetrate 1-1/2 inches or deeper from a surface. Subcontractors must obtain the permit through the LBNL Construction Manager a minimum of 10 days prior to the start of work. **Work may not proceed unless there is an approved, signed permit at the job or project site.** Permits must also be posted in a conspicuous place at the job or project site

For excavation over 20 feet or deeper, a Registered Professional Engineer hired by the subcontractor shall design all shoring, sloping, or benching. All designs shall be submitted to LBNL Project Manager and filed at the subcontractor's field office prior to the start of work.

Emergency rescue equipment shall be on site and readily available by the subcontractor.

A.5.2 Competent Person Responsibilities

A Competent Person must be identified and assigned by the subcontractor. The Competent Person is responsible for the excavation and **shall be on site during all operations relating to the open excavation.**

The Competent Person must be capable of identifying existing and predictable hazards in the surroundings, or working conditions that are unsanitary, hazardous, or dangerous to subcontractors. The Competent Person has the authorization to take prompt corrective measures. 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.
- A permit must be obtained from the nearest Cal/OSHA district office before subcontractors are allowed within 5 feet or more of the excavation.

The Competent Person is responsible for:

- Ensuring that all:
 - Excavated materials and stockpiled materials shall be placed a minimum of 2 feet from the edge of the excavation.
 - Loose soil or rocks shall be removed from the sides of excavation walls.
 - Excavations 4 feet in depth or greater shall 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 shall be erected and maintained at the top of the excavation when required for fall protection.
- Limiting the number of workers in the excavation to only those persons required to perform the work.

The Competent Person responsible for the crew working in the excavation shall inspect the excavation throughout the work period, and stop operations when unsafe conditions exist. The Competent Person shall inspect all excavation before entry:

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

The Competent Person must be able to identify conditions where hazardous material may exist. The atmosphere in the excavation shall be tested prior to entry and periodically throughout the operation. When conditions change, such as with atmospheric conditions, the Competent Person must immediately remove any persons in harm's way, and must immediately notify the LBNL Project Manager.

A.5.3 Effects of Excavating and Trenching on Adjoining Property

The subcontractor shall evaluate the stability of adjacent structures before starting an excavation, and document and monitor their stability daily thereafter.

Removal of rock or concrete by blasting and pile driving causes vibrations that may be sufficient to damage structures nearby, as may the removal of earth that results in the movement of bracing systems and underpinning, or soil consolidation resulting from the lowering of a water table, etc.

A review of the subsurface conditions (determined from on-site borings) and the plans of existing wildings (where available) are necessary to evaluate lateral and vertical integrity. An inspection to evaluate the condition of adjoining/existing property shall be completed by the subcontractor prior to (and possibly after ceasing) operations.

The following shall influence the degree of inspection:

- The distance of the structures from the hazard.

- The severity of the hazard.
- The general condition of the structures.
- Requirements by local laws, contract, and/or liability.

Where job operations such as pile driving and blasting may cause vibrations affecting the nearby structures, it is required that vibration measurements be made by the subcontractor, making data available to the LBNL Project Manager. This will enable the job to monitor and set up procedures to keep the energy ratio of the vibrations at a safe level.

Where settlement of the nearby street, utilities, and structures may occur because of excavation and foundation work, the streets, utilities, and structures shall be regularly checked for vertical and horizontal movement, and a log maintained by the subcontractor. Any movement shall be investigated immediately.

All inspection reports shall be copied to the LBNL Construction Manager.

A.5.4 Soil Classification

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. All unclassified soil shall be treated as Type C Soil.

Type C Soil means:

- Cohesive soil with unconfined compressive strength of 0.5tsf (48 kPa) or less; or
- Granular soils including gravel, sand, loamy sand; or
- Submerged soil or soil from which water is freely seeping; or
- Submerged rock that is not stable, or
- 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.

A.5.5 Surface Encumbrances

All surface encumbrances that are located so as to create a hazard to subcontractors shall be removed or supported, as necessary, to safeguard workers in the excavation.

A.6 Fall Protection

A.6.1 Scope and Application

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 [PUB-3000 Chapter 30 \(Fall Protection Program\)](#). 🚩

It is the responsibility of the worker to utilize and enforce the following procedures and meet all current DOE, federal, state, and/or Lab policies relevant to the operation(s).

A.6.2 Requirements

Any work task on a walking/working surface with an unprotected side or edge which is 6 feet or more above a lower level requires fall protection hazard controls. These hazard controls may include: guardrail systems; safety net systems; personal fall arrest systems; or other fall protection measures.

Exception: Work on a flat or low sloped roof (slope less than 4 in 12), where all work is conducted at least 15 feet from any unprotected edge, is permitted to be performed without additional fall protection hazard controls.

Access to roofs and other areas requiring fall protection hazard controls will be identified with a sign that states: "Warning – Fall Protection Required For Work On This Roof – Contact Your Division Safety Coordinator". The term "Fall Protection" refers to any form of fall protection hazard controls that may include: guardrail systems; safety net systems; personal fall arrest systems; or other fall protection measures.

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.

