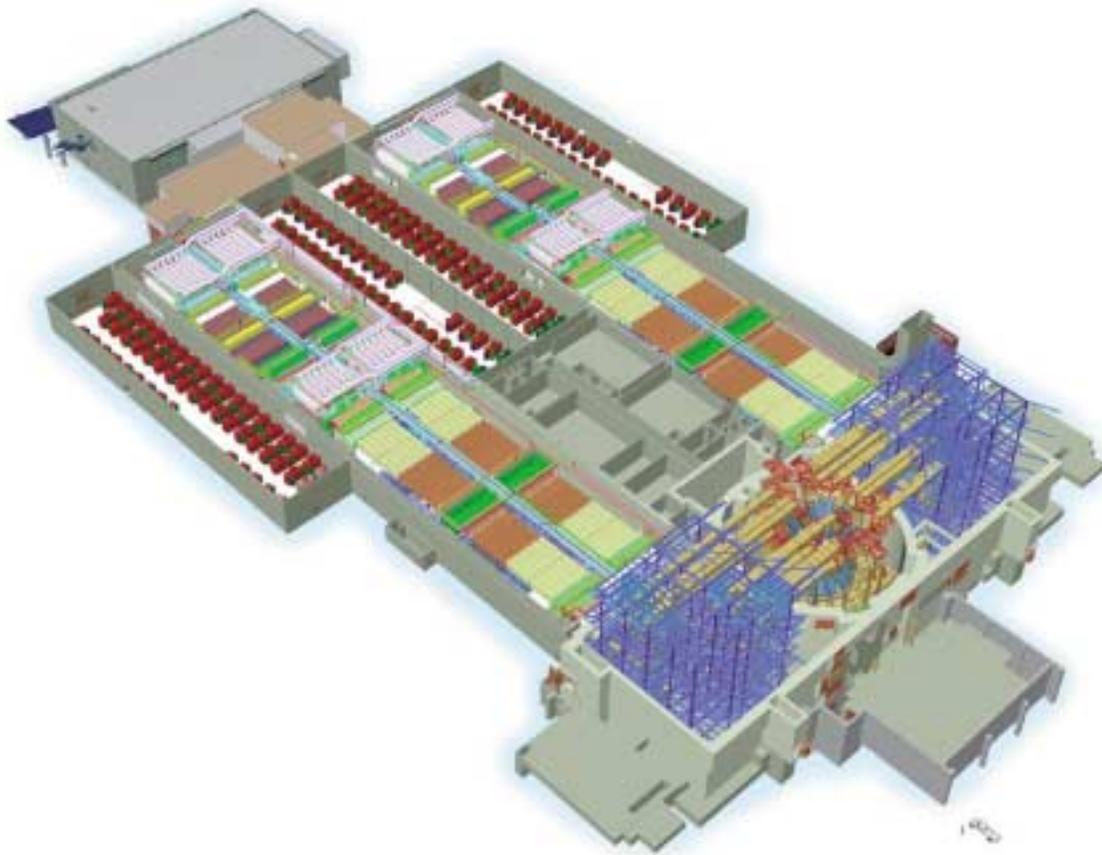


Construction Safety Program for the National Ignition Facility

Appendix A

September 1, 2000



DISCLAIMER

This document was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor the University of California nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or the University of California. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or the University of California, and shall not be used for advertising or product endorsement purposes.

This work was performed under the auspices of the U. S. Department of Energy by the University of California, Lawrence Livermore National Laboratory under Contract No. W-7405-Eng-48.

This report has been reproduced directly from the best available copy.

Available electronically at <http://www.doc.gov/bridge>

Available for a processing fee to U.S. Department of Energy
And its contractors in paper from
U.S. Department of Energy
Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, TN 37831-0062
Telephone: (865) 576-8401
Facsimile: (865) 576-5728
E-mail: reports@adonis.osti.gov

Available for the sale to the public from
U.S. Department of Commerce
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
Telephone: (800) 553-6847
Facsimile: (703) 605-6900
E-mail: orders@ntis.fedworld.gov
Online ordering: <http://www.ntis.gov/ordering.htm>

OR

Lawrence Livermore National Laboratory
Technical Information Department's Digital Library
<http://www.llnl.gov/tid/Library.html>

Construction Safety Program for the National Ignition Facility

Appendix A

Robert Predmore

September 1, 2000

Contents

1. General Rules and NIF Code of Safe Practices.....	A-1
2. Personal Protective Equipment	A-9
3. Hazardous Material Control.....	A-12
4. Traffic Control	A-22
5. Fire Prevention	A-24
6. Sanitation and First Aid.....	A-28
7. Confined Space Safety Requirements.....	A-30
8. Powered Industrial Truck Safety	A-33
9. Ladders and Stairways.....	A-38
10. Scaffolding Safety	A-40
11. Machinery, Vehicles, and Heavy Equipment.....	A-43
12. Welding and Cutting—General	A-46
13. ARC Welding	A-47
14. Oxygen/Fuel Gas Welding and Cutting.....	A-48
15. Excavation, Trenching, and Shoring.....	A-50
16. Fall Protection.....	A-55
17. Steel Erection and Installation of Decking, Flooring, and Grating	A-58
18. Working with Asbestos.....	A-60
19. Radiation Safety	A-61
20. Hand Tools.....	A-64
21. Electrical Safety.....	A-65
22. Nonelectrical Work Performed near Exposed High-Voltage Power-Distribution Equipment	A-70
23. Aerial Lifts and Self-Propelled Elevating Work Platforms	A-72
24. Lockout/Tag Requirements.....	A-76
25. Rigging	A-82
26. Cranes.....	A-85
27. Housekeeping.....	A-94
28. Material Handling and Storage.....	A-95
29. Lead.....	A-96
30. Concrete and Masonry Construction.....	A-97
31. Lasers	A-99
32. Pressure Safety	A-101
33. Permits and Authorizations.....	A-106

1. General Rules and NIF Code of Safe Practices

These rules apply to all National Ignition Facility (NIF) workers (workers), which include Lawrence Livermore National Laboratory (LLNL) employees, non-LLNL employees (including contract labor, supplemental labor, vendors, personnel matrixed/assigned from other national laboratories, participating guests, visitors and students) and contractors/subcontractors. The General Rules and NIF Code of Safe Practices shall be used by management to promote the prevention of incidents through indoctrination, safety and health training, and on-the-job application.

As a condition for contract award, all employers shall conduct an orientation for all newly hired and rehired employees before those workers will be permitted to start work on this facility. This orientation shall include a discussion of the following information.

The General Rules and NIF Code of Safe Practices must be posted at a conspicuous location at the job site office or be provided to each supervisory worker who shall have it readily available. Copies of the General Rules and NIF Code of Safe Practices can also be included in employee safety pamphlets.

The Environmental, Safety, and Health (ES&H) rules at the NIF site are based upon compliance with Department of Energy (DOE), LLNL, Federal Occupational Safety and Health Administration (OSHA), California (Cal)/OSHA, and federal and state environmental requirements.

Responsibilities

1. All workers shall comply with the ES&H requirements of their own parent organization, this NIF Construction Safety Program, and all health and safety plans generated by the Construction Manager.
2. All workers must certify on Form S & H A-1 that they have read and understood, or have been briefed and understood, the NIF Project General Rules and NIF Code of Safe Practices. (An interpreter must brief those workers who do not speak or read English fluently.)

Exceptions to the Requirements in Appendix A

Requests for exceptions/modifications to NIF ES&H requirements will only be approved if equivalent safety or environmental protection is demonstrated and regulatory requirements are met. Approvals shall be issued in writing by the cognizant manager (or Beampath Infrastructure System [BIS] Associate Project Manager) with concurrences from the NIF Assurance Manager, NIF Safety Coordinator, and the ES&H Team 2 Leader.

NIF Code of Safe Practices

General

1. All workers shall comply with this NIF Code of Safe Practices, assist all other workers in doing so, and report all dangerous conditions or practices immediately to their supervisors.
2. Supervisors shall insist on workers observing and obeying every rule, regulation, and order as is necessary to the safe conduct of the work, and shall take such action as is necessary to obtain observance.
3. Think Safety! If you have and maintain an attitude of safety on the job, then the chances of being injured are very greatly reduced. Report all unsafe or unhealthful practices and conditions to your supervisor at once.
4. All injuries shall be reported promptly to the foreman or supervisor so that arrangements can be made for medical or first aid treatment.
5. When injuries occur, the first step is always to provide medical care for the injured and eliminate immediately any apparent cause of the injury. If a cause is not apparent, the work area and equipment shall be secured until the cause is determined by qualified authorities.
6. All workers shall be given frequent instructions about how to prevent incidents. Instructions shall be given at a 5-minute (or more) safety meeting at the beginning of each shift, and at a weekly safety meeting.
7. It is a part of every worker's job to attend and take an active part in all safety training meetings and to actively support the company's safety program. Read and abide by all safety materials made available to you. They concern your safety and health and the safety and health of your fellow workers.
8. No one shall knowingly be permitted to work while his/her ability or alertness is impaired by illness, fatigue, medication, or other causes.
9. Reporting to work under the influence of alcohol, stimulants, tranquilizers, or barbiturates--or using them during working hours--will be cause for arrest and permanent removal from the LLNL work site and grounds for disciplinary or legal action if warranted.
10. Horseplay, scuffling, and other acts which tend to have an adverse influence on the safety or well-being of the workers shall be prohibited.
11. Work shall be well planned and supervised to prevent injuries in the handling of materials and in working together with equipment.
12. Workers shall not handle, or tamper with electrical equipment, machinery, vehicles, or air and water lines in a manner outside of the scope of their regular duty except with specific instructions from their supervisors.
13. Workers shall not enter manholes, underground vaults, chambers, tanks, silos, trenches, ditches, or any other subsurface area, or confined spaces without specific instructions from their supervisors, and it has been determined safe to enter.

14. Always be as familiar as possible and alert at all times to conditions and work processes in surrounding areas and with the presence of other workers and equipment so that you can foresee and avoid possible dangers.
15. “Roped off areas” or areas enclosed with barricades are considered danger zones and shall be respected as such. Admittance to or passage through such areas is prohibited without permission except to those employees working within the barricaded area.
16. When work requires barricades or floor opening covers to be temporarily removed, keep area secured until the work is finished and then reinstall the barricade or floor covering immediately.
17. Be Sure.
 - i. You know how to do the job in a correct, safe manner.
 - ii. You know the hazards and how to protect yourself.
 - iii. You ask the advice of your supervisor if you are not sure.
18. Firearms and explosives are prohibited within the NIF OCIP project areas, or on equipment and other facilities.
19. Do not try to place speed above safety. An efficient, safe worker is better than a speedy, careless one.
20. Throwing or dropping materials from one area or level to another is prohibited unless every precaution is taken to eliminate the possibility of damaging equipment or injuring persons.
21. Be alert for and heed all warning signs at all times.
22. When lifting heavy objects, the large muscles of the leg instead of the smaller muscles of the back shall be used. Get help on lifting all objects too heavy for one person.
23. Hard hats, safety glasses with sideshields, and sturdy work shoes or boots shall be worn at all times. Inappropriate footwear or shoes with thin or badly worn soles shall not be worn. Other personal protective equipment such as gloves, goggles, respirators shall be worn when conditions require them for safety.
24. Observe good housekeeping. Keep work areas clear of debris and trash. Stack lumber and materials safely. Remove or bend nails from lumber, forms, etc.
25. Do not work or pass beneath suspended loads.
26. Only trained, qualified, and authorized persons shall install wiring or perform work or repairs on electrical equipment.
27. Excavations and trenches over 5 feet deep must be shored, sloped back, benched, or a trench shield used to prevent cave-ins. A Competent Person must evaluate all excavations and trenches each day. Ladders are to be provided within 25 feet of workers in excavations and trenches 4 feet or deeper.
28. Work shall be so arranged that employees are able to face ladders and use both hands while climbing. Defective ladders shall not be used. Do not stand or sit

- on or above the top step or top cap. Extend ladders at least three feet above the walking surface. Secure ladders to prevent unintended movement.
29. No burning, welding, or other source of ignition shall be applied to any enclosed tank or vessel, even if there are some openings, until it has first been determined that no possibility of explosion exists, and authority for the work is obtained from the foreman or superintendent.
 30. Any damage to scaffolds, falsework, or other supporting structures shall be immediately reported to the foreman and repaired before use.
 31. Open sided floors, wall openings, floor holes, platforms, etc., more than 6 feet above the ground or floor must have standard guardrails or be covered.
 32. Make sure handrails and walkways are in good repair and clear of tools, spare parts, and obstructions.
 33. Workers exposed to fall hazards 6 feet or greater must be protected by a means of fall protection such as guardrails, nets, or personal fall arrest equipment such as a full body harness and shock absorbing.
 34. All equipment shall be locked out and tagged to protect against unintended or inadvertent operation when such operation could cause injury to personnel.
 35. Safe access shall be provided and maintained to all work areas.

Hazardous Materials

1. Material Safety Data Sheets (MSDS) are available through your supervisor for all chemicals, flammables, solvents, paints, and other hazardous products used on the project.
2. Label/mark all containers of flammable, combustible, hazardous, and toxic materials.
3. If workers observe sandblasting dust, asbestos fibers, smoke, or other possibly dangerous pollutants in the air of a work space, they shall contact their supervisors for instructions.
4. Workers shall cleanse thoroughly after handling hazardous substances, and follow special instructions from authorized sources.
5. No smoking when handling flammable materials.
6. Store flammable and combustible liquids away from other combustible materials, or in special, flammable liquid storage lockers.
7. Gasoline shall not be used for cleaning purposes.
8. Smoking is prohibited at or in the vicinity of hazardous operations or combustible or flammable materials.

Use of Tools and Equipment

1. All tools and equipment shall be maintained in good condition.
2. Damaged tools or equipment shall be removed from service and tagged "DEFECTIVE."
3. No guard, safety device, or appliance shall be removed from tools, machinery, or equipment except for the purpose of making repairs. Such removal shall only be done by persons qualified to make the repair, and they shall first disconnect any power source and have the tool, machinery, or equipment in a safe area. All guards and other protective devices shall be in their proper places and adjusted. Workers shall report promptly all deficiencies to their supervisor.
4. Pipe or Stillson wrenches shall not be used as a substitute for other wrenches.
5. Only appropriate tools shall be used for the job.
6. Wrenches shall not be altered by the addition of handle-extensions or "cheaters."
7. Files shall be equipped with handles and not used to punch or pry.
8. A screwdriver shall not be used as a chisel.
9. Wheelbarrows shall not be pushed with handles in an upright position.
10. Portable electric tools shall not be lifted or lowered by means of the power cord. Ropes shall be used.
11. Electric cords shall not be exposed to damage from vehicles.
12. Ground-Fault Circuit Interrupters (GFCI) are required on all temporary power circuits.
13. In locations where the use of a portable power tool is difficult, the tool shall be supported by means of a rope or similar support of adequate strength.
14. Compressed air shall not exceed 30 psi for cleaning purposes. Do not use pure oxygen for cleaning, especially on oily clothing!