Exception: Use of a personal fall arrest system is only required on scissor lifts when an engineered anchor point is provided by the manufacturer.

Steel erectors and sheet metal installers are required to utilize 100% positive fall protection above 6 feet at all times

The work control procedure(s) for fall protection for construction and non-construction subcontractors shall be documented on the subcontractor's approved Job Hazard Analysis. The work control procedure(s) for employee (and subcontractors and guests using LBNL procedures) shall be documented on the LBNL Written Fall Protection Plan (Fall Protection Planning Matrix), provided by the EH&S Division. The LBNL Fall Protection Planning Matrix is a supplement to any existing individual or task specific job hazard analysis.

Regardless of the work control procedure(s) used to define the fall protection hazard controls, procedures for rescue shall be detailed on the work control document.

Work tasks excepted from additional fall protection hazard controls:

- During scaffold erection and dismantling, the designated competent person overseeing the operation shall determine the feasibility of positive fall protection. If it is deemed that positive fall protection is infeasible, the competent person shall 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 LBNL Project management for review prior to commencing the operation.

- 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 either have a positive fall protection or must maintain 3 point contact (consisting of 2 feet and 1 hand) at all times.
- Double lanyards, nets, guardrails, or other means shall be used to maintain the 100% positive six-foot fall protection. The Subcontractor is solely responsible for the development, implementation, and enforcement of this policy.

A.6.3 Descriptions

Horizontal distance (without fall protection) from unprotected edge = 15 ft. minimum, except for roofers.

Free fall distance shall not exceed 6 feet.

Guardrails and parapets must be 39 to 45 inches high, and must withstand 200 lbs at top. Guardrails must have mid-rails and toe-boards, if tools or materials may fall to others below. Cable must be a minimum ¼-in. diameter, and flagged at 6-foot intervals, with no sag under pressure below 39 inches. Pipe must be 1-1/2-inch diameter minimum, and wood must be 2x4 at minimum.

Skylights must be covered with a minimum 200 lb force covers, guardrails, or fall restraint/fall arrest, within a 15-foot distance.

Warning line system (low slope roofs only):

Construction—“Non-Conforming Guardrail,” a minimum of 15 feet from unprotected edge.

Systems requirements— Uprights withstand 16 lb force at 30 inches; line to be rope, wire, chain of 500 lb strength; flagged at 6 ft intervals; height 34–39 inches; line attached to uprights; no slide through.

Fall Restraint— Worker’s center of gravity cannot fall over the unprotected edge in any direction.

Vertical Lifelines shall 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 lbs. (Only one worker per lifeline.)

Horizontal Lifeline shall be secured above the point of operation to anchorage or structural member capable of supporting a minimum of 5,000 pounds.

Lanyards shall be a minimum of 5/8-inch nylon rope or equivalent with a 900 lb shock-absorbing system and a maximum length to provide for a fall of no longer than 6 feet plus deployed shock absorber. The rope shall have a nominal breaking strength of 5,000 lbs.

A.7 Fire Hazards and Prevention

A.7.1 Scope and Application

In order to reduce the possibility of fire damage and associated losses incurred during construction, alteration, or demolition, a Fire Safety plan shall be developed to assure that the listed requirements in NFPA 241 (2004 edition), Article 87 of the California Fire Code and the California Code of Regulations (CCR), Title 8, Section 36, Fire Protection and Prevention are addressed. The Fire Safety plan must be submitted to the LBNL Fire Marshal for review and approval. These requirements apply to all projects, subcontractors, and visitors. LBNL employees and their visitors must support the subcontractor's safety plan, or in the event the work is being done by LBNL, they must support the LBNL safety plan for the construction, alteration, or demolition project.

A.7.2 Requirements

Prior to commencing work, the following requirements are to be reviewed, and the appropriate measures put in place to assure their compliance.

- Fire Department access roads must be established and maintained.
- Required means of egress must be provided and maintained.
- An adequate water supply of sufficient volume, duration, and pressure must be provided, and water mains and hydrants are made operational as soon and as long as combustibles are present.
- Type and number of fire extinguishers must be provided consistent with the hazards present and consistent with NFPA 10. Fire hose may be substituted for extinguishers as approved by the LBNL Fire Marshal.
- Sprinkler protection is to be retained as long as reasonable.
- Temporary standpipes are to be provided, where required.
- Combustible debris shall not be allowed to accumulate.
- Heating devices shall be of an approved type and kept away from combustibles.
- Smoking shall not be permitted.
- Fire Safety Permits shall be obtained for all hot work operations.
- Fire Watches shall be provided as required by Fire Safety Permits.
- All modifications or shutdown of fire suppression and/or detection systems shall be approved.
- Fire hose shall be provided, if required.
- Access to all fire fighting equipment shall be maintained, and equipment shall be kept in operating condition

- Acceptable communication methods (fire alarm, phone) must be in place for reporting a fire alarm or other life safety emergency. Reporting instructions must be conspicuously posted.
- Firewalls, doors, automatic closing devices, and exit stairways are to be established as early as practical, and fire cutoffs shall be maintained as long as practical.
- Containers of flammable and combustible liquids must meet DOT regulations, and shall not be stored near exits or stairs.
- Handling and storage of flammable and combustible liquids shall follow NFPA 30 and CCR, Title 8, Article 36, latest edition. Flammable and combustible gases must follow NFPA 54 and 58, as applicable.

A.7.3 Evacuation

- The required means of egress need to be identified and maintained. Stairways and ladders must be kept clear and free of combustible storage.
- Temporary lighting must be installed and maintained in working condition.
- Post and maintain Exit signs. Exit paths must be clear and well marked.

A.7.4 Fire Extinguishers

Each subcontractor is responsible for making sure that their employees are trained in the proper use of fire extinguishers. The subcontractor is responsible for the proper selection, maintenance, and provision of fire extinguishers that provide protection in the area affected by their work. Subcontractors may not rely on the use of LBNL extinguishers in their plan. In no event shall an LBNL extinguisher be moved as part of a plan to protect an area. Extinguisher placement shall follow NFPA 10, latest edition.

A.7.5 Fire Prevention

- All temporary electric shall be in accordance with all current existing codes.
- Storage of any material within 10 feet of fire hydrants is strictly prohibited.
- Work areas shall be policed by the subcontractor on a regular basis to prevent accumulation of material.
- No motors or machinery shall be left running during nonworking hours except as specifically directed by LBNL Project management.
- All heating equipment shall have necessary safety devices and shall be wired, piped, and operated according to all applicable Codes, Rules, and Regulations.
- All tarps and blankets shall be of fire-retardant material.
- All fuel and solvent containers shall be placed on drip pans.
- No open burning or fires shall be permitted on site. Anyone doing so is subject to immediate dismissal.
- No solid fuel shall be permitted on the site.
- All gas cylinders such as propane, oxygen, and acetylene shall be stored and tied in a vertical position in areas designated by LBNL Project management. All stored cylinders shall be capped. Oxygen will not be stored within 20 feet of any other gas.

- All gas cylinders in use shall be tied in the vertical position and capped at the end of the working day.
- All oxygen and acetylene in use shall be on proper carts with required separations (by five feet or a fire-rated wall) and with a fire extinguisher readily available.
- During welding or cutting operations, a fire extinguisher will be required and shall be the responsibility of the subcontractor performing this work.
- Roofer's kettles shall be kept away from finished walls and material storage areas. A minimum of two 20# ABC fire extinguishers is required next to the kettles.
- Individuals are not permitted to wear oil- or tar-soaked clothing.
- Spark screens are required on hoist engines.

A.7.6 In the Event of a Fire

In the event of a fire, alert people nearby, activate an alarm, extinguish the fire if safe to do so (avoiding smoke or fumes), and notify management. Listed below is a more detailed list.

- 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 the following emergency number to reach the Lab's Fire Dispatch Center: 925-447-6880 (NOTE: this call will be treated as a 911 call. Use this number only to report a fire or life safety emergency!)
- A properly trained user, confident in their ability to use the extinguisher safely, may attempt to extinguish a small fire.
- Notify LBNL Management.

A.8 Gasoline-Powered Equipment

A.8.1 Scope and Application

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 electrical powered unless otherwise approved by LBNL in writing.

- Use only approved **metal** safety cans for filling engine tanks. (Automatic safety latch closer and with flash arrestors) (**No plastic cans**)
- Shut down engine when refueling.
- Have a suitably sized (at a minimum 20-pound) ABC dry chemical type extinguisher available wherever flammable liquids are handled.
- No smoking near gasoline.

A.8.2 Fumes

Gas engines exhaust carbon dioxide and carbon monoxide. Carbon dioxide is heavier than air; carbon monoxide is slightly lighter. A mixture of the gases usually is heavier than air, although heat may cause it to rise. Both are without 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 protection equipment.

Do not run gas engines in pits, manholes, or confined spaces without positive ventilation. Always pipe gas engine exhausts to outside air when engine is located in enclosed space. Start blower before engine. If engine stops, be sure 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, hoist engineers, shanties, pipe or crawl spaces under basement floors, and where gas heaters are used. Treat these spaces as confined spaces.

A.8.3 Flammable or Combustible Liquids

When drums are used for storage of flammable or combustible liquids, use drum pumps that are designed specifically for flammable or combustible liquids and are listed by a Nationally Recognized Testing Laboratory (NRTL). Storage arrangements for flammable or combustible liquids shall follow NFPA 30.

A.9 Hand and Power Tools

A.9.1 Scope and Application

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 shall ensure that their employees know how to safely use tools they are required to work with.

A.9.2 Procedures

- 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."
- Maintain working areas free of clutter.
- Keep 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 tools.

- Hammers with broken or cracked handles, chisels and punches with mushroomed heads, wrenches with sprung jaws, or bent or broken wrenches should not be used.
- Handheld electrical tools must be equipped with a "dead-man" or "quick-release" control so that power is shut off automatically whenever 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 the work.
- All handheld portable electrical equipment must have its frame grounded or be double insulated and identified as such.
- All magazine-fed or powder-actuated tools shall reference the section entitled "Powder Actuated Fastening Tools."