Machinery and Vehicles

1. Only authorized persons shall operate machinery or equipment.
2. Loose or frayed clothing, or long hair, dangling ties, finger rings, etc., shall not be worn around moving machinery or other sources of entanglement.
3. Machinery shall not be serviced, repaired or adjusted while in operation, nor shall oiling of moving parts be attempted, except on equipment that is designed or fitted with safeguards to protect the person performing the work.
4. Engines shall be turned off before fueling.
5. Where appropriate, lockout procedures shall be used.

6. Workers shall not work under vehicles supported by jacks or chain hoists, without protective blocking that will prevent injury if jacks or hoists should fail.
7. Air hoses shall not be disconnected at compressors until hose line has been bled.
8. All excavations shall be visually inspected before backfilling, to ensure that it is safe to backfill.
9. Excavating equipment shall not be operated near tops of cuts, banks, and cliffs if employees are working below.
10. Tractors, bulldozers, scrapers and carryalls shall not operate where there is possibility of overturning in dangerous areas like edges of deep fills, cut banks, and steep slopes.
11. When loading where there is a probability of dangerous slides or movement of material, the wheels or treads of loading equipment, other than that riding on rails, should be turned in the direction which will facilitate escape in case of danger, except in a situation where this position of the wheels or treads would cause a greater operational hazard.
12. Crowding or pushing when boarding or leaving any vehicle or other conveyance shall be prohibited.
13. Always look around equipment before starting to make sure no one is near moving parts, making inspections or adjustments.
14. Stand clear of hauling equipment that is being loaded or is dumping material.
15. Do not touch or guide moving cables or running wires with any part of your body. Keep your hands and fingers away from blocks and sheaves. Stand clear of all cables, wires, and lines that are under strain.

Roofing Operations

1. Knotted hand lines should not be used.
2. Roofers tending kettles, or carrying buckets of hot tar, shall wear gloves that fit snugly at the wrists, and long sleeved shirts fastened at the wrists.
3. At no time should a roofer, while handling or exposed to injury from hot tar, work without a shirt or appropriate footwear.
4. Appropriate portable fire extinguishers shall be kept at or near the kettle, attached, if practicable, to the tongue of the kettle, away from the danger zone.
5. Kettle covers should be equipped with a handle that projects at least fourteen inches (14") away from the surface of the cover or lid.
6. Kettle covers shall be closed and latched when in transit and the kettle should be slop-proof when cover is closed.
7. When parked, means shall be provided to prevent inadvertent movement of the kettle.

8. Ladders should be used with great caution, and roof gutters should not be depended upon for support.
9. Workers handling buckets of hot tar should not carry anything that will interfere with the safety of this operation.
10. The gallows frame shall be securely anchored before hoisting materials.
11. Only muscular power shall be used to hoist materials by means of a gallows frame. A winch or power hoist shall not be used.

NIF PROJECT

FORM S+H A-1—SAFETY RULES TRAINING, ORIENTATION, AND DOCUMENTATION

I, _____ hereby acknowledge that I have received training and understand the National Ignition Facility OCIP Construction Safety Rules.

EMPLOYEE SIGNATURE

DATE

INSTRUCTOR

DATE

2. Personal Protective Equipment

It is the responsibility of supervisors and foremen to provide all workers with directions about employer-provided and worker-provided protective equipment necessary for each operation. Personal protective equipment shall be worn as required. The requirements set forth herein pertaining to personal protective equipment shall apply at all locations, whether permanent or temporary. It is the employer's responsibility to provide personal protective equipment to its employees, and to ensure proper use wherever necessary.

Personal protective equipment shall be used to reduce the potential for injuries or detrimental effects on health, which are not controllable by engineering or administrative means, to all employees. The use of personal protective equipment for protection from identified hazards is mandatory under the following conditions:

1. Where required by law, NIF, or LLNL policy.
2. Where exposure to the hazard has the potential for injury or illness to an employee.
3. Where there is a potential for damage or contamination to property or the environment.
4. Where the failure to utilize the equipment would expose nonemployees to a safety or health hazard.

The mandatory use of personal protective equipment will apply to all visitors in areas where use of such equipment is required.

Responsibilities

1. All NIF workers shall use the protective equipment prescribed by the regulatory authorities, such as Federal OSHA and employers' rules and regulations to control or eliminate any hazard or other exposure to illness or injury. Any employee who willfully refuses to use the prescribed protective equipment designed to protect him or her or willfully damages such equipment shall be subject to disciplinary action which may lead to his or her immediate termination. As necessary, each employer shall provide personal protective equipment to their employees.

Basic NIF PPE Requirements

1. Ear Plugs or Muffs. The use of **hearing protection is mandatory** where workplace daily noise levels exist with the possibility that employees receive exposure in excess of the allowable noise. The hearing protection devices chosen for use must conform to all applicable federal, state, and local safety and health regulations.

2. Eye Wear, Goggles, Safety Glasses, Face Shield, and Helmets. This could include, but not be limited to, grinding, chipping, sanding, sandblasting, or use of chemicals. Safety glasses with sideshields or face shields must conform to the American National Standards Institute (ANSI), Standard for Occupational and Educational Eye and Face Protection, Z87.1. Welding shields, with no less than #10 filter plate and safety lenses on both sides, shall be worn by personnel doing welding. Burning goggles, with no less than #4 filter plate and safety lenses on both sides, shall be worn by personnel doing flame cutting. Face shields are required during activities such as grinding, cad welding, chain sawing, chipping, or handling corrosive liquids or molten materials. Face shields protect only the face and do not meet the requirements for eye protection; therefore, safety glasses are required with face shields.

Eye protection shall be worn at all times, except in administrative areas. Approved welding helmets and appropriate protective eye wear is required on-site by all contractors during machinery activities which require appropriate protection.

3. Hard hats are required in all construction areas. Hard hats shall be worn at all times in construction areas, except in administrative areas. The head protection devices shall meet the specifications contained in the American National Standards Institute, Z89.1, Requirements for Industrial Head Protection.

Hard hats for the protection of employees exposed to high-voltage electrical shock and burns shall meet the specification contained in American National Standards Institute, Z89.2. All employees and visitors must wear company approved hard hats during work hours while inside construction areas.

4. Respirators. When it is determined that effective engineering control of oxygen deficiency or air contaminant exposure is not feasible, appropriate respiratory protection will be provided for use by the exposed employees. Use will be mandatory whenever a potential respiratory hazard exists.

The selection, use, and maintenance of respirators shall comply with all applicable state/federal, ANSI Z88.2 and local laws pertaining to safety and health. Approved respirators (MSHA) will be used when excessive dusts, mists, fumes, gases or other atmospheric impurities are determined to be harmful to health. Contractors are responsible to provide a written respiratory protection program if respirators are used on-site.

5. Safety Harnesses and Lifelines. Full body safety harnesses will be used by all employees working from unguarded surfaces where falls to a different level GREATER THAN SIX (6) FEET present a hazard. Safety Belts will not be allowed (except when used as part of a positioning device system, or where allowed by OSHA, e.g., linemen's body belts); only the use of a full body harness and shock absorbing lanyard will be acceptable. The project is a 100% tie off project, requiring the use of two lanyards when exposed to a fall greater than six(6) feet.
6. Footwear. All employees working in construction areas should wear sturdy work shoes or boots. In areas where there is danger of falling objects, hard toe safety boots or shoes shall be worn.

7. Gloves. Strong nonslip gloves are recommended for all workers, except when wearing them could create greater risks
8. Dress Code. Employees working in construction areas are required to wear clothing for the appropriate season. Shirts shall have a minimum of 4" sleeves. Tank tops and sleeveless shirts are not allowed. Pants should be long enough to cover the top of appropriate foot wear. Winter clothing should be sufficient to protect against cold related injuries, i.e., hypothermia and frostbite.
9. Special Equipment. As heretofore stated, the use of personal protective equipment will be deem mandatory when the hazard cannot be controlled at the source. This shall apply to the use of special protective equipment such as gloves, aprons, sleeves, shoes, hoods, and boots. When it has been determined through the site management, statistical analysis, or compliance requirements that the use of special protective equipment is needed to provide the hazard control, this mandatory use requirement shall apply.

3. Hazardous Material Control

These rules apply to all workers and vendors, including employees with supervisory and nonsupervisory assignments. The General Safety and Health rules shall be used by management to promote the prevention of unintended incidents through indoctrination, safety and health training and on-the-job application.

Responsibilities

1. Health Hazard Communication Plan

A written plan for compliance with state and federal worker right-to-know laws is a requirement to be submitted by the contractor to the NIF Project Manager for approval. This plan shall include specific safety responsibilities for all levels of management and for the worker.

2. All workers must certify on Form S+H A-2, that they have read and understood, or have been briefed and understood, the NIF rules on hazard communication. (An interpreter must brief those workers who do not speak or read English fluently.)

3. Identification

Chemicals, paints, solvents, adhesives, etc. may be used in the course of construction. An inventory of all potentially hazardous materials shall be available on site in the construction office, along with a MSDS for each material. These shall be available at all times to employees, LLNL inspectors, and other persons affected by the materials (e.g., other subcontractors on the same job site).

All containers shall be labeled describing the product's identity, its hazards, and first-aid procedures to follow in the event of an emergency.

4. Worker Notification

Before using any hazardous material, each worker shall be aware of the requirements of this section and be trained in the proper use, disposal, and special handling procedures to be followed for each material (e.g., when respirators are to be worn).

5. Handling

While handling hazardous chemicals or solvents, employees shall follow directions and comply with any warnings or cautions affixed to the labels. Any questions concerning the use of such chemicals and personal protective equipment shall be directed to the supervisor.

6. Disposal

The subcontractor is responsible for proper disposal, in accordance with Federal, State, and Local regulations, of chemical and hazardous waste generated by the subcontractor in the performance of this subcontract. Preexisting hazardous

material removed and discarded as waste by the subcontractor in the performance of this subcontract shall be disposed of by LLNL.

Hazard Material & Waste Management Guidelines for NIF

I. Hazard Communication

The Hazard Communication Standard (HCS) as mandated by OSHA is contained in 29CFR1910.1200. As outlined within the Standard, employers are responsible for evaluating hazards of all chemicals, and transmitting information concerning the hazards to affected employees. Information is transmitted by means of a Hazard Communication Program. The Hazard Communication Program shall contain the following elements:

A. Hazard Communication Program Guidelines

1. Written Hazard Communication Program

Employers must develop, implement, and maintain at the workplace a Hazard Communication Program to describe how the following elements will be met. In addition, the following must be included:

- a. A list of the hazardous chemicals known (or suspected) to be present at the site, with reference to the MSDS.
- b. Methods to be used to inform employees of the hazards of nonroutine tasks.

NOTE: Employers who produce, use or store hazardous chemicals in such a way that the employees of other contractors may be exposed shall additionally ensure that the Hazard Communication Program developed includes the following:

- a. MSDS sheet copies to the Construction Management central file. This method will be utilized to provide the other contractors with the necessary information from the MSDS;
 - b. Method to be used to inform employees of steps to be taken to protect employees during normal operations and in foreseeable emergencies; and,
 - c. Methods to be used to inform the other employees of the labeling system used in the workplace.
- ##### **2. Labels and Other Forms of Warning**

The Employer shall ensure that each container of hazardous chemicals in the workplace is labeled, tagged or marked with the identity of the hazardous chemical(s) and appropriate hazard warnings.

3. Material Safety Data Sheets (MSDS)

Employers must maintain a MSDS for each hazardous chemical they use. Additional responsibilities for MSDSs include:

- a. Maintain copies of the MSDSs for each hazardous chemical in the workplace, and ensure that they are readily accessible to employees in their work area; and,
- b. The MSDSs may be kept at a central location as long as employees can immediately obtain the required information in an emergency.

4. Employee Information & Training

Employers must provide employees with information and training on hazardous chemicals in their work area at the time of initial assignment and whenever a new hazard is introduced.

Information must include:

- a. The requirements of the Hazard Communication Standard;
- b. Any operation in their work area where hazardous chemicals are present; and,
- c. The location and availability of the written program, including the list(s) of hazardous chemicals and MSDSs.

Training must include:

- a. Methods that may be used to detect the presence or release of hazardous chemicals in the work area;
- b. The physical and health hazards of the chemicals in the work area;
- c. Personal protective measures and equipment; and,
- d. Specific details of the employers Hazard Communication Program.
Employee training for this requirement will be documented and acknowledged by employee signatures following each session using Form S+H A-2 at the end of this section.

B. Specifications For Hazard Communication Program Submittal

Each employer shall submit to the Construction Manager a copy of the MSDS inventory thirty (30) days prior to on-site construction activities. Following review of the MSDSs, the MSDSs will be incorporated into a central registry.

1. Hazard Communication Central File

A central file shall be set-up at Construction Management offices to maintain Hazard Communication Program information in a principal location for use in emergency situations (i.e., spill, fire, employee exposure).

Construction Management will review the Hazard Communication Program and pertinent information will be compiled into the file. The file will be maintained and updated for the duration of the project.

2. Audit and Review

It is the responsibility of the Contractor's Safety Representative to review his employees Hazard Communication Program on at least an annual basis. All revisions and updates shall be incorporated to reflect changes in the purchase, use, storage and handling of hazardous chemicals at the construction site.

It is also the responsibility of the Contractor's Safety Representative to periodically audit procedures in the use of hazardous materials and to institute corrective action where required to meet the requirements of the Standard.

HAZARD COMMUNICATION TRAINING DOCUMENTATION

SAMPLE FORM S+H A-2

I, _____, hereby acknowledge that I have received hazard communication training on _____. The training explained the law, the chemicals I may be exposed to (to include the hazards and their controls), how to use a Material Safety Data Sheet, where the MSDSs, chemical list, and the written program may be found, and the proper detection, first aid, and spill control procedures.

EMPLOYEE SIGNATURE
SIGNATURE

CONTRACTOR TRAINER

GENERAL CONTRACTOR NAME

SUBCONTRACTOR NAME

II. Hazardous Material and Waste Management Guidelines

A. Hazard Assessment

1. Hazardous Materials

A hazardous material is defined as a material that exhibits one or both of the following (See also Cal/OSHA's Director's List):

- a. Physical Hazard—Flammable, combustible, compressed gas, explosive, reactive, etc., or
- b. Health Hazard—Toxic, highly toxic, irritant, corrosive, etc.

Hazardous materials are most easily identified through manufacturer information by way of container labeling and Material Safety Data Sheets (MSDS). In addition, hazardous materials can be identified through specific systems developed by agencies such as OSHA, CAL/OSHA Director's List, CA Labor Code, Section 6382, the Department of Transportation (DOT), California EPA and the National Fire Protection Association (NFPA). All hazardous materials arriving on-site must be labeled according to guidelines established through OSHA.

All trucks transporting hazardous materials on, off, or at the Site must be labeled and/or display a placard according to DOT specifications. DOT information on proper shipping names and placard is contained in 49 CFR 172.101.

Each Contractors Hazard Communication Program will be made available to the Lab's Fire Department, if so requested.

2. Hazardous Wastes

The Environmental Protection Agency (EPA) defines hazardous waste as a discarded commercial product, off-specification material, container residue, spill residue, or hazardous material declared a waste by the generator. EPA provides criteria for identifying and listing hazardous waste.

Characteristics of hazardous wastes are defined as wastes that exhibit characteristics of ignitability, corrosiveness, reactivity, or toxicity.

The contractor is responsible for the identification and proper use of hazardous materials and the elimination of hazardous waste on-site, as stipulated through and in accordance with all Federal, State, and Local regulations.

B. Nonhazardous, Hazardous Material, and Hazardous Waste Management

1. Acceptance and Storage of Hazardous Materials

When the schedule for performance of the work is submitted after contract award, submittal of the Hazardous Materials and Waste Management Plan is to be provided to Construction Management and NIF. This provides data regarding anticipated quantities, storage, disposal, spill prevention and

clean-up methods, and contingency planning as it relates to hazardous materials and hazardous waste.

Construction Management and the NIF may share this information with the Hazards Control Department's Emergency Management Division (LLNL Fire Dept.) and ES&H Team 2 for review.

General storage and/or lay down areas will be assigned by the LLNL Fire Department and ES&H Team 2. Storage within these areas shall be in accordance with applicable Federal, State and local regulations.

2. Nonhazardous Material Handling, Storage and Disposal

Nonhazardous materials are classified as materials that do not exhibit physical or health hazards, such as general construction debris.

Contractors will place all nonhazardous waste (trash, rubbish, etc.) in dumpsters. Nonhazardous waste is not allowed to accumulate in the work area, and should be removed at the end of every shift. Trash should be placed in dumpsters provided by the designated trash collector.

The contractor is responsible for maintaining storage areas in a clean and safe condition. If the area is unacceptable, the Project Manager may require a clean-up of the area at the expense of the contractor.

3. Hazardous Material Handling and Storage

All site personnel required to work with or have a potential for being exposed to hazardous materials, shall obtain approval through site management for such operations, have appropriate training, and the contractor shall provide all necessary personal protective equipment and/or engineering controls to prevent exposures.

All hazardous material storage areas will be equipped with appropriate containment measures, safety equipment, and spill clean-up materials as required by federal, state, and local regulations. In addition, all flammable materials are to be stored according to specific requirements designated by NFPA 30 and LLNL Fire Department regulations.

Storage of bulk containers, including 55-gallon drums of fuels and related oils and lubricants for equipment must be reviewed and approved by the Construction Manager and ES&H Team 2 prior to storage on site. Any operations concerning hazardous materials storage must be cleared through the LLNL Fire Department and ES&H Team 2 prior to any on-site operations.

Waste materials are not to be stored with usable material. Tools, clothing, and similar materials that are not hazardous or are not required for safe handling or spill clean-up of hazardous materials are to be kept in the storage area. Incompatible materials are not to be stored together. Review of the appropriate MSDS will provide information regarding specific storage requirements, as well as incompatible materials and special requirements.

4. Hazardous Waste Storage

Permanent or long-term hazardous waste storage will not be allowed within the Lawrence Livermore Lab. All operations regarding temporary hazardous waste storage within regulatory time limits will be cleared through Construction Management, the LLNL Fire Department and ES&H Team 2 prior to approval. All quantities of waste must be tracked and handled in accordance with Federal, State, and local regulations.

5. Hazardous Waste Disposal

Hazardous waste must be containerized and stored separately, with subsequent disposal in accordance with all Federal, State and local regulations.

Notification should be made to Construction Management and NIF Management when waste is scheduled to be removed off-site. Information regarding the disposal method and/or destination of the waste may be requested by the Project Manager. Waste materials (not generated on-site) are not to be brought onto the site.

Waste transportation or disposal contractors will not be allowed on-site without notification to and approval from Construction Management and NIF management.

6. Management of Empty Containers

Empty containers are to be cleared from the work area daily. Container reuse is acceptable based on the following provisions:

- a. The original material contained was not toxic, flammable or combustible.
- b. The identity of the new contents are clearly identified using all applicable labeling requirements.
- c. The new material being placed into the container is not a hazardous material (i.e., trash, scrap metal, etc.) or a hazardous waste.

7. Specific Provisions for Petroleum Based Materials

Petroleum based materials are substances such as fuel, diesel, oils, or lubricants.

Bulk storage of petroleum based materials is not allowed on-site.

8. Removal of Unused Material and Partially Filled Containers from the Site—Hazardous Material.

All hazardous materials shall be removed from the site on a daily basis following completion of each phase of work or as soon as through with material.

The Project Manager may request information regarding material identity, destination, responsible party, and manner of transportation prior to removal off-site. Information requested may include an affidavit from the contractor confirming the material is a product and not a waste material.

Hazardous material is not to be abandoned on-site. If material is found on the site and can be traced to a contractor, the contractor shall be required to remove the material, or will be responsible for all expenses incurred for moving and disposal of the material.

The contractor is responsible for the proper clean up and/or decontamination of assigned areas. Failure to do so, will result in contractor incurring all expenses for the clean up and/or decontamination.

C. Environmental Incident

An environmental incident involves a release or potential release of a hazardous substance that can pose a substantial danger to employees, public health and welfare, or the environment. An effective response depends on an accurate evaluation of the incident, notification to outside agencies (as applicable), and development of an effective course of action. Any incident situation represents a potential threat to employees, the public, or the environment. For environmental incidents at the NIF Project site, all precautions will be taken to remedy the situation in a safe manner.

1. Hazard Identification and Assessment

Initial hazard identification can be performed through a standardized identification system such as:

- a. National Fire Protection Association (NFPA) 704-M System
- b. Department of Transportation (DOT) Hazard Identification System

This allows immediate hazard identification through visual examination of a label, placard or sign. Contractors are responsible to train employees on the specific identification system that will be utilized on the project. In addition, immediate access to MSDSs must be available in the central file, the MSDS provides extensive information that is critical in an incident situation. Contractors and subcontractors are required by the Hazard Communication Standard to maintain MSDSs so they are readily accessible for each work shift.

Through the hazard identification and assessment, the incident can be categorized into either an emergency or nonemergency environmental incident.

- c. An emergency incident is considered an incident that presents a potential for harm to personnel or the environment, the contractor is unable to immediately control the situation, and/or the spill exceeds the reportable quantity. Emergency assistance shall be immediately requested by dialing 911 or from a cellular telephone 447-6880. A nonemergency incident is defined as an incident which does not present potential harm to personnel and/or the environment, the contractor has the capability to immediately control the situation, and/or the spill is less than the reportable quantity. IF any question exists ES&H Team 2 (x2-6126) is to be immediately contacted.

2. Environmental Incident Management

Environmental Incident Management Procedures will adhere to the LLNL Hazardous Spill/Emergency Response Plans.

Notification to the media will flow through LLNL Public Affairs Office only.

4. Traffic Control

The provisions of the California Vehicle Code (CVC) and the Laboratory's requirements for pedestrians, traffic safety, and parking apply to all NIF workers, visitors, vendors, and guests. The CVC, while not legally binding on site, shall be considered as a source document and is enforceable through LLNL's Protective Force Division. Protective Force Division officers will cite operators (regardless of employment status) who violate on-site traffic and parking regulations. Speeding and moving traffic infractions are serious safety concerns. Anyone who violates either the CVC or Laboratory requirements while on site is also subject to corrective action by LLNL and the NIF Project management.

The requirements for all vehicles are based on the CVC, while those for commercial vehicles are based on the Department of Transportation (DOT) 49 CFR (various sections), "Federal Motor Carrier Safety Regulations," and the CVC.

Traffic control and routes are as indicated on the construction drawings and outlined in the written instructions. Sketches for the construction of certain detours in areas not indicated on the drawings shall be submitted to NIF Construction Management for approval. Personnel are directed to become familiar with these details.

Responsibilities

1. All workers (pedestrians, motor vehicle operators, and bicycle riders) must comply with these requirements and the provisions of the California Vehicle Code (CVC) when operating Laboratory-owned, privately owned, rented vehicles, or bicycles to make the roadways and pathways safe. Individuals who operate their own motor vehicle, a Laboratory motor vehicle, or a rental vehicle on or off LLNL property must have on their person a valid, current driver's license from their state of residence and are responsible for operating vehicles in accordance with the applicable vehicle code.

Basic Rules for Traffic Safety

1. Seat belts must be used by the driver and all occupants of a motor vehicle. The driver shall ensure that occupants wear their seat belts.
2. Vehicles must be operated at a speed that is reasonable, safe, and proper for the weather, traffic, and road conditions. The maximum speed limit at the LLNL Livermore site is 25 miles per hour (mph), unless otherwise posted. The maximum speed limit in parking lots and alleys is 15 mph. The speed limit on the NIF Project is **5 MPH**.

3. All flagmen and other workers in traffic areas shall wear appropriate high-visibility vests.
4. Required safety, fire, instructional, and traffic signs shall be posted and obeyed. They shall not be removed until their removal is approved by the Construction Manager.
5. Workers shall park personal vehicles in designated parking areas only.
6. Private vehicles and bicycles are not permitted on the NIF Project site bounded by the perimeter fence. Exception: contractor office and laydown areas.

Note: Drivers operating a powered industrial truck shall wear seat belts if they are provided.

5. Fire Prevention

Numerous construction projects have been destroyed as a result of fires. All workers on the NIF Project are expected to be constantly alert to the potential for jobsite fires. Common sources of jobsite fires include: use of open flames, sparks from grinding, hot slag, temporary heating devices, overloaded electrical circuits, and faulty electrical equipment such as damaged cords. The use of Hazardous Work Permits (frequently referred to as “Hot Work Permits”), diligent work planning, review of site conditions, fire watches, plus readily available fire extinguishing equipment will help eliminate or control the potential for damaging fires at the NIF.

Responsibilities

All workers shall comply with the following requirements.

1. Hot Work Operations

A Hot Work Permit, which is issued by the Hazards Control Department’s Emergency Management Division (LLNL Fire Dept.), is required for all hot work operations. Hot work operations include cutting, welding, brazing, soldering, roofing or road work using tar pots, torches and hot air guns used in applying roofing, thermal spraying, use of open fires for any purpose, or any similar activity. The requirements of the Permit shall be followed without exception. The supervisor, construction inspector or construction manager must contact the LLNL Fire Department to arrange for the permit. A single “blanket” permit may be requested to cover long term phases of the project, such as conventional facility construction.

An authorized fire watch person(s) shall be provided for all hot work operations in which there is the possibility that a smoldering fire may be started by hot work. The fire watch person(s) shall have no other assigned duties except to act as a fire watch. They shall remain in the area during the hot work operations and for not less than 30 minutes (60 minutes for torch-applied roofing) following the end of hot-work operations. The fire watch shall have a dedicated fire extinguisher of the appropriate type and size.

2. Smoking

Smoking is prohibited at or in the vicinity of hazardous operations or combustible or flammable materials. “No Smoking” signs shall be posted in these areas. Smoking will be allowed only in designated areas. Where smoking is permitted, safe receptacles shall be provided for smoking materials.

3. Waste Disposal

Accumulations of combustible waste material, dust, and debris shall be removed from the structure and its immediate vicinity at the end of each work shift, or more frequently as necessary for safe operations. Good housekeeping shall be

maintained, and access will be kept clear at all times. If portable dumpsters are provided for waste disposal, they shall be located at least 25 ft from any structure.

4. Fire Alarm Reporting

Telephone service for reporting fires to the LLNL Emergency Dispatch Center (911 or 447-6880 from a cellular telephone or non-LLNL telephone) shall be readily available near the premises. Instructions shall be issued to notify the LLNL fire department immediately in case of fire, including those already extinguished by construction site personnel. The LLNL fire department number shall be conspicuously posted near each telephone.

5. Access for Fire fighting

All-weather roads for fire fighting equipment shall be maintained. Fire hydrants and fire department connections shall be kept clear of any obstructions.

6. Fire Extinguishers

Fire extinguishers shall be located on or adjacent to:

- a. Storage sites of combustibles.
- b. Fuel dispensing vehicles.
- c. Sites of hot work operations.
- d. The supervisor's vehicle.
- e. The supervisor's office or shed.
- f. Self-propelled equipment.

In addition, at least one approved extinguisher shall be provided in plain sight on each floor at each usable stairway where combustible material could accumulate. Extinguishers shall be placed within the structure so that the maximum travel distance to an extinguisher is no more than 75 ft. Fire extinguishers shall be inspected and documented monthly. Fire extinguishers shall be removed from service when discharged and replaced.

7. Solvents

Flammable or combustible solvents shall not be used for cleaning purposes without specific instructions from the supervisor and such instructions shall include the site and conditions of such use. Waste solvents shall be managed according to Federal, State, and Local regulations.

8. Temporary Heaters

The use of temporary heating devices shall meet the following requirements:

- a. Temporary heating equipment shall be "listed" and shall be installed, used, and maintained in accordance with the manufacturer's instructions.
- b. Fuel supplies for liquefied petroleum gas-fired heaters shall comply with NFPA 54, National Fuel Gas Code, and NFPA 58, Standard for the Storage and Handling of Liquefied Petroleum Gases.

- c. Refueling operations shall be conducted in an approved manner. This can necessitate the removal of the heater prior to refueling. The appliance also should be allowed to cool prior to refueling.
- d. Heater devices shall be situated so that they are secured and shall otherwise be installed in accordance with their listing, including clearance to combustible material, equipment, or construction. Heaters shall be set horizontally level unless otherwise permitted by the manufacturer's markings.
- e. Heaters used in the vicinity of combustible tarpaulins, canvas, plastic, or similar coverings shall be located at least 10 feet from the coverings. The coverings shall be securely fastened to prevent ignition or upsetting of the heater due to wind action on the covering or other material.
- f. Temporary heating equipment, where utilized shall be monitored for safe operation and maintained by properly authorized personnel. Temporary heating equipment, while operating, should be visually inspected every hour to ensure that combustibles have not blown or fallen over near the temporary heating device. During windy periods, it might be necessary to reduce the interval between inspections. Any object near the temporary heating device that is hot to the touch should be moved, or the temporary heating device should be relocated. Any appliance that is not operating properly should be turned off until repairs have been made.
- g. When heating areas occupied by personnel, heating, and appliances should be of the indirect fired type with the combustion exhaust gases discharged into the outside atmosphere. Whenever combustion gases from heating appliances are not discharged to the outside atmosphere, a monitoring program for toxic gases must be established and approved by the Construction Manager.
- h. The use of temporary heating devices shall also conform to the requirements in OSHA 29CFR 1926.154.

NIF Project Site Fire Prevention and Control Rules

1. Cleaning Agents. Explosive liquids will not be used as cleaning agents. Use only approved cleaning fluids.
2. Combustible Materials. Gasoline and similar combustible liquids will be stored in secure approved containers and in an area free from burning hazards.
3. Combustible Materials. Keep all heat sources away from combustible liquids, gases or other flammable materials. When not in use, store combustible materials in a well ventilated, cool place.
4. Fire Extinguisher. Do not remove or tamper with fire extinguisher installed on equipment or vehicles or in other locations unless authorized to do so or in case of fire.
5. Fire Fighting Equipment. Fire fighting equipment must be kept free from obstacles, equipment, materials and debris that could delay emergency use of

such equipment. Familiarize yourself with the location and use of the project's fire fighting equipment.