A.9.3 Training Requirements

The subcontractors shall provide training or retraining on safe tool usage and maintenance to employees.

A.10 Hearing Conservation Policy

A.10.1 Scope and Application

The objective of this policy is to prevent the unnecessary loss of hearing due to excessive noise levels. Subcontractors are solely responsible for any required noise testing for their employee(s) in their work areas.

Subcontractor employees who are issued hearing protective equipment shall receive training, which includes informing employees of the effects of noise on hearing and the purpose, use and care of hearing protection. This training is the responsibility of the subcontractor.

Warning signs stating "High Noise Area — Hearing Protection required" will be posted by the subcontractor on the periphery of all work areas where subcontractor employees may be exposed to excessive noise levels.

A.11 Housekeeping

A.11.1 Scope and Application

During the course of construction, alteration, or repairs, form and scrap lumber with protruding nails and other debris, shall be kept cleared from work areas, passageways, and stairs in and around buildings or other structures by the subcontractor completing the work on a continuous daily basis.

Combustible scrap and debris shall be removed at regular intervals during the course of construction. Safe means shall be provided to facilitate such removal.

Containers shall be provided for the collection and separation of waste, trash, oily and used rags, and other refuse. Any dumpster in use shall use an "open door" policy or have a proper step platform built up to its side. Containers used for garbage and other oily, flammable, or hazardous wastes, such as caustics, acids, or harmful dusts shall be equipped with covers. Garbage and other waste shall be disposed of daily.

The storage of material shall not create hazards. Bags, bundles, and other containers or materials must be stacked, blocked, interlocked, and limited in height so that they do not slide or collapse. Subcontractor storage areas must be kept free from the accumulation of materials that may cause tripping, fire, or harboring of rats and other pests. Masonry blocks shall not be stacked above 2 pallets, and blocks must be wrapped while stacked.

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

This site will be kept clean at all times!

A.12 Ladders

A.12.1 Scope and Application

Ladders shall be inspected daily by the subcontractor's Competent Person. 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 shall immediately be withdrawn from service and tagged to prevent use, or destroyed.

Portable ladders shall 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 shall not be used in a horizontal position as platforms, runways or scaffolds.

Extension ladders and side rails shall 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, shall be installed.

Ladders shall not be placed in passageways, doorways, driveways, or any location where they may be displaced by activities being conducted on any other work, unless protected by barricades or guards.

When ascending or descending a ladder, the user shall face the ladder using at least one hand to grasp the ladder. An employee shall not carry an object that could cause the employee to lose balance and fall.

Portable ladder feet shall be placed on a substantial base, and the area around the top and bottom of the ladder shall be kept clear.

Extension ladders in use shall be tied off, blocked, or otherwise secured to prevent their being displaced.

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

Each subcontractor employee shall be trained by their 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, and Cal/OSHA requirements.

A.12.2 Step Ladders, A-Framed Ladders

Step ladders shall only be used in an open (fully extended) position. The top and top step of a stepladder shall not be used as a step.

A.12.3 Portable Metal, Aluminum or Wood Ladders

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.

A.12.4 Job-Made Ladders

The maximum length of single-cleat ladders shall 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 2 or more separate ladders staggered with a protected platform between each ladder. The maximum length of double-cleat ladders shall not exceed 24 feet. If ladders are to be used by masons or hod carriers, the length shall not exceed 20 feet.

All job-made ladders, landings, and lashings shall be inspected at least every week by the creating subcontractor, and any defects shall be corrected immediately.

A.12.5 Fall Protection Requirement while working from ladders

The 6-foot fall policy does not apply to moving up and down ladders. However, when working from ladders above 6 feet, Title 8 Subchapter 4 (Construction Safety Orders), Article 25 (Ladders), Section 1675(k) applies.

Therefore, when working on ladders above 6 feet, one shall be permitted to stand and work on the top three rungs or cleats of a ladder unless there are members of the structure that provide a firm handhold, or the employee is protected by a personal fall protection system (e.g.,

positioning device or fall restraint system) in accordance with the requirements of Article 24 of Construction Safety Orders.

A.13 Material and Personnel Hoists

A.13.1 Scope and Application

All hoists shall comply with the manufacturers' specifications and limitations applicable to their operation. Where manufacturers' specifications are not applicable, the limitations assigned to the equipment shall be based on the determination of the using subcontractor's professional engineer

competent in the field. Rated load capacities, recommended operating speeds, and special hazard warnings or instructions shall be posted on cars and platforms.

Following assembly or erection of hoists, and before being put into service, an inspection and test of all functions and safety devices shall be made by the subcontractor. A similar inspection and test is required following any major alterations. All hoists shall be inspected monthly by the subcontractor. Records shall be maintained at the site by the subcontractor.

When the hoist platform/cage is on an upper level, the first-floor level shall be guarded to prevent entry of personnel or storage of material.

Material hoists shall conform to the regulations of ANSI A10.5 and Cal/OSHA, Construction Safety Orders, sections 1605.1 to 1605.21; and personnel hoists to ANSI A10.4 and Cal/OSHA, Construction Safety Orders, section 1604.I, 1604.30.