6. Oily Rags and Waste. Discard and/or store all oily rags, waste and similar combustible materials in metal containers on a daily basis. Rags and other waste materials saturated with oil, fuels, or solvents must be managed as hazardous waste.
7. Safety Cans. Handling of all flammable liquids by hand containers will be in approved type safety containers with spring closing covers and flame arrestors.
8. Smoking and Fires. Extinguish all matches, cigarettes, cigars and pipe tobacco before discarding. Do not smoke while fueling equipment or while in close proximity to refueling areas. Never leave open fires unattended.
9. Storage. Storage of flammable substances on equipment or vehicle is prohibited unless such unit has adequate storage area designed for such use.
10. Types of Fires.
 - a. Class A (wood, paper, trash) - use water or foam extinguishers.
 - b. Class B (flammable liquids, gas, oil, paints, grease) - use foam, CO₂ or dry chemical extinguisher.
 - c. Class C (electrical) - use CO₂ or dry chemical extinguisher.

6. Sanitation and First Aid

Sanitation and first aid rules for the NIF Project are established as follows:

Responsibilities

All employers and workers shall comply with the following requirements as appropriate:

1. An adequate number of toilet facilities shall be provided.
2. Bottled drinking water and disposable cups shall be provided, along with a container for the disposal of used cups. This drinking water shall be conveniently placed in the area of the work site.
3. Proper ventilation shall be maintained in order to avoid possible harmful buildup in areas where toxic fumes, dust, vapors, or gases may be produced. Respiratory protection shall be supplied when adequate ventilation cannot be provided.
4. First-aid kits shall be placed in the field office and carried in the Superintendent's vehicle. First-aid equipment shall be inspected regularly for completeness, and an employee qualified in first aid shall be on site during the normal work shift.
5. All employers shall submit a list of qualified first-aid trained employees to Construction Management.
6. The emergency phone number card, in addition to being posted on the project bulletin board, shall be posted prominently in work areas and carried in each superintendent's vehicle. Depending on the nature of the incident and the first aid or medical care required, the necessary assistance shall be requested by phoning the emergency number (911 or 447-6880 from a cellular telephone or non-LLNL telephone) indicated on the card.

NIF Project Site Sanitation & First Aid Rules

1. Injury incident. Avoid unnecessary moving of an injured person. Notify first aid immediately and keep the injured person as comfortable as possible until first aid personnel arrive.
2. Burns. Immediately treat acid, caustic and thermal burns by flushing with cold water, then report promptly to first aid.
3. Drinking Cups. Do not drink out of a common dispensing cup or ladle. Use only drinking fountains or individual disposable cups.
4. Drinking Water. Drink water that is specifically supplied and marked for drinking purposes.
5. Electrical Shock. Turn electric power off, or use a dry board, stick or other nonconducting object to remove the contact from the victim. Do not touch the victim until he is free from current contact.

6. Hygiene. Personal cleanliness is extremely important. Many skin irritations result from careless or incomplete washing or bathing. Wash thoroughly and dry the skin completely to eliminate skin rashes, irritations and infections.
7. Redressing. If it is necessary to have an injury redressed, report to first aid and to your supervisor immediately.
8. Reporting. Report all injuries, no matter how slight, to first aid and to your supervisor immediately.
9. Treatment. Follow all advice given by trained first aid attendants, nurses or physicians relating to your injury.
10. Heat Stress. High temperatures may occur on the NIF Project site. The following tips to workers are intended to help prevent heat-related disorders. Simply drinking plenty of water and wearing light, loose-fitting clothing, for example, significantly reduces the risk. OSHA offers the following suggestions:
 - a. Encourage workers to drink plenty of water (without salt)—about one cup of cool water every 15–20 minutes. Avoid alcohol, coffee, tea and caffeinated soft drinks, which contribute to dehydration.
 - b. Help workers adjust to the heat by assigning a lighter workload and longer rest periods for the first 5 to 7 days of intense heat.
 - c. Encourage workers to wear light-weight, loose-fitting, light-colored clothing. Workers should change their clothing if it gets completely saturated.
 - d. Use general ventilation and spot cooling at points of high heat production. Good airflow increases evaporation and cooling of the skin.
 - e. Learn to spot signs of heat stroke, which can be fatal. The symptoms are severe headache, mental confusion/loss of consciousness, flushed face and hot, dry skin. If someone has stopped sweating, seek medical attention immediately. Other heat-related illnesses include heat exhaustion, heat cramps, skin rashes, swelling, and loss of mental and physical work capacity.
 - f. Train first-aid workers to recognize and treat the signs of heat stress. Supervisors also should be able to detect early signs of heat-related illness and permit workers to interrupt their work if extremely uncomfortable.
 - g. Consider a worker's physical condition when determining fitness to work in hot areas. Obesity, lack of conditioning, pregnancy, and inadequate rest increase susceptibility to heat stress.
 - h. Alternate work and rest periods, with longer rest periods in a cooler area. Shorter, but frequent, work-rest cycles are best. Schedule heavy work for cooler parts of the day and use appropriate protective clothing.
 - i. Certain medical conditions, such as heart conditions, or treatments like low-sodium diets and some medications, increase the risk from heat exposure. Seek medical advice in those cases.
 - j. Monitor temperatures, humidity, and workers' responses to heat at least hourly.

7. Confined Space Safety Requirements

This section outlines the responsibilities for individuals who work in confined spaces. Individuals who do not comply with these requirements risk the possibility of injury or death. These requirements are based principally upon the Federal OSHA requirements (29CFR 1910. 146) for confined spaces.

A “confined space” is defined as an enclosed area that is large enough for an employee to enter and perform assigned work, has limited or restricted means of entry or exit, and is not designed for continuous human occupancy.

The following are examples of confined spaces that may exist:

- Storm drainpipes
- Sewers
- Storage tanks
- Utility pipelines
- Large vacuum vessels
- Vaults
- Manholes
- Trenches/excavations
- Transformer tanks

Entry into a confined space occurs when any part of a worker’s body passes through an opening into a confined space.

The two categories of confined spaces are low-hazard confined space (nonpermit confined space) and high-hazard confined space (permit-required confined space).

Excavations (including trenches) may be categorized as confined spaces depending on the depth and physical layout. Safety representatives must conduct an evaluation of such areas on a case-by-case basis to determine whether they are high-hazard confined spaces. Excavations that are more than 4 feet deep usually qualify as confined spaces. Work within deep excavations may qualify those excavations as high-hazard confined spaces. A deep excavation with a connected sewer line in the space is usually evaluated as a high-hazard confined space. An excavation that is more than 4 feet deep in which a gasoline-powered compactor is used is usually evaluated as a high-hazard confined space, even if ventilation controls are in place. Not all excavations (e.g., very shallow excavations, less than 4 feet, or excavations with sloping sides) meet the definition of a confined space and/or a high-hazard confined space. Entry into these spaces would not have to be in accordance with OSHA and LLNL confined space requirements.

Responsibilities

1. Each employer shall provide equipment needed to work in confined spaces. Examples of such equipment include, but is not limited to:
 - Barricades, ropes, tapes, and similar items used to limit access,
 - Ground fault circuit interrupters,

- Explosion-proof voltage lamps and other equipment needed to work safely in confined spaces that may contain potentially hazardous atmospheres,
 - Devices for providing mechanical ventilation in confined spaces,
 - Atmospheric testing instruments,
 - Harnesses and rescue devices,
 - Respirators, including supplied air respirators and SCBAs, breathing-quality air sources, and supplies/equipment needed to keep it in working condition
 - Other personal protective equipment,
 - Devices to block the flow of hazardous materials or energy into the confined space including blanks for piping and lock out/tag out equipment, and other items,
 - Equipment for inerting spaces, as needed.
2. Each employer shall implement and maintain a confined space program. This program contains a permit system using their own personnel and permits, and the capability to work safely in confined spaces. Examples of capabilities needed to work in confined spaces include, but are not limited to the capability to:
- Identify confined spaces
 - Evaluate confined and classify confined spaces
 - Determine what atmospheric testing is needed for which substances and when, and
 - Develop and implement appropriate precautions using their own personnel or subcontractor.

Each employer's confined space program shall be reviewed and approved prior to implementation on the NIF site by the Construction Manager with concurrence from the LLNL Safety Representative for NIF.

3. All workers who must enter or work in confined spaces shall be instructed on how to work safely in confined spaces and perform the duties required by Federal/California OSHA requirements. Examples of this training include, but are not limited to:
- Confined Space Entrant training,
 - Confined Space Attendant training,
 - Training about how to conduct measurements prior to and during work in confined spaces,
 - Training about how to prepare hot work permits for fire-hazardous work in confined spaces,
 - Training about how to use and service respirators.

Evidence of this training shall be made available for review.

4. Rescue arrangements shall be coordinated with the LLNL Fire Department. The University will provide emergency communications equipment, as needed, and guidance about how to notify and work with the LLNL Fire Department in an

emergency. The University will provide guidance about acceptable radio and electronic communications devices used to communicate with workers in confined spaces.

5. Anyone creating a confined space hazard shall ensure that proper controls and warnings (e.g., signs, locks, barriers, etc.) are used to inform workers of the hazard and restrict inadvertent access to the confined space.

8. Powered Industrial Truck Safety

All powered industrial truck (commonly referred to as fork trucks) operation shall be conducted in a safe manner to avoid injury or damage to property. This section implements NIF policy for powered industrial truck/fork truck/forklift safety. It contains safety requirements for fire protection and the design, maintenance, and use of fork trucks and other specialized industrial trucks powered by electric motors or internal combustion engines or nonpowered manually operated lifts and trucks.

Responsibilities

1. All employers are responsible to develop, document, and utilize powered industrial truck safety procedures as required.
2. All workers involved with the operation and use of powered industrial trucks must be instructed on the safe operation and use of powered industrial trucks, A record of training shall be maintained. All powered industrial truck operators shall receive training as required under CFR 1910.178(l). Training shall consist of a combination of formal instruction, practical training, and evaluation of the operator's performance in the workplace. Powered industrial truck operators shall receive initial training and refresher training when necessary or required. Refresher training is required when:
 - a. The operator has been observed to operate the vehicle in an unsafe manner.
 - b. The operator has been involved in an incident or near-miss incident.
 - c. The operator has received an evaluation that reveals that the operator is not operating the truck safely.
 - d. The operator is assigned to drive a different type of truck.
 - e. A condition in the workplace changes in a manner that could affect safe operation of the truck.

Every three years, an evaluation of the operator's performance must be conducted. Each employer shall certify that each operator has been trained and evaluated as required. Training records for contractors/subcontractors employees shall be made available for review.

4. Each employer shall submit a list of certified powered industrial truck operators to Construction Management.
5. Each employer shall conduct daily preoperational inspections of powered industrial trucks under their control to ensure that the requirements of the powered industrial truck safety program are being followed. If any malfunctions or defects are found during the inspection, the truck shall be parked (with the keys removed) and tagged "Out of Service" using a "Danger Do Not Operate"

tag, pending repairs. Inspection documentation shall be delivered to Construction Management.

Basic Rules for Powered Industrial Truck Safety

The requirements below apply to all powered industrial truck operators.

1. Only trained and qualified persons authorized by their employer shall be allowed to operate a powered industrial truck.
2. Operate fork trucks only in designated areas with adequate ventilation.
3. Do not exceed the floor load rating.
4. Secure (tie down) unstable loads before starting the vehicle.
5. Keep arms and legs inside the fork truck structure, except when signaling for turns or stops.
6. Do not jump from a moving fork truck.
7. Make sure that there is adequate clearance before passing under or between structures.
8. Maintain indoor and outdoor speed under 5 mph on the NIF Project site, and under 15 mph when off site.
9. Yield to pedestrians.
10. Do not carry passengers, except where factory-installed seats are provided.
11. Tilt the mast back before traveling.
12. Stay at least three vehicle lengths back when following another fork truck.
13. Maintain forks about 4 to 6 in. (10–15 cm) off the driving surface when traveling.
14. Do not attach slings, cables, or chains to the forks to lift materials or objects from underneath them.
15. When forward vision is obscured, drive in reverse.
16. Do not leave a fork truck parked with an elevated load.
17. Do not park a fork truck without turning off the power, placing all the controls in the neutral position, and setting the brake. A fork truck is considered unattended if the operator is out of sight of the truck or more than 25 ft (8 m) away.
18. Observe all traffic signals.
19. Do not use a fork truck to tow or push other fork trucks, another vehicle, or other equipment.
20. Use pneumatic-wheel fork trucks for irregular terrain and when traveling on LLNL streets.
21. Use hard-wheel fork trucks indoors only.

22. Place tines (forks) as wide as possible for the load and lock them in place to prevent sideways movement.
23. Follow manufacturer's instructions for repositioning the tines, for example, it may be necessary to tilt the mast forward to the required angle to allow the tines to slide freely on the bar. Get assistance if necessary.
24. Keep fingers out of potential pinch points when repositioning the tines.
25. Never add a counterweight. Know the weight of the load.
26. Do not exceed the fork truck's rated capacity.
27. Do not lift material or equipment you are unfamiliar with.
28. Use seat belts where provided.
29. Maintain at least a 10-ft (3 m) separation from overhead power lines.
30. When crossing rails or other irregular areas, slow down and approach on a diagonal.
31. Move to the right side of the lane when traveling on LLNL roads to allow passing vehicles adequate clearance; pull over and stop when necessary.
32. Mount a "Slow-moving" vehicle sign (triangle) to the rear of fork trucks approved for road use.
33. The requirements below apply when parking fork trucks:
 - Park on level surfaces.
 - Lower the forks to the ground.
 - Tilt the mast forward.
 - Set the parking brake.
 - Place the controls in the neutral position.
 - Turn off the engine.
 - Chock the wheels if the truck must be parked on a slope.
34. When operating a fork truck on the loading dock, the driver shall
 - Secure all dock plates,
 - Ensure at least one trailer wheel is chocked before driving onto or into a truck trailer,
 - Drive the fork truck slowly on wet and slippery docks, and
 - Slow down and sound your horn when proceeding through doorways.
35. When operating a fork truck on ramps or inclines, the driver shall
 - Point the forks up the ramp or incline when carrying a load, regardless of the direction of travel, up or down;
 - Drive unloaded fork trucks with the forks pointing downhill for added stability;
 - Obtain help to guide you when going up a ramp or incline with a load and your vision is blocked; and
 - Never turn a forklift sideways on a ramp or incline.

36. Conduct a daily functional inspection of the fork truck and its attachments.
37. Operators must have a valid California state driver's license.
38. Notify the supervisor if unfamiliar with or believe a load is not safe to lift, or believe an environment is not safe to enter.
39. Inform supervisors of any safety-related problems involving your fork truck.
40. Steering or spinner knobs shall not be attached to the steering wheel unless the steering mechanism is of a type that prevents road reactions from causing the steering handwheel to spin. When installed, the steering knob must be mounted within the periphery of the wheel.

Mandatory Equipment

The design of all fork trucks shall comply with ANSI standard ANSI B56.1, Part II, "American National Standard for Powered Industrial Trucks." A manufacturer's capacity plate shall be affixed to the forklift and maintained in a legible condition. The rated capacity shall be clearly posted on the vehicle so as to be clearly visible to the operator.

Special lifting attachments shall be approved by the manufacturer for use on powered and nonpowered fork trucks. The manufacturer's capacity plate shall be modified or a second plate added describing the attachment and any related weight capacity modifications. All special lifting attachments that may be used with a fork truck shall be load-tested and labeled to indicate the maximum rated capacity of the attachment and its net weight. Attachments shall have a positive means of being secured to the forks or mast. Large 30 to 55 gal. drums (114 to 208 L) shall be handled with an approved lifting attachment. Bare forks must not be used to pick-up or move these drums. Drums secured to a pallet may be lifted.

Fork Truck Designation and Area of Use

Fork trucks are designated for use in different environments, hazardous and nonhazardous, depending on how they are powered and safeguarded to mitigate hazards caused by exhaust, fuel, and electrical systems. The selection of the proper fork truck shall be based on the location of use and the classification of the fork truck. Use adequate ventilation for fork trucks powered by internal-combustion engines. Contact the ES&H team for an analysis of oxygen deficiency, carbon monoxide, and other contaminants in the atmosphere. Electric fork trucks are preferred for indoor operations and required when working in confined spaces.

Work Platforms

Work platforms (personnel baskets) mounted on the forks and used to hoist personnel shall be securely fastened to the lifting carriage and/or forks. These

baskets shall be labeled identifying their capacity and the date of certification. The operator of the fork truck is responsible for the safety of co-workers on the platform. An operator shall remain on the fork truck at all times when the basket is occupied, the parking brake set, and the transmission in neutral. The fork truck shall remain stationary when personnel are in the basket. Personnel must first exit the basket before the fork truck is driven.

Refueling

Fuel gasoline, diesel, and propane fork trucks outdoors only; wear appropriate personal protective equipment (PPE). In addition, close the valve for the propane bottle while the engine is running to consume all gas in the line. Propane bottles are only filled by authorized and trained personnel. Recharge electric fork truck batteries only in designated, posted, and well-ventilated areas. Do not conduct smoking or spark-producing operations while batteries are being charged. Wear the appropriate PPE if battery maintenance is being performed.

Pedestrian Areas

Pedestrians working nearby should be sure to keep a safe distance from forklifts. This means staying clear of the forklift's turning radius and making sure the driver knows where you are. The driver shall: yield the right-of-way to pedestrians, prevent anyone from walking or standing under elevated forks, and sound the horn as a warning when approaching personnel.

Inspection, Testing, and Maintenance

Only trained and authorized personnel shall maintain and inspect fork trucks. All work should be done in accordance with the manufacturer's specifications.

Nonpowered Fork Trucks/Lifts

These units are treated differently, and the operator is not required to have a license to operate this type of lift. Supervisors must, however, only allow trained personnel to operate these units. At the start of each work shift during which the unit will be used, the operator shall conduct a pre-operational visual inspection. If any malfunctions or defects are found during this inspection, the fork truck shall be parked and tagged "Out of Service" using a "Danger Do not Operate" tag, pending repairs. Special lifting attachments approved by the fork truck manufacturer may be used on these units. The fork truck manufacturer's capacity plate shall be modified or a second plate added describing the attachment and any related capacity modifications.

9. Ladders and Stairways

All ladders and stairways shall be built, used, and maintained in a safe manner to prevent injury to workers.

Responsibilities

1. Each employer shall develop, document, and utilize ladders and stairway safety procedures as required.
2. All workers shall be instructed in the safe use of ladders and stairways, and maintain a record thereof. Training records shall be made available for review.
3. Each employer must conduct daily inspections of ladders and stairways under their control to ensure that the requirements are being followed.

Basic Rules for Ladder and Stairway Safety

1. Workers required to use ladders and stairways shall be trained in their safe use and in the recognition of hazards related to them.
2. No worker shall use a ladder that is defective or does not meet OSHA requirements. Defective ladders shall be tagged "Do Not Use" and removed from service immediately.
3. Wooden ladders shall not be painted. They may be treated with linseed oil.
4. Ladders shall not be tied or fastened together.
5. Work shall be arranged so that workers are able to face ladders and use both hands while climbing.
6. The use of ladders to transport heavy or awkward-shaped items is prohibited. Ladders shall not be overloaded by persons or materials.
7. Step ladders shall never be used as straight ladders. They shall be fully opened at all times except when in storage. Workers shall not stand on the top step or top of step ladders.
8. Straight ladders shall be positioned with the base set back a distance equal to approximately one fourth of the height of the ladder to its bearing point. The ladder shall extend at least three feet above the landing. The ladder must be secured to prevent it being displaced. A grasping device (grab rail) shall be made available when the ladder does not extend three feet above the landing.
9. Face the ladder and use both hands when going up and down ladders.
10. When using a ladder, workers must not extend themselves to the sides such that their torso is beyond the side rail of the ladder.
11. Materials and tools should be raised and lowered by a rope or other mechanical means.

12. Select the right ladder for the job.
13. Stairways shall meet OSHA requirements.
14. When using stairways, do not run, skip stairs, or slide on handrails.
15. A stairway or ladder shall be provided where there is a break in elevation of 19 inches or more, and no ramp, runway, sloped embankment, or personnel hoist is provided.

10. Scaffolding Safety

All scaffolding shall be erected, used, maintained, and disassembled in a safe manner to prevent injury to workers, collapse or tip over.

Responsibilities

1. Each employer shall develop, document, and utilize scaffolding safety procedures as required.
2. Before erecting any scaffold that is more than three stories tall (greater than 36 feet), a detailed written plan shall be submitted to the Construction Manager for review and approval. The plan shall show the design of scaffolding, bracing, attachment to the structure, maximum loading, or other provisions to be made to protect workers from the hazard of scaffolding collapse or tip over. The proposed plan shall comply with the standards established by State of California, CCR Title 8, and California Building Standards Code (CBSC)(formerly CCR Title 24). If the detailed plan varies from such scaffolding system standards, it shall be prepared by a California registered civil or structural engineer whose name and registration number shall be indicated on the drawings. If a dispute arises as to whether the plan shall be prepared by a registered civil or structural engineer, the University's determination of the matter shall be final and conclusive on the Subcontractor. The cost of required engineering services shall be borne by the Subcontractor and shall be deemed to have been included in the amount bid for the work as stated in the Agreement.

Neither the review nor approval of any plan showing the design of scaffolding, bracing, attachment to the structure, or other provisions for worker protection shall relieve the Subcontractor from the obligation to comply with CCR Title 8 and CBSC for the design and construction of such protective work, and the Subcontractor shall indemnify the University from any and all claims, liability, costs, actions, and causes of action arising out of or related to the failure of such protective systems. The Subcontractor shall defend the University, its officers, employees, and agents in any litigation or proceeding brought with respect to the failure of such protective systems.

3. Each employer must instruct their employees in the safety significance, purpose, and use of the scaffolding safety procedures, and maintain a record thereof. Training records for contractors/subcontractors employees shall be made available for review.
4. All contractors/subcontractors are responsible for advising all other affected persons when their safety will be impacted by scaffolding.
5. Each employer must conduct daily inspections of scaffolding under their control to ensure that the requirements are being followed. Scaffolding shall be inspected by a designated competent person. Inspection documentation shall be delivered to Construction Management.

6. Each employer shall submit a list of competent persons for scaffolding safety to Construction Management.

Basic Rules for Scaffolding Safety

1. All scaffolding shall be erected, maintained, and disassembled by workers trained in the safe erection, maintenance, and disassembly of scaffolding. The scaffolding crew shall work under the direction of a trained, certified, and competent scaffolding supervisor.
2. All manufactured scaffolding shall be erected and used in accordance with the manufacturer's instructions.
3. All platforms 6 feet or higher above the ground or surrounding surface shall be provided with standard guardrails, including top rail and midrail, on all open sides. Toeboards are required where necessary.
4. Midrails shall be located approximately midway between the top rail and the walking surface. Cross bracing can be used in place of midrails provided the cross meets at approximately the midheight between the top rail and the working surface. Cross bracing can be used in place of top rails provided the cross meets at approximately the height of the top rail and a separate midrail is also provided.
5. Portable ladders shall be used to provide safe means of access to scaffolds where ladders are not an integral part of the scaffolding framework.
6. Integral scaffold stairways shall be employed when scaffolds exceed three stories tall. Stairways shall be provided with standard handrails.
7. Workers shall not ride on scaffolds when they are being moved unless the scaffold is on a level surface (within 3° of level) and the base width of the scaffold is at least 1/2 the height.
8. Scaffolds shall be level and plumb, and placed on adequate support. Plywood alone does not meet the support requirements. Metal base plates or wheels must be used on metal tubular or welded frame scaffolds. Castor wheels must be locked when the scaffold is not being moved.
9. A minimum of two scaffold grade planks shall be used to form a deck or walking surface. Manufactured scaffold planks must be used in accordance with manufacturer's instructions. All deck planking shall be secured to prevent movement.
10. Placing planks between ladders, or on top of buckets shall not be used in place of approved scaffolding. Heavy, industrial type saw horses capable of supporting planking, worker, and materials can be used to create scaffolding. Do not place saw horses on top of each other to gain a higher platform.
11. In order to prevent movement or tip over, scaffolding must be secured to the structure every 26 feet vertically and every 30 feet horizontally.

12. Scaffolds shall be maintained in a safe condition. Loose or missing guardrails, cracked or broken planks, structure out of plumb or level, unsupported bases, wheels unlocked, etc. make a scaffold unsafe. The scaffolding should not be used until unsafe conditions are corrected.
13. Do not overload a scaffold with materials or workers. Do not stand or climb on the guardrails. Portable ladders are not safe when used on top of scaffolds. Use of ladders on scaffolds must be reviewed and approved by a safety representative.
14. Scaffolds must be inspected daily and prior to use. Do not work on slippery scaffolding until it is cleared or sanded.
15. For other types of scaffolds such as mason's or bricklayer's scaffolds, see OSHA requirements.
16. Makeshift scaffolds are not permitted.
17. All elevated platforms higher than 25 feet must have a 25 foot clear zone or barricaded perimeter around the base of the work platform. The only personnel allowed in the clear zone will be personnel loading or unloading materials or equipment from the platform. Platforms larger than 100 square feet must be screened around the perimeter to prevent falling objects.

11. Machinery, Vehicles, and Heavy Equipment

Operation and maintenance of machinery, vehicles, and heavy equipment such as earth movers, road graders, bulldozers, and large dump trucks can lead to serious injury to personnel.

Responsibilities

1. Each employer shall develop, document, and utilize heavy equipment safety procedures as required.
2. Each employer shall advise all other affected persons when their safety will be impacted by the operation and maintenance of heavy equipment.
3. Each employer shall assure that workers assigned to operate machinery, vehicles, or heavy equipment are trained, qualified, and licensed (where necessary) to operate the assigned machine, vehicle, or heavy equipment.
4. Each employer shall submit a list of qualified machinery, vehicle, and heavy equipment operators to Construction Management.

Basic Rules for Machinery, Vehicles, And Heavy Equipment

1. Unless it is part of their regular duties, for which they have had adequate training, no worker shall operate machinery or equipment without specific instructions and guidance. Only licensed operators shall operate vehicles. Motor vehicle operators must hold a current and valid operator's license for the type of vehicle to be operated.
2. No vehicle or heavy equipment shall be operated in a reckless or careless manner or at a speed that is not reasonable and proper with regard to weather, traffic, surface condition, visibility condition, load, or type of vehicle. Reckless operation may be grounds for removal of privilege to operate and possible disciplinary action.
3. Operators shall inspect vehicles and equipment daily before beginning work and at the end of the shift, reporting any obvious areas of possible malfunction (such as brakes or tires, leaking fuel or oil). Repairs shall be made promptly. Defective vehicles and equipment shall not be used until repairs are made. Job superintendents shall make daily safety inspections. Operators are responsible for immediately reporting to supervisors any apparent or latent unsafe conditions of the equipment being operated. Job site records shall be maintained, as required.
4. Motors of all equipment shall be shut off while being refueled.
5. Seat belts must be worn by operators and passengers when provided.

6. Back up alarms must be used on all equipment with an obstructed view to the rear. A signal person should be used to help guide backing equipment where necessary for safer backing, and when a back up alarm does not exist or is non functional. Do not disconnect back up alarms.
7. Heavy equipment can be difficult to maneuver in congested areas and may be slow in stopping or turning. Avoid right-of-way situations by always yielding to the heavy equipment. Heavy equipment operators must obey normal traffic right-of-way regulations. Site-specific heavy equipment traffic flow patterns may be established when necessary.
8. Flagpersons must wear appropriate high-visibility vests or reflective clothing.
9. Persons on the ground working near where heavy equipment is being operated must remain in view of the operator. Do not walk or pass close in front of or behind heavy equipment. Never attempt to pass under heavy equipment.
10. Operators must not jump from their equipment. Always use ladders and steps provided.
11. Dump truck operators must exit their truck or remain in the protected cab if safe to do so when being loaded.
12. Stay clear of pinch points on heavy equipment such as where equipment articulates or where hydraulic arms move in or out. Pinch points must be guarded.
13. Heavy equipment must not be operated on side slopes or inclines that present a danger of rolling over. Keep equipment away from the edge of banks of excavations and trenches that may collapse.
14. Outriggers must be used when operating equipment so provided such as rubber-tired backhoes.
15. Backhoes shall not swing their buckets or loads over workers in trenches or excavations. Special care must be observed by operators and workers when moving trench shields.
16. Floors and decks of equipment shall be kept clean and free of anything that might cause slipping, tripping, or a falling hazard.
17. The need for servicing or repairs shall be reported to the supervisor. No repairs or adjustments shall be made on units during operation. No lubrication shall be performed on units during operation except those on which the manufacturer has installed safeguards specifically for the protection of the person doing the lubrication.
18. Working under suspended loads is forbidden.
19. Workers are prohibited from riding booms, loads, slings, hooks, or lift-truck forks or platforms.
20. Air hoses shall not be disconnected until they are bled and pressure is securely turned off at its source. All air hoses shall meet the requirements of 29 CFR 1926.302(b) (Federal OSHA Construction Safety Standards).
21. Workers shall inspect all backfill areas before starting backfill operations.

22. Caution shall be taken to make sure that no one is below when equipment is used near tops of cuts, banks, or inclines.
23. Special care, and an observer(s) with whom effective communication has been set up, shall be used where there is a possibility of overturning equipment (e.g., near tops of cuts, banks, inclines, deep fills, and soft or muddy terrain).
24. Adequate devices shall be worn for protection of hearing by operators or employees working near units producing noise levels in excess of prescribed standards.
25. Riding on flatbed trucks or in the back of pickups is not permitted. Riding on equipment is not permitted unless the vehicle is so equipped to safely carry passengers.
26. All vehicular incidents that occur on the Laboratory site, of whatever size and nature, whether injury or noninjury, shall be reported immediately to the superintendent and to the NIF Construction Manager.