A.14 Material Handling and Storage

A.14.1 Scope and Application

All materials shall be handled and stored with the utmost care. Subcontractors shall ensure that their employees are properly trained in proper moving, lifting, grabbing, hoisting, team lifting, and any accessories for handling materials. No employees are to be exposed to material handling that may injure themselves or others in their area. All temporary storage of materials shall be secure, neat and orderly, and out of walkways. Materials shall not be haphazardly piled or strewn about in any work area.

LBNL management shall designate areas for storage for each subcontractor's materials. The subcontractor is responsible to inform LBNL five days prior to a material shipment arriving at the project site to ensure proper planning for storage. The subcontractor is solely responsible for any materials brought onto the site.

Any equipment utilized in the movement and storage of materials shall be in good condition, and shall meet the manufacturer's specifications, and all applicable federal, state, and local standards and codes. All personnel utilizing such equipment shall be properly trained as to the operation of

such equipment. The subcontractor is solely responsible for such training and retraining, if required.

A.15 Oxy-Acetylene Burning and Welding

A.15.1 Scope and Application

The task of cutting metal with an acetylene flame shall be assigned only to experienced subcontractor employees. Goggles meeting a minimum requirement of 7, 8, or 9 tinted shade shall be worn at all times while cutting. Proper gloves shall be worn. Outer clothing shall be free from oil or grease and made of fire-resistant material. Sleeves and pockets shall be kept buttoned. High top shoes and fire-resistant leggings or high boots shall be worn.

- Where welding or cutting is required as described above, a "HOT WORK PERMIT" shall be required. LBNL Construction Manager shall issue this permit.

Subcontractors shall provide some means of catching sparks and slag when cutting or welding. Portable, hand-operated 20# ABC fire extinguishers shall be kept close at hand at all times. Subcontractors shall also provide a one-hour fire watch prior to, during, and after all burning or welding operations.

Acetylene shall never be used at a pressure of more than 15 pounds per square inch, as it is likely to explode above this pressure. All torches used shall be of the type with built in anti-reverse flow valves.

A.16 Storage & Handling of Cylinders of Oxygen

A.16.1 Scope and Application

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.

Cylinders of oxygen except those in actual use or required for the day's supply, shall be stored in a place designated by LBNL Management, where unauthorized persons will not tamper with them. Oxygen cylinders shall be stored in a vertical position with caps in place and chained.

Open flames of any description shall not be employed in any building used for the storage of oxygen cylinders.

If cylinders are stored on the ground or open platforms, such locations shall not be adjacent to points where there is a large amount of combustible material.

A.17 Acetylene

A.17.1 Scope and Application

When cylinders of acetylene are not in use, outlet valves shall be kept tightly closed and valve caps replaced, even though cylinders may be considered empty.

Cylinders shall be stored in a safe, dry, well-ventilated place where they will not be unduly exposed to the heat of the stoves, radiators, furnaces, or the direct rays of the sun, and as designated by LBNL Construction management.

Cylinders of dissolved acetylene shall always be stored in an upright position at all times, with the valve end up and capped and chained.

Under no circumstances shall an attempt be made to transfer acetylene from one cylinder to another, or to compress acetylene into a cylinder.

When transporting, moving, and storing compressed gas cylinders, valve protection caps shall be in place and secured.

When oxygen and acetylene cylinders are hoisted, they shall be secured on a cradle, sling board, or pallet. They shall not be hoisted or transported by means of magnets or choker slings. They shall not be used as a weight for crane cables.

Oxygen and acetylene cylinders not in use shall be separated by 20 feet or a ½-hour fire-rated wall. Gauges shall be removed at the end of each work shift and properly stored.

Cylinders shall be handled carefully, never shall be dropped, and shall be placed so they will not fall or be struck by other objects.

Partially used cylinders shall be closed at the valves.

When exhausted, cylinders shall be returned as rapidly as practicable to the storage building or area, and from there to the manufacturer. Empty cylinders shall be marked "Empty" and stored apart from full cylinders to prevent confusion. Valves shall be closed and valve protection caps replaced.

Carts shall have fire extinguishers attached.

Fuel and oxygen hoses, including couplings, shall be inspected frequently to insure they are not frayed or otherwise damaged.

Storage of compressed gas hoses shall only be in a ventilated gang box.

A.18 Powder-Actuated Fastening Tools

A.18.1 Scope and Application

To reduce the possibility of injuries, Only LOW VELOCITY POWDER-ACTUATED FASTENING TOOLS shall be used. The stud, pin, or fastener of these tools shall be caused to

have a velocity not to exceed 300 feet per second when measured 6-1/2 feet from the muzzle by accepted ballistic test methods. Subcontractor superintendents shall enforce compliance with Federal OSHA regulations governing the use of the tools along with the contents of this section.

A.18.2 Requirements

The use of Powder-Actuated Fastening Tools shall be governed by the following rules:

- Tools shall meet requirements of the latest edition of ANSI A10.3.
- Only subcontractor employees qualified by instructions of the manufacturer's qualified representative and/or licensed by the state or local authorities shall be assigned to use a Powder Actuated Fastening Tool. All qualified employees shall carry proof of training by way of a training identification card at all times.
- Only cartridges and fasteners supplied by the manufacturer of the tool shall be used.
- Powder Actuated Fastening Tools shall 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, etc.) will be grounds for immediate and permanent removal from the job site.
- All safety devices incorporated in the tool by the manufacturer shall be used at all times. A sign, minimum 8-in. x 10-in. with 1-in. letters, stating "Powder Actuated Tool in Use" or equivalent shall be posted by the Contractor in area of use. (ANSI A10.3)
- Piston Tool — A Low Velocity type utilizing a piston activated by the power of a blank cartridge furnished by the Tool Manufacturer to drive a stud, pin, or fastener into a work surface.
- Powder Assisted Hammer Drive Tool — A Low Velocity type utilizing a captive piston activated by a blow from a 4 lb. hammer supplemented by the power of a blank cartridge furnished by the Tool Manufacturer to drive a stud, pin, or fastener into a work surface.
- All used and unspent cartridges shall be properly disposed of per manufacturer's recommendations.

A.19 Personal Protective Equipment

A.19.1 Scope and Application

Each individual subcontractor is responsible for issuing the proper personal protective devices to their Contractors. Federal, state, and local safety rules shall be checked regarding the use of such equipment. Where available, use equipment approved by a nationally recognized testing laboratory. Used personal protective equipment shall never be given to an employee without having been cleaned and sterilized.

A.19.2 Requirements

PPE requirements shall be posted at the main entrance to the job site.

A.19.3 Head Protection

All subcontractors and visitors shall wear hardhats 100% of the time while on the job site. Impact-resistant hardhats provide protection only when the inside Web suspension is intact and is adjusted to correct head size with proper crown clearance. No "soft top" welding shall be permitted.

A.19.4 Eye Protection

All subcontractors and visitors shall wear eye protection 100% of the time while on the job site.

Eye protection with side shields and/or one-piece goggles are required to be worn by all subcontractors and visitors while on the construction job site.

All subcontractors involved in pumping or pouring of concrete shall provide their employees at the point of discharge with a wire mesh face screen along with the required use of safety glasses to prevent caustic burns to the face.

Cup type chipper goggles shall be used by workers in heavy breaking or drilling.

Face shields shall be worn for protection from flying particles produced by light drilling, breaking, chipping, and power saws, and are particularly effective for subcontractors who wear corrective glasses. Adapters for use with hard hats or caps are required. Shaded spectacle glasses or shaded face shields shall be worn by subcontractors engaged in oxy-acetylene burning and welding by subcontractors engaged as electric welders' helpers. Shade 7, 8, 9 or darker is required.

All subcontractors engaged in electric or arc welding shall use welding masks and hoods. Subcontractors shall consult suppliers for the exact shade to match the amperage tube used.

A.19.5 Respiratory Protection

Subcontractor employees exposed to dust, fumes, and/or gases shall provide proper respiratory protection designed to protect against the particular substance encountered. The subcontractor is solely responsible for the proper fit testing, training, and maintenance per Cal/OSHA and Federal OSHA standards, and to provide the appropriate equipment.

All training documentation must be provided to LBNL Management, prior to start of work.

A.19.6 Hand Protection

Various types of gloves are made to protect hands against particular hazards, i.e., rubber gloves to handle alkalis and other chemicals; leather gloves to handle rough items as reinforcing steel, lumber, masonry, etc.; and special leather gloves to protect against welding heat sparks and slag. Their use is required as appropriate.

All subcontractor employees working with metal studs, sheet metal, metal decking, ceiling grid, and cleanup or housekeeping activities will be required to wear cut-resistant gloves.

A.19.7 Foot Protection

Subcontractors shall wear foot guards when working with soil tampers or where falling objects could be dropped on one's shoes. Thin sheet steel insoles are available to protect against nail punctures during stripping operations.

All personnel will wear sturdy work boots with durable sidewalls, toes, and soles. Soft shoes or sneakers are not permitted. Visitors shall wear appropriate sturdy shoes or be kept out of the construction area. Metatarsal guards will be required when chipping concrete or asphalt.

A.19.8 Body Protection

All personnel shall wear shirts and long trousers to protect against the elements and work-site hazards. No sleeveless shirts, tank tops, mesh shirts, short, or sweatpants will be permitted. Sleeves shall extend a minimum of 4 inches from the top of the shoulder.

Special clothing is required when working in very hot, cold, or wet workplaces, or when working with some chemicals, such as alkalis. Subcontractors are responsible to provide their employees with the proper clothing in these situations.

A.19.9 Special Protective Equipment

All subcontractors working in certain operations (chemical work, etc.) shall be provided and wear the specialized protection equipment designed for that particular operation. (Wood-soled shoes, non-sparking tools, chemical goggles, etc.) The MSDS shall be consulted regarding protective equipment required.

A.20 Protection of Openings and Open Side Floors and Decks

A.20.1 Scope and Application

Falls of workers from, and workers struck by materials falling from, floors and decks of structures during construction are not frequent, but are usually severe. The object of this section is to present the common methods of worker protection in these two loss areas.