12. Welding and Cutting—General

All welding and cutting shall be controlled in a safe manner.

Responsibilities

1. Each employer shall develop, document, and utilize welding and cutting safety procedures as required.
2. All workers involved with welding and cutting shall be instructed on the safety significance, purpose, and use of welding and cutting safety procedures and maintain a record thereof. Training records shall be made available for review.
3. Each employer shall advise all other affected persons when their safety will be impacted by welding and cutting.

Basic Rules for Welding and Cutting Safety

1. Only trained workers, whose regular duties as assigned by their supervisors include welding and cutting, shall perform this work.
2. Only standard, approved equipment shall be used.
3. Fire extinguishers will be easily accessible to all employees performing welding or cutting operations.
4. Screens or shields shall be provided for the protection of persons or combustible material exposed to sparks or falling objects.
5. When working on lead, zinc, or other materials that could generate harmful fumes, adequate ventilation and exhaust devices shall be provided. When ventilation is not practical or feasible, respiratory protection shall be used.
 - a. The designated safety representative or foreman shall inspect the work site before any use of welding or cutting equipment to ensure that all combustibles in the work area have been removed or otherwise protected from the welding or cutting work. He/she shall also assure that a current Hazardous Work Permit for hot work is in effect at the designated job site.
 - b. A fire watch may be required (see Section 5, Fire Prevention).

13. ARC Welding

Arc welding shall be controlled in a safe manner. Refer to Section 12 Welding and Cutting—General for additional requirements.

Responsibilities

1. Each employer shall develop, document, and utilize arc welding safety procedures as required.
2. All workers involved with arc welding shall be instructed on the safety significance, purpose, and use of arc welding safety procedures and maintain a record thereof. Training records shall be made available for review.
3. Each employer shall advise all other affected persons when their safety will be impacted by arc welding.

Basic Rules for Welding and Cutting Safety

1. Frames of welding machines operated from electric power sources shall be properly grounded.
2. When welding, workers shall wear adequate masks or hoods with proper eye protection, gloves, and leather aprons as minimum protection; these shall be supplemented with hard hats, safety shoes, and other protective gear where warranted.
3. All workers and passersby near the welding area shall be protected from eye flash-burns by use of partitions, screens, or other appropriate methods.
4. Welding cables, cords, and leads shall be neatly secured so as not to cause tripping.
5. Electrode stubs shall be disposed of immediately in a safe container.
6. A fire watch may be required (see Section 5, Fire Prevention).

14. Oxygen/Fuel Gas Welding and Cutting

Oxygen/fuel gas welding and cutting shall be controlled in a safe manner. Refer to Section 12 Welding and Cutting—General for additional requirements.

Responsibilities

1. Each employer shall develop, document, and utilize oxygen/fuel gas welding and cutting safety procedures as required.
2. All workers involved with oxygen/fuel gas welding and cutting shall be instructed on the safety significance, purpose, and use of oxygen/fuel gas welding and cutting safety procedures and maintain a record thereof. Training records shall be made available for review.
3. Each employer shall advise all other affected persons when their safety will be impacted by oxygen/fuel gas welding and cutting.

Basic Rules for Oxygen/Fuel Gas Welding and Cutting

1. Cylinders shall never be dropped or struck.
2. Cylinders shall be stored away from any source of heat.
3. Where stored in the open, cylinders shall be protected from continuous sunlight.
4. Oxygen cylinders shall be stored at least 20 ft away from those containing any fuel gas.
5. Where stored inside, oxygen cylinders shall be separated from those containing fuel gases by a 5-ft-high, noncombustible barrier with a fire rating of at least 0.5 hr, or they shall be separated by a 20-ft distance.
6. Cylinders shall be stored vertically and secured to prevent them from falling over.
7. Cylinders shall never be lifted by machinery unless they are in a safe stand or cradle or are otherwise positively secured against falling or being dropped.
8. Special arrangements shall be made to secure cylinders while they are being transported. Carrying them loose on the back of a truck or in a pickup is prohibited.
9. Caps shall be firmly screwed onto cylinders except when the cylinders are connected to a regulator during use.
10. Oxygen cylinders shall be kept free from oil or grease. Use of oil or grease as a lubricant for oxygen valves or attachments is prohibited.
11. Smoking or flame is prohibited near welding gas cylinders or outlets.

12. Field adjustment or repair of gauges, valves, accessories, or safety devices is prohibited.
13. Acetylene shall not be used for welding or cutting at pressures exceeding 15 psig.
14. Fuel gas cylinder valves shall not be opened more than one full turn, and the wrench shall be left on the valve stem so that the valve can be closed quickly if necessary.
15. Oxygen cylinder valves shall be opened fully and made hand-tight against the back seat. This takes the high-range cylinder pressure off the packing.
16. Mixing gases in cylinders, refilling cylinders, or using cylinders for any use except their original purpose is prohibited.
17. It is permissible to close torch valves alone only when work is briefly suspended and the operator is nearby. Any other interruption of use (e.g., if one cylinder becomes empty) necessitates closing the cylinder valves, followed promptly by opening the torch valves to purge lead-hoses and releasing the regulator screws.
18. Hoses shall never be hung from regulators, other equipment, or the cylinder tops.
19. Reverse-flow check valves or flashback arrestors shall be provided on oxygen and fuel gas systems.
20. A fire watch may be required (see Section 5, Fire Prevention).

15. Excavation, Trenching, and Shoring

All excavations, including trenches shall be protected to prevent cave-in or loose soil falling into excavations through shoring, bracing, sheet piling, underpinning, sloping, or other methods.

Responsibilities

1. Each employer shall develop, document, and utilize excavation safety procedures as required.
2. Before beginning any excavation or trench that is 5 feet deep or more, the employer shall submit to the Construction Manager for review and approval a detailed written plan showing the design of shoring, bracing, sloping, or other provisions to be made to protect workers from the hazard of caving ground during the excavation. The proposed plan shall comply with the standards established by State of California, CCR Title 8, and California Building Standards Code (CBSC)(formerly CCR Title 24). If the detailed plan varies from such shoring system standards, it shall be prepared by a California registered civil or structural engineer whose name and registration number shall be indicated on the drawings. If a dispute arises as to whether the plan shall be prepared by a registered civil or structural engineer, the University's determination of the matter shall be final and conclusive on the Subcontractor. The cost of required engineering services shall be borne by the Subcontractor and shall be deemed to have been included in the amount bid for the work as stated in the Agreement. Neither the review nor approval of any plan showing the design of shoring, bracing, sloping, or other provisions for worker protection shall relieve the Subcontractor from the obligation to comply with CCR Title 8 and CBSC for the design and construction of such protective work, and the Subcontractor shall indemnify the University from any and all claims, liability, costs, actions, and causes of action arising out of or related to the failure of such protective systems. The Subcontractor shall defend the University, its officers, employees, and agents in any litigation or proceeding brought with respect to the failure of such protective systems.
3. **Excavation Permit Process:** Permission to proceed must be obtained from the Construction Manager prior to digging, grading, tunneling, trenching, and/or drilling. Note this requirement also applies to penetration of slabs on grade by jack hammering, power and pneumatic activated tools, etc. Of particular concern is the prevention of contact with live electrical conductors or other significant hazards (e.g., natural gas lines, water lines, air lines, etc.). The intent is to minimize the chance of injury or death to personnel and disruption of essential services. Soil excavations less than one foot deep or penetrations related to replacement of existing apertures (fence posts, sprinkler repairs, sign posts, etc.) within original space are exempted from this requirement. The

Construction Manager is responsible for obtaining a Soil Excavation (digging, grading, tunneling, trenching, and/or drilling) Permit from the LLNL Plant Engineering Maintenance Operations Division. Refer to Maintenance Operations Procedure (MOP) MOP-02003, Soil Excavation (Digging, Grading, Tunneling, Trenching, and/or Drilling) Permit Procedure.

Prior to excavation or slab penetration, attempts must be made to locate underground utilities. The Construction Manager (Responsible Person) for the soil excavation/penetration operation shall assure that the following actions are accomplished:

- a. Review available project drawings and coordinate with the appropriate utilities.
- b. Review drawings and other historical documentation.
- c. Collect information from knowledgeable employees based on personal recollection of construction in a particular area.
- d. Make on-site observation of existing conditions such as exposed conduit, manholes, valve boxes, nearby equipment, and like items.
- e. Perform any additional methods the Responsible Person deems necessary to assure safe working conditions.
- f. Mark the area to be excavated in white paint as per California Code 4216.
- g. Bring all pertinent, most recent drawings, including an enlarged section of the site map showing the location of the proposed excavation, to the Central Permit Desk to schedule a PE Utility Locator survey or get a Locator tracking number and appropriate forms (for Locator Contractor).
- h. Have a survey of the proposed work area completed by a qualified locator service and reviewed by the LLNL Utilities Group prior to pulling the permit. Locator services are available through off-site locator contractors or on-site through Plant Engineering Locators. The duties of the locator service are detailed in MOP-02003. They include using active/conductive locating (radio frequency conductive equipment) as opposed to passive/inductive locating whenever practical, or any other means necessary.
- i. Complete a Soil Excavation Job Safety Analysis Reference Checklist for the typical items that should be considered prior to any penetration action.

Issuance of a permit should not be considered as approval to begin penetration actions. Permission to start penetration actions shall be granted by the Responsible Person only after it has been determined that the workplace conditions are safe for these operations.

A copy of the Approved Permit Package shall be posted at the job site. The package will include the Permit, Locator report form, and detailed locator's drawing.

Upon completion of the excavation project, the Responsible Person shall submit a completed permit and required documentation.

Excavation Process for Identified Interferences

The following procedures shall be followed when performing excavations near identified interferences:

- a. Any jackhammer work performed under this procedure shall be accomplished using the following personal protective equipment: 0–5kV rated insulating gloves with moisture absorbing liners and rubber soled shoes. The insulating gloves must be tested in accordance with the manufacturer's standards.
 - b. Excavation within 30" of a known utility must be hand dug or excavated until the utility is located or to the required depth.
 - c. Excavation that will cross existing location utilities shall be performed by hand or air knife until required depth is reached or utility is physically located.
 - d. Excavation that is paralleling or nearly paralleling (15 degrees) utilities shall be performed by hand until required depth is reached or utility is located. Repeat every 25 feet along parallel or nearly parallel trenches if actual location is at uniform depth. Decrease distance to 10 feet if depth is not uniform.
 - e. If feasible, secure located utilities by proper lock and tag procedures during the hand excavation process.
 - f. As appropriate, execute work under supervision of a competent person as defined by CFR 1926, Section 650 to 651.
4. Each employer shall instruct their employees in the safety significance, purpose, and use of the excavation safety procedures, and maintain a record thereof. Training records shall be made available for review.
 5. Each employer shall advise all other affected persons when their safety will be impacted by excavations.
 6. Each employer must conduct daily inspections of excavations under their control to ensure that the requirements of the excavation safety program are being followed. Excavations shall be inspected by a designated competent person. Inspection documentation shall be delivered to Construction Management.
 7. Each employer shall submit a list of qualified and competent persons for excavation safety to Construction Management.

Basic Rules for the Excavation Safety Program

1. Workers shall not enter or work in any excavation that has not been properly shored, sloped, benched, shielded or otherwise protected from cave-in.
2. All excavations shall be under the control of a competent person who is both capable of identifying existing and predictable excavation hazards, and authorized to take prompt corrective measures to eliminate them. The competent person shall make daily inspections of excavations and the adjacent areas. Excavations shall be inspected by the competent person prior to work and as often as needed throughout the work shift. Inspections shall also be made after rainstorms.
3. All shoring shall be installed, maintained, and removed only by workers trained to install the shoring system being employed. Hydraulic shoring shall be installed in accordance with the OSHA tables, and the manufacturer's data and recommendations.
4. Suitable temporary barricades, fences, or other structures as required for the protection of public traffic and employees shall be provided around excavations. Barricading of excavations and trenches shall conform to LLNL standards. Lighted barricades must be used on all roadways. Excavations in remote locations shall be barricaded. Refer to the contract for barricading requirements.
5. All personnel bridges over trenches or excavations 2 feet or more wide must be equipped with standard safety railing. Workers shall not attempt to jump across excavations or trenches.
6. Excavations may be considered confined work spaces and shall initially be treated as such when access is necessary. Refer to Section 7 Confined Space Safety Precautions regarding entry into excavations.
7. Excavation spoil piles shall be located sufficiently far away from the excavation so that the toe of the pile of excavated material is at least 2 feet from the edge of the excavation.
8. A safe means of access including ladders, stairs, steps, ramps, etc., shall be provided for all excavations 4 feet or greater in depth. Ladders shall not be located further than 25 feet from workers in an a trench or excavation unless other means of access are provided.
9. When working in excavations, workers shall stay within the protected areas of the excavation (e.g. stay within the shoring, trench shield, etc.).
10. Workers must keep alert for changing ground conditions or signs of possible movement. If any unsafe excavation conditions are found, exit the excavation immediately and report the conditions to your supervisor and to the designated competent person. Do not allow others to enter the excavation until unsafe conditions have been corrected.
11. Heavy equipment shall not be allowed to work near the edge of excavations where personnel in the excavation would be at risk from the equipment

toppling into the excavation. Stop logs, barricades, or berms shall be used to prevent heavy equipment from rolling into excavations.

12. SARA/OSHA training is required for employees handling contaminated soil.

16. Fall Protection

Falling while on the job is a leading cause of serious injury to workers. Whether tripping and stumbling or falling from elevated work, the outcome can be as devastating to the worker. Protection from falling demands careful planning to prepare the work environment and provide all necessary equipment to control identified falling hazards. Constant diligence is also necessary on the part of workers to protect themselves from falling. Fall hazards should first be controlled through designs or engineering practices that eliminate the exposure. When this is not possible, fall protection is routinely provided through the proper use of guardrails, nets, and personal fall arrest systems. Fall restraint is an important practice that should be applied when using personal fall protection equipment. Fall restraint systems allow the employee to move only as far as the sides of the working level or working area, but avoid falling. This is different from the use of personal fall arrest systems that are designed to protect the worker but do not by themselves prevent the fall from occurring. Positioning device systems are also used to provide fall protection. These systems protect the employee only when he/she is actually at his/her working location. While moving to or from that location, workers may not be adequately protected. Other controls are necessary when using positioning device systems. All fall protection shall be used and maintained in a safe manner to prevent injury to workers.

Responsibilities

1. Each employer shall develop, document, and utilize fall protection equipment and safety procedures as required.
2. All workers who may be exposed to fall hazards must be instructed on the safety significance, purpose, and use of fall protection equipment and procedures, and maintain a record thereof. Training records shall be made available for review.
3. Each employer must conduct inspections of fall protection equipment under their control to ensure that the requirements of the fall protection safety program are being followed. Fall protective equipment such as body harnesses, positioning belts, lanyards, safety lines, rope grabs, retractable lifelines and reels, etc., must be inspected at least every six months and documented. Inspection documentation shall be delivered to Construction Management.
4. Each employer shall submit a list of Qualified and Competent persons for fall protection to Construction Management.