Frequently, railings and covers are moved in order for material to be hoisted or to perform other work and then replaced. In either case, procedures and designs to facilitate swift and safe removal and replacement shall 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.

The use of metal banding or chains (except when furnished by the manufacturer of the equipment) is prohibited as perimeter or other fall protection.

A.20.2 Floor and Roof Opening/Covers

Floor and roof openings shall be protected by a standard railing or cover. All "skylights" shall be protected in the same manner.

Covers shall support without failure at least twice the weight of the subcontractors, equipment, and materials that may be imposed on the cover at any one time.

All covers shall be secured so as to prevent displacement.

All covers shall be color coded or marked with the words "hole" or "cover."

A.20.3 Standard Railing

Railings shall be constructed of wood, as follows, or in an equally substantial manner from other materials, and shall consist of a top rail not less than 42 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 a mid-rail.

The mid-rail shall be halfway between the top rail and the floor, platform, runway or ramp. "Selected lumber," free from damage that affects its strength, shall be used for railings constructed of wood.

A standard toe board shall be 4 inches (nominal) minimum in vertical height from its top edge to the level of the floor, platform, runway, or ramp. It shall be securely fastened in place and have not more than 1/4-inch clearance above floor level. It may be made of any substantial material, either solid, or with openings not over one inch in greatest dimension. Toe boards shall be provided on all open sides and ends of railed scaffolds at locations where persons are required to work or pass under the scaffold and at all interior floor, roof, and shaft openings.

Toe boards shall 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 shall be at least 2" x 4" stock spaced not more than 8 feet apart. The top rail shall be of 2" x 4" stock, and the intermediate rail shall be at least a one by six-inch board. No double-headed nails are to be used in the construction of these railings.

When wire rope is used for guardrails, the cables shall be 3/8-inch minimum diameter wire rope of 13,500 pounds minimum breaking strength.

Posts shall not be more than 6 feet on center. For cable safety railings, cables shall 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 AN ENGINEER AND APPROVED BY AN LBNL STRUCTURAL ENGINEER.

A.20.4 Rebar Protection

During the construction of reinforced concrete buildings, subcontractors erect forms or perform other duties over exposed vertical or upturned reinforcing bars, bolts, or other protrusions (i.e., conduits/pipes). Serious injuries and deaths have resulted from falls on these protrusions. Also, floor slab reinforcing that extends beyond a section of slab in place can be an Incident.

Subcontractors are not permitted to work above vertical protruding reinforcing steel unless it has been protected to eliminate the hazard of impalement.

Several approved methods to protect against this hazard are:

- Empty steel drums placed over the dowels until the column reinforcing is placed. The drums are then moved forward as the work progresses.
- Shallow boxes made from scrap lumber used in the same manner as No. 1 above.
- Plank covers for rows of bond bars.
- 4" x 4" x 4" wood blocks drilled to bar size and used as No. 4 above.
- Troughs or continuous 2"x4" wood rail secured to avoid displacement.
- Cal/OSHA approved, steel-lined, flat-head rebar caps.

Wire mesh or reinforcing bars extending beyond a section of slab in place shall be bent down and secured to eliminate a tripping hazard. Otherwise, subcontractors shall be prohibited from walking over the area.

A.20.5 Safety Signs and Banners

Warning, Danger, No Trespassing and other signs, correctly posted, help to protect the public and subcontractor employees from incidents.

Proper signs shall be posted and maintained in good condition wherever hazardous conditions exist by the subcontractor. A sufficient supply of the necessary signs shall be kept on hand for replacement and to cover new hazards as they develop. Additional posting requirements to be completed by the subcontractors are found in the Federal Occupational Safety and Health Act, Construction Standards. Such requirements include but are not limited to posting for lasers, powdered actuated tools, and overhead hazards. (Reference: OSHA 1926.200).

A.21 Scaffolding

A.21.1 Scope and Application

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 shall have the wheels locked while the scaffold is in use.
- Tubular welded rolling scaffolds require a horizontal/diagonal brace.
- All rolling scaffolds shall be fully planked while in use and guardrails with toe boards in place when the scaffold reaches a height of 6 feet.
- Baker-style scaffolds shall 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 shall be provided for all scaffolds.
- Cross bracing does not take the place of a guardrail.
- End rails shall be part of the guardrail system on all scaffolds.
- Scaffolds shall 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 shall be secured to a firm anchorage point separate from the scaffold anchorage.
- Scaffolds higher than four times its least base dimension shall be tied off to a structure or use outriggers.
- Scaffolds shall be constructed on a firm, stable base. If scaffolds shall be constructed on soft ground proper mudsills shall be used.
- Never erect a scaffold without a base using screw jacks and sole plate. Never put an open pipe end directly on concrete, a wood support, asphalt paving or soil, as it may shift during use.
- Fall protection shall be provided at all heights above 6 feet regardless of the type of scaffold.
- Whoever removes a guardrail is responsible to replace it; if they do not, they are subject to removal from the project.

A.21.2 Requirements for Fall Protection

- During scaffold erection and dismantling, the designated competent person overseeing the operation shall determine the feasibility of positive fall protection. If it is deemed that positive fall protection is infeasible, the competent person shall 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 LBNL Project management for review prior to commencing the operation.