Basic Rules for Fall Protection

(Note: These fall protection requirements may be different from current OSHA regulations on fall protection. They are specific to work at the NIF Project. Additional fall protection requirements are addressed in other sections of this appendix to the *Construction Safety Program for the National Ignition Facility*.)

1. Workers shall be protected against falling whenever a fall hazard exists.
2. Personal fall restraint systems designed to prevent the potential for falling are preferable to dependence on personal fall arrest systems.
3. NIF is a 100% tie-off project requiring the wearing of two shock absorbing lanyards, at least one of which must be attached to a secure anchorage when exposed to a fall greater than six (6) feet. The use of a positioning device and an additional shock-absorbing lanyard while climbing is also acceptable to meet this requirement. (Note that this is different from current OSHA interpretation regarding protection requirements while changing location.)
4. Fall protection is required on all open sides and edges of walking/working surfaces (horizontal and vertical surfaces) with an unprotected side or edge that is 6 feet (1.8 m) or more above a lower level. Fall protection is also required (but not limited to) when workers are exposed to a fall of 6 feet or more when working as follows:
 - a. Near leading edges.
 - b. In hoist areas.
 - c. Near holes (including unprotected skylights), shafts, pits, excavations, ramps, runways, and above dangerous equipment.
 - d. Near wall openings (where the inside bottom edge of the opening is less than 39 inches above the walking surface).
 - e. On formwork and reinforcing steel.
 - f. On scaffolding.
 - g. During steel erection, overhand bricklaying, precast concrete erection, and roof work.
 - h. Working on cranes and derricks.
5. Fall protection shall be provided by use of guardrail systems, safety net systems, personal fall arrest systems, positioning device systems (when permitted), and covers, fences, or barricades as required. The use of warning line systems, controlled access zones, and safety monitoring systems must be reviewed and approved by the Construction Manager prior to their implementation as a means of fall protection.
6. Holes (including skylights) shall be protected by covers or guardrails. Floor hole covers shall be marked with the word "HOLE" or "COVER." Covers shall be strong enough to support the intended load, and shall be secured to prevent unintended displacement.

7. Standard guardrails shall be installed in accordance with OSHA requirements. Toeboards or screens are required when necessary to protect against falling objects.
8. Only full body harnesses are permitted. Body belts are not allowed except when used as part of a positioning device system or otherwise allowed. A lanyard made from chain, rope, webbing, wire, etc., may be used with a body belt for positioning use only.
9. Each worker shall also wear a safety harness with a safety lanyard secured to a separate lifeline while working from swing scaffolds, bos'n chairs or other suspended work platforms where a falling hazard is present.
10. Anchorage points used for personal fall arrest systems shall be capable of supporting at least 5000 pounds per employee attached. (Note: Anchorage points under the supervision of a Qualified person may meet other requirements.) Anchorage points for positioning device systems shall be capable of supporting at least 3000 pounds. Anchorage points for personal fall restraint systems shall be capable of supporting four times the intended load.
11. Harnesses, body belts, lanyards, and other fall protection components shall be used only for employee protection and shall not be used to hoist or hold materials.
 - a. Personal fall arrest systems and components subjected to impact loading shall be immediately removed from service and shall not be used again for employee protection until inspected by a competent person.
 - b. Snaphooks shall be of a double-locking type. Unless the locking gate meets the 5000-pound breaking strength requirements for snaphooks, the snaphooks shall not be engaged to each other; directly to webbing, rope, or wire rope; to horizontal lifelines (a separate ring or carabiner should ride on the horizontal lifeline); or to any object that is incompatibly shaped or dimensioned in relation to the snaphook such that unintentional disengagement (e.g., roll-out) could occur.
 - c. Personal fall arrest equipment shall not be attached to guardrail systems.
 - d. Personal fall arrest equipment shall be inspected prior to each use for damage, wear, and other defects. Defective equipment must be removed from service.
 - e. Safety nets shall be provided when work places are more than 25 feet above the ground or other surfaces where the use of ladders, scaffolds, catch platforms, temporary floors, safety lines, or safety harness use is impossible.

17. Steel Erection and Installation of Decking, Flooring, and Grating

Steel erection, including installation of decking, flooring, and grating is recognized as an inherently hazardous construction activity. All steel erection shall be conducted in a safe manner to prevent injury to workers.

Responsibilities

1. Each employer shall develop, document, and utilize steel erection safety procedures as required.
2. All workers involved with steel erection must be instructed on the safety significance, purpose, and use of the steel erection safety procedures, and maintain a record thereof. Training records shall be made available for review.

Basic Rules for Steel Erection

1. Fall protection shall be provided to workers when they are exposed to a fall hazard of 6 feet or more. Fall protection shall meet the requirements of Section 16 and OSHA Steel Erection requirements.
2. Workers are not permitted to walk on top of structural steel at any time without having fall protection. Straddling and walking on the side flanges also requires fall protection.
3. Ladders, scaffolds, lifts, etc., shall be used to reach elevated locations. Climbing or sliding down structural steel from one level to another is not permitted.
4. Welders and other workers who are performing stationary work shall use fall protection attached to a secure anchorage.
5. When placing solid web structural steel members, the load shall not be released from a hoisting line until the members are secured with not less than two bolts at each connection and drawn up wrench tight.
6. When placing open web steel joists on structural steel framework, or placing loads on open web steel joists, the structural framework and open web steel joists shall be safely bolted together.
7. Structural steel framework shall be temporarily guyed or braced to prevent collapse.
8. Bolts, drift pins, tools, etc., shall be secured against falling. Air hose connections shall be restrained.
9. "Christmas-treeing" of structural steel shall not be allowed.
10. Tag lines shall be used to control loads.
11. When wire rope is used as a floor periphery-safety railing, the wire rope shall be 1/2-inch diameter, installed approximately 42 inches high, and flagged at not

more than 6-foot intervals. A minimum of 3 each drop-forged wire rope clips shall be used at each connection point or splice.

12. Workers shall not perform welding, burning, or open-flame work on any staging suspended by fiber or synthetic rope.
13. Workers shall use barricades to preclude any personnel below from being subject to any falling objects.

18. Working with Asbestos

All work with asbestos shall be conducted in accordance with the provisions of 8 CCR, 29 CFR 1926.58, the asbestos safety criteria subcontract specifications, and Supplement 21.19 of LLNL *ES&H Manual* (available through the construction manager or Program construction coordinator). All asbestos-related work shall be performed only by personnel/employees who have received appropriate training mandated by CAL/OSHA.

19. Radiation Safety

All use of radioactive materials, ionizing radiation sources, or radiographic equipment shall comply with “Occupational Radiation Protection; Implementation of 10 CFR 835” (H&SM S33.02) in Volume II of the ES&H Manual. The Quality Manager of Construction (QMC) Area Manager (AM) or Construction Manager shall be notified before the start of work with radioactive materials, ionizing radiation sources, or radiographic equipment, including soil density measurement and field radiography of pipes, vessels, and structures, or when work will occur in areas where access is controlled for radiation safety purposes.

Responsibilities

1. All workers shall comply with NIF radiation safety requirements.
2. Before the start of a job involving radioactive materials, ionizing radiation sources, or radiographic equipment, the QMC, AM, or Construction Manager shall notify the Construction Safety Officer who will alert the cognizant ES&H Team 2 Health Physicist.
3. When radiation dosimeters are issued to contract/subcontract personnel, they shall be exchanged at least on a quarterly basis (monthly, if required) and turned in at the completion of the assignment.
4. When construction work will be performed in a work area that has access controls for radiation safety, subcontractor personnel will be briefed on radiation safety requirements.
5. If a subcontractor will be providing services that, if performed off site, would require licensing or registration by the State of California Radiological Control Department or the Nuclear Regulatory Commission, he/she must supply a copy of the license for review by Hazards Control.
6. Subcontractors must obtain written approval from Hazards Control before bringing radioactive materials (e.g., radioactive materials used in soil density gages or radiography equipment) on site and before using radiation generating devices (e.g., x-ray machines) on site.
7. The Construction Manager shall submit the necessary documentation for review and approval by the ES&H Team. Approval shall be documented using a LLNL Radiation Work Permit for Visitors.

General Radiation Safety Guidelines for Field Radiography

1. Various State of California registration requirements apply:
 - a. Radiographic (Field Radiography)
 - b. Accelerator under 10 MeV
 - c. Accelerator 10 MeV or over

2. Field radiography is subject to the following conditions:
 - a. Radiation performance requirements
 - b. Labeling requirements
 - c. ANSI N432 requirements
 - d. Security requirements
 - e. Radiation survey instruments
 - f. For gamma sources: leak tests, inventory, etc.
 - g. Inspection and maintenance
 - h. Training requirements
 - i. Operating and emergency procedures
 - j. Personnel monitoring controls
 - k. Operating procedures for radiography
 - l. Documentation and records

Radiation Work Permit

See attached LLNL Radiation Work Permit for Visitors.



LLNL Radiation Work Permit for Visitors

Vaild from: _____ **(date) to:** _____ **(date)**

Administrative Information

Company name:
 Company address:
 Date and location of work:
 Type of work to be conducted:
 Authorization license (e.g., state license number):

Health Physics/ALARA Review

Can the contractor show:

- | | |
|--|--------|
| • Written operational procedures? | Yes/No |
| • Written safety procedures? | Yes/No |
| • Documented employee training equivalent to DOE Radiological Worker I? | Yes/No |
| • Calibrated instruments appropriate for the type of radiation involved and the environment? | Yes/No |

Note: If the answer to any of these questions is “no,” provide site-specific safety controls below.

Safety Controls

Who will provide safety support services during LLNL/Contractor radiological operations?

The Contractor shall:

- Wear an LLNL dosimeter while on site.
- Follow the specified procedures.
- Implement the following site-specific controls:

 ES&H Team Health Physicist or Team Leader

 Responsible Contractor

 Quality Manager of Construction or Area Manager

 Project Safety Manager

20. Hand Tools

All hand tools, whether self-owned or company-furnished, shall be maintained in safe condition and comply with the applicable requirements.

Responsibilities

1. Each employer shall develop, document, and utilize hand tool safety procedures as required.
2. All workers shall comply with the Basic NIF Project Site Hand Tool Safety Rules listed below.

Basic NIF Project Site Hand Tool Safety Rules

1. Damaged or Defective Tools. Do not use broken, defective, burned or mushroomed tools. Report defective tools to your supervisor and turn tool in for replacement.
2. Hard Facing. Do not strike two hardened steel surfaces together; i.e., two hammers or a hammer and hardened steel shafts bearings, etc.
3. Power Tools. Only assigned, qualified operators will operate power, explosive actuated or air driven tools.
4. Proper Tool. Always use the proper tool and equipment for any task you may be assigned to do. For example: do not use a wrench as a hammer or a screwdriver as a chisel.
5. Storage. Keep tools in their proper storage place when not in use. Do not leave tools where they might present a tripping hazard, fall on somebody or be stolen. Do not carry sharp edged tools in your pockets.
6. Securing. TOOLS THAT ARE EXPOSED TO A FALL FROM ONE LEVEL TO ANOTHER, SHALL BE TETHERED TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO EQUIPMENT.
7. Guards. Guards required on power tools shall be used at all times. Switch-locking devices shall comply with the requirements of 29 CFR 1926.300. Power grinders shall have protective shields.
8. Refueling. All gasoline- or diesel-powered tools and equipment shall be stopped during refueling.
9. Powder-actuated. Studguns, powder-actuated, and powder-assisted industrial tools must be designed and equipped to prevent free flight of any projectile. Operators shall be trained and licensed by the tool's manufacturer in the operation of the particular tool in use and carry a valid operator's card for the specific tool. Records of training and certification will be maintained by the subcontractor. Tools are never to be left unattended, except when properly stored.
10. Appropriate personal protective equipment shall be used.

21. Electrical Safety

Electricity when handled carelessly can lead to electrical shock, burns, or other serious injury or fatality. Electricity must be respected at all times. Worker exposure to electrical energy must be controlled.

Responsibilities

1. Each employer shall develop, document, and utilize electrical safety procedures as required.
2. All workers must comply with NIF electrical safety policy and requirements.
3. Any high-voltage work performed by LLNL High Voltage Crafts shall be performed in accordance with the LLNL High Voltage Operations Manual, including associated OSPs, as well as the NIF electrical safety requirements.

Basic Rules for Electrical Safety

1. Only trained, qualified, and authorized persons shall install wiring or perform work or repairs on electrical equipment.
2. Ground Fault Circuit Interrupter (GFCI) protection is required on all temporary 120-V, 15-20-A, single-phase electrical power circuits. This applies both indoors and outdoors.
3. Electrical power equipment (tools, machines, extension cords, etc.) shall be maintained in safe working condition free of electrical hazards such as frayed cords, missing ground connector pins, loose or missing grounds, or electrical shorting. Defective equipment must be tagged out of use and removed from service immediately.
4. Electric tools shall be grounded using three-prong plugs and receptacles (except for double insulated tools). All electrical equipment must be properly grounded.
5. Temporary power cords (extension cords) shall only be used in continuous lengths, free of splices. Where spliced, splices shall have insulation equal to that of the cable. Cords shall be routed in areas away from vehicle and pedestrian traffic flow. Temporary power cords shall not be supported with or attached to the building structures with nails, wire, or by conductive materials. Cords must be elevated above wet areas or standing water.
6. Temporary lights shall be equipped with guards to prevent unintended breakage or contact with energized parts. Guards shall not be required when the reflectors are constructed with bulbs that are deeply recessed. Temporary lights shall be equipped with heavy-duty electrical cords, with connections and insulation maintained in safe condition. Temporary lights shall not be suspended by their electric cords unless the cords and lights are designed for such suspension.

Temporary power must not be obtained by connecting to temporary lighting circuits.

7. Power distribution boxes, also known as “spider boxes,” approved for use in construction, shall be used to supply temporary power. Temporary power taps, better known as multiple outlet boxes, surge protectors, etc. are not approved for use in construction and shall not be used.
8. Only “Approved” electrical equipment and wiring methods shall be used. Improvising is not allowed.
9. Wiring methods and practices shall follow the National Electrical Code and the National Electrical Safety Code.
10. For non electrical work performed in proximity to energized equipment, see Section 22.
11. Control all sources of electrical power at all times. This can be accomplished during testing by closing equipment covers, installing temporary covers of equivalent protection (no use of cardboard covers), use of barricades, insulating blankets, or by stationing a person to warn others of exposed electrical energy.
12. High Voltage equipment, insulating gloves, blankets, grounding equipment, etc. shall be maintained in safe condition and tested for electrical defects at least quarterly. Results of testing shall be recorded and the records kept on file.
13. Only qualified High Voltage Electricians shall perform work on energized High Voltage circuits (i.e., 600 volts or greater) or equipment.
14. Use only the test instruments and insulated tools rated for the voltage and current specified.
15. Wear appropriate personnel protective equipment (PPE).
16. IT IS LLNL POLICY TO WORK ON OR NEAR ELECTRICAL CIRCUITS AND EQUIPMENT IN A DE-ENERGIZED STATE USING THE LOCKOUT AND TAG PROCEDURE, except where working on or near energized equipment is safer than de-energizing it or where it is essential for the equipment to remain energized. Programmatic convenience is not sufficient cause to work on or near energized equipment.

However, if there are no alternatives, and work on or near an energized electrical system is required, it will be done contingent upon the following conditions:

Approval is required prior to performing work on or near energized equipment.

A NIF Energized Electrical Work Permit must be secured five days prior to performing the work. The application for this permit will be made in writing to the QMC or Area Manager and will include a description of the work, when it is planned to occur, and a valid reason why it must be done in an energized condition.

The permit application will include a Job Hazard Analysis (JHA), specific to the activity, thoroughly identifying potential hazards and the procedures and supervision that will be implemented to eliminate them. It is intended that this

type of work will only occur in exceptional cases and only when advanced planning could not have avoided it.

These rules have been established to safeguard personnel from injury or death.

The immediate supervisor (foreman) of a worker found to be working on or near an energized electrical system without having first secured the above-mentioned permit and/or followed the procedures and safety measures committed to in the JHA will be subject to removal from the NIF Project.

17. Deenergize hazardous energy sources for the equipment or system. Lockout and tag all hazardous energy sources. Make sure that the controls will not operate the equipment or system and that all hazardous energy, including residual or stored energy is blocked, discharged, or relieved prior to starting work. Follow the Lockout and Tag Procedure, Section 24 when deenergizing any electrical power.
18. When handling acid or batteries, wear face shields and protective clothing such as rubber gloves and aprons. Immediately flush with water any acid coming into contact with your skin. Avoid breathing acid vapors.
19. Be alert to and strictly obey all warning and danger tags or signs around electrical apparatus. Do not close a switch that has a danger tag on it signed by or placed there by someone else.
20. LLNL has established hazard classifications for work on or near energized electrical equipment. The safe work practices for each class are based on the potential contact with exposed, energized parts operating at the levels specified. All system voltages are measured as RMS or DC values; pulsed systems require further analysis. Where the operating level may be in more than one hazard class, the work practices for the highest hazard class shall apply.

Note: A three-phase power source is a one-branch circuit, which counts as one source. A split-phase power source with a common neutral circuit (Edison circuit) counts as two sources.

Note: For the purposes of this section, a qualified person, competent person, or safety watch must be qualified to perform cardiopulmonary resuscitation (CPR). Refer to Table A-1 from the LLNL *ES&H Manual* below:

21.

Table A-1

Equipment/System Hazard Class	Work Practice
<p>Class 1: Includes systems with branch circuit voltage <140 V, branch circuit current limited to <30A, and exposed voltage <50 V. If the source is limited to <5mA, the exposed voltage may be >50 V. The stored energy for these systems is <10 J.</p>	<p>One qualified person may work alone on the equipment with general supervision.</p>
<p>Class 2: Includes relatively simple systems with exposed voltage <245 V and stored energy <10 J. Workers must fully understand all hazards associated with these systems.</p>	<p>One qualified person may work alone on the equipment with general supervision, but another competent person shall be positioned within visible and audible range of the worker.</p>
<p>Class 3: Includes systems with exposed voltage ≥ 245V and stored energy ≥ 10 J. These systems shall have no more than two exposed energy sources >50 V. Workers must fully understand all hazards associated with these systems.</p>	<p>The project engineer or supervisor shall assign two qualified persons to perform the work. These individuals must work within audible and visible range of each other. An OSP or management-approved written procedure specifically addressing the electrical hazards and controls is required.</p>
<p>Class 4: Includes any system or equipment that is not described in one of the previous categories. These systems are complex because they have energized, exposed parts and large, dispersed arrangements of components, and may not be well understood.</p>	<p>Two qualified persons and a safety watch are required to perform the work. An OSP, specifically addressing the electrical hazards and controls, is required. If the OSP is not signed by a Division Leader or higher level of management, then the worker must get written approval prior to beginning the work.</p>

NIF Energized Electrical Work Permit

Date/Time Work Started: _____ Date/Time Work Completed: _____

Job Location: _____

Description of the work to be performed: _____

Explain reason for performing the work in an energized condition: _____

Which energized work hazard classification* will you be working on: _____ Voltage(s): _____
Class 1 2 3 4 (circle)

* For hazard classification, refer to CSP, Appendix A, Section 21

Explain voltage in panels to be worked on: _____

Write a step-by-step procedure you will use while this work is still energized: _____

Names of qualified employees who will perform the work:

- 1. _____ 2. _____
- 3. _____ 4. _____

(Hazard Classes 1 and 2 require at least 1 qualified person to perform the work. Classes 3 and 4 require two qualified persons to perform the work)

Name(s) of qualified safety monitor(s):

- 1. _____ 2. _____

(Hazard Class 2 requires a second competent person within visible and audible range. Hazard Class 4 requires a separate safety watch in addition to the two qualified persons)

What tools will be used?: _____

Safety equipment to be used: _____

Journeyman in charge: _____ Supervisor: _____

Submitted by: _____

A Job Hazard Analysis specific to the work has been reviewed: Yes No (circle)

Approved by: _____
(QMC or Area Manager)

22. Nonelectrical Work Performed near Exposed High-Voltage Power-Distribution Equipment

All nonelectrical work performed in or near* exposed high-voltage (i.e., 600 volts or greater) power distribution equipment, including electrical lines, substations, switchyards, manholes/vaults, and other similar installations shall be in accordance with LLNL's guidelines (available through the cognizant NIF Construction Safety Officer). Included in the guidelines are activities such as wire pulling and splicing, excavating and trenching, boom/crane/manlift operations, fencing, lighting, drilling, and other construction work.

Responsibilities

1. All workers shall comply with NIF requirements, including 29CFR 1926, Subpart V – “Power Transmission and Distribution”, and California OSHA.
2. When work is performed in or near energized high-voltage power distribution equipment, authorization shall be obtained from the NIF Construction Management and Plant Engineering, Site Utilities Division, before work is started.
3. A determination shall be made of the possible hazards and of the protective equipment and precautions necessary for the safety of personnel.
4. Affected persons shall receive notification of the potential hazards and the necessary controls.
5. All LLNL employees and non-LLNL employees shall also comply with the LLNL Plant Engineering Management Policy Memorandum PE-08 (September 2, 1997).

Definitions

Qualified High-Voltage Electrical Worker: A qualified person who, by reason of a minimum of two years of training and experience with high-voltage circuits and equipment, has demonstrated to NIF Construction Management and LLNL management that he/she is familiar with the work to be performed and the hazards involved.

Qualified Employee: An employee who has sufficient training and experience on a particular type of electrical equipment to demonstrate to supervision that he/she is competent to complete the work to be done and is fully aware of the hazards involved.

***Near or in proximity to:** A situation in which, in the most extreme case, there is a potential that an employee or any materials, tools, and/or equipment may come in contact with the energized high-voltage source.

Basic Requirements

- a. In all cases, safety shall come first when performing nonelectrical work in proximity to exposed high-voltage power distribution equipment.
- b. No person other than a qualified high-voltage electrical worker shall perform work or take any object within the area where there is a hazard of contact with energized high-voltage power distribution conductors, unless directly under the observation of a qualified employee.
- c. Extraordinary caution shall be exercised in the handling of materials and the operation of equipment in the vicinity of energized high-voltage power distribution equipment.
- d. Safe working distances as expressed in the above provisions must be maintained.
- e. When practical, barricades or barriers shall be installed to prevent unintended contact with energized lines or equipment.
- f. Appropriate warning signs shall be posted near the barricades or barriers.

23. Aerial Lifts and Self-Propelled Elevating Work Platforms

All aerial lifts and self-propelled elevating work platforms (e.g., powered scissor lifts) shall be operated and maintained in a safe manner to prevent injury to workers, collapse, or tip over. Aerial lifts include manual vertical aerial platforms, powered vertical aerial platforms, and boom-supported aerial platforms (e.g., extensible boom platforms, articulating boom platforms).

Responsibilities

1. Each employer shall develop, document, and utilize aerial lift safety procedures as required.
2. All workers involved with the operation and use of aerial lifts and self-propelled elevating work platforms must be instructed on the safety significance, purpose, and use of aerial lift and self-propelled elevating work platform safety procedures and the operation and record maintenance thereof. Operators of aerial lifts and self-propelled elevating work platforms shall be trained in accordance with the manufacturer's operating manual and other rules as required. Operators shall be trained either on the same model of aerial platform or self-propelled elevating work platform or one having operating characteristics and controls consistent with the one to be used. Training records shall be made available for review.
3. Each employer shall advise all other affected persons when their safety will be impacted by the operation and use of aerial lifts or self-propelled elevating work platforms.
4. Each employer must inspect each aerial lift and self-propelled elevating work platform before use each day or at the beginning of each shift including a visual inspection and a functional test.

Basic Rules for Aerial Lift and Self-Propelled Elevating Work Platform Safety

1. All aerial lifts and self-propelled elevating work platforms shall only be operated by authorized and qualified workers.
2. All aerial lifts and self-propelled elevating work platforms shall be operated in accordance with the manufacturer's instructions. Only use the machine as it was intended.
3. Operators shall perform a workplace inspection before use and during use. The user shall check the area for the following types of hazards: drop-offs or holes, bumps and floor obstructions, debris, overhead obstructions and high-voltage conductors, hazardous locations, inadequate surface and support to withstand all load forces imposed by the lift, wind and weather conditions, presence of unauthorized persons, other possible unsafe conditions.

4. Operators shall not operate a damaged, defective, or malfunctioning machine.
5. Operating manuals must be provided with each aerial lift and stored in a weather resistant storage compartment.
6. Scissors-type work platforms shall be operated on firm level surfaces. Articulating or extensible boom-type lifts shall be operated on firm level surfaces as much as is possible and within guidelines established by the manufacturer. Aerial lifts or scissors-type work platforms may be equipped with tilt or other motion/capacity warning alarms. These alarms shall be operational. Do not alter or disable the limit switch(s). Operators shall not depend upon the tilt alarm as a level indicator.
7. Repositioning aerial lifts and self-propelled elevating work platforms while elevated shall only be done cautiously and carefully. The operator must make certain that the unit is on a level, firm surface free from hazards such as drop-offs or holes, bumps and floor obstructions, debris, depressions, ramps, etc. The operator must maintain a clear view of the path of travel, maintain a safe distance from obstacles, and maintain a safe distance from overhead obstacles. Operators shall not drive over 0.5 mph with the platform raised.
8. Traveling 50 feet or more with an aerial lift or self-propelled elevating work platform shall be done with the platform in the lowered or stowed position. Extensible or articulating booms should be retracted or folded. Care and slow speeds should be used while driving across uneven ground, ramps, debris, unstable or slippery surfaces, and near holes and drop-offs.
9. Outriggers, stabilizers, extendable axles, or other stability enhancing means are to be used as required by the manufacturer.
10. When other moving equipment and vehicles are present, special precautions shall be taken such as posting warning flags, roping off the area, using flashing lights, or installing barricades.
11. Care shall be taken to prevent entanglement of the aerial lifts and self-propelled elevating work platforms in ropes, electric cords, hoses, etc.
12. If the lift is to be left unattended, operators shall lower the platform, shut off the engine, engage the parking brake, and take necessary precautions to prevent unauthorized use.
13. Operators shall use the three (3)-point contact method (3 out of 4 arms and legs in contact with the machine) while mounting and dismounting. Never attempt to mount or dismount a moving machine or climb down the frame or boom from the platform or bucket when raised.
14. Operators shall not operate the machine unless the guard rails are properly installed and the entry is secured for operation. Operators shall attach the platform entry chain and close the entry gate before operating.
15. Only one designated person should operate the controls. Operators shall never allow anyone to tamper with, service, or operate a machine from the lower control stations while personnel are in the bucket or platform except in an emergency.

16. Operators shall be aware of crushing hazards when grasping the platform guard rail or edges of a bucket platform. Operators shall keep hands and limbs out of pinch points such as on scissors lifts.
17. Maintain safe distances between the operator, the machine, and fixed objects. A hard hat should be worn at all times when operating aerial lifts and self-propelled elevating work platforms.
18. Operators shall not use the drive maneuver in close to an obstruction. The operator shall place his/her machine, then use the raise, swing, and boom functions to get in close.
19. Operators shall wear approved fall protection devices as required for the type of machine. A full body harness must be worn by all occupants in a boom-supported aerial platform with a safety lanyard securely attached to the boom or bucket. The manufacturer’s fall protection requirements shall be followed when working from any type of aerial lifts or self-propelled elevating work platform. Operators shall never attach their lanyard to an adjacent structure except as provided below.
20. Operators shall not sit, stand, or climb on the platform guard rails or edge of the bucket. They shall maintain a firm footing on the platform floor at all times.
21. When required to exit or climb out of an elevated aerial lifts or self-propelled elevating work platform to a location not otherwise protected by guardrails, floors, or other continuous means of fall protection, operators shall use a second shock-absorbing lanyard to connect to the new location before disconnecting from the aerial lifts or self-propelled elevating work platforms. When entering an elevated aerial lift or self-propelled elevating work platform from an unprotected location, operators shall connect a shock-absorbing lanyard to the anchorage point in the aerial lift or elevating platform before entering.
22. Operators shall maintain safe distances from electrical power lines or conductors. They shall allow for boom or platform movement or electrical line sway or sag. Operators shall follow minimum safe approach distances (MSAD).

Minimum Safe Approach Distance (MSAD)		
Voltage Range (Phase to Phase)	Minimum Safe Approach Distance	
	(Feet)	(Meters)
0 to 300 V	AVOID CONTACT	
Over 300 to 50KV	10	3.05
Over 50 KV to 200KV	15	4.60
Over 200KV to 350KV	20	6.10
Over 350KV to 500KV	25	7.62
Over 500KV to 750KV	35	10.67
Over 750KV to 1000KV		13.72

23. Gasoline, diesel, or propane-powered lifts shall only be operated in areas with adequate ventilation to prevent the buildup of carbon monoxide or other hazardous gases. When these lifts are operated indoors, air monitoring is required.
24. Operators shall not operate the machine during lightning storms.
25. Operators shall not use the machine as a ground for welding. They shall disconnect both battery leads before performing any welding operations.
26. Operators shall not over load an aerial lift or elevating work platform. Occupants and equipment shall not exceed the maximum platform capacity (or the maximum capacity of the platform extension when so equipped).
27. Operators shall not increase the surface area of a platform or the load. By increasing the area exposed to the wind, the stability of the machine is decreased.
28. Operators shall not exceed manufacturer's limits when pushing on or pulling toward any object outside of the lift or platform.
29. Operators shall not attempt to increase the stability of a lift or elevating work platform by attaching it to an adjacent structure. Operators shall not tie or attach to adjacent structures.
30. Operators shall not modify or alter an aerial lift or elevating work platform. Mounting attachments for holding