A.22 Spray-On Fireproofing

A.22.1 Scope and Application

Spray-on Fireproofing Operations can create a number of safety, health, and environmental hazards if not carefully managed.

The hazards from over spray and fallout of spray-on fireproofing may be further aggravated by blowing wind.

The following shall be required to keep potential hazards to a minimum:

- Subcontractors who spray and mix fireproofing material shall wear NIOSH approved respirators for toxic dusts.
- Other trades shall be kept out of the areas being sprayed.
- Floors shall be cleaned of spray fallout as it accumulates and this placed in bags or in closed containers by the subcontractor.

When fireproofing is completed in an area or on a floor, the material shall be completely removed from the floor before the over spray protection is removed.

All fireproofing material that has collected on or in the over spray protection shall be completely removed as the protection is removed. No material shall be allowed to fall outside of the building or left on the floor.

Dust created by dumping dried bagged material into the mixer shall be controlled.

Empty bags shall be neatly stacked and tied. No dried material shall be allowed to contaminate the area.

To contain over spray, exteriors shall be enclosed. To avoid disturbing fireproofing on exterior columns and spandrel beams, considerable care shall be taken when removing protection. It is recommended that plastic tarpaulins be used, as the spray fireproofing will not stick to this material.

Special care shall be taken to minimize over spray from the cementations spray-on fireproofing on floors and platforms to avoid causing exceedingly slippery conditions. The subcontractor is solely responsible to keep the spray on fireproofing work area cleaned up on a continuous daily basis.

A.23 Traffic Control

A.23.1 Scope and Application

When operations are such that signs, signals, and barricades do not provide the necessary protection on or adjacent to a highway or street, flagmen, or other appropriate traffic controls shall be provided by the subcontractor completing the operation.

Signaling directions by flagmen shall conform to American National Institute D6.1-I971.

Hand signaling by flagmen shall be by use of red flags at least 18 inches square or sign paddles, and in periods of darkness, red lights. Flagmen shall be provided with and shall wear a red or

orange warning garment while flagging. Warning garments worn at night shall be reflective material.

All subcontractors receiving materials are solely responsible for the traffic control during the unloading processes and shall provide the necessary personnel to complete such tasks. All efforts shall be made to ensure trucks with materials are unloaded on site.

A.24 Permits

24.1 Scope and Application

Permits are required for the activities listed below and must be obtained prior to start of work. Permits must be posted conspicuously at the work site.

A.24.2 Fire Safety Permit

All hot work requiring the use of open flames, heat-producing, or spark-producing equipment requires a Fire Safety Permit from the LBNL Fire Department. Upon request for a Fire Safety Permit, the Fire Department's representative will meet the requester at the work location and discuss precautions to be taken, including the placement of fire extinguishers or a fire watch.

Construction subcontractors may request a Fire Safety Permit directly from the Fire Department or through the Project Manager.

A.24.3 Dig Permit to Penetrate Ground or Existing Concrete Surfaces

All work that will require excavation, drilling, or driving of stakes or poles into the ground requires a permit. A permit is also required to penetrate 1-1/2 inches or deeper into existing concrete surfaces such as floor slabs, walls, beams, or columns.

The permit is issued by the LBNL Utilities Engineer. Subcontractors may obtain the permit through the project Manager.

A.24.4 Confined Space Permit

A permit is required before entering a confined space. Regulations for entering a confined space can be found in LBNL's [Confined Space Entry Program](#). Subcontractors may issue their own permits, provided their procedure for entering a confined space has been previously approved by the LBNL Construction Safety Engineer.

A.25 Forklift Trucks

A.25.1 General Safety Practices

Users must familiarize themselves with and comply with OSHA Standard 29 CFR 1910.178. This standard is summarized as follows:

- Modifications and additions must not be performed by the customer or user without the manufacturer's prior authorization or without a qualified engineering analysis. Where

such authorization is granted, capacity, operation, and maintenance instruction plates, tags, or decals must be changed accordingly. Note: Prior to modifications or additions, the Facilities Department and EH&S shall be contacted for approval.

- 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.
- The user must see that all nameplates, caution markings, and instruction markings are in place and legible.
- The user must consider that changes in load dimension may affect truck capacities.

A.25.2 Fire Safety

Users must familiarize themselves with and comply with NFPA No. 30-1969. NFPA standards specify certain hazardous locations, Class I through Class III, in which various types of trucks should not be used unless they comply with NFPA requirements.

- Precautions must be taken to prevent emissions and hazardous sparks when flammable materials are present.
- All forklift trucks must carry fire extinguishers, usually 1.1 kg (2-1/2 lb) ABC, regardless of their location classification.
- Repairs or refueling of gasoline and liquefied petroleum gas (LPG) trucks shall be done according to NFPA standards to avoid health hazards, burns, and explosions.
- Only authorized fuel and fuel tank equipment are to be used in gasoline and liquefied petroleum gas trucks.

A.25.3 Licensing and Certification

All persons operating forklifts at the Laboratory are required to carry a valid Forklift Operator Certification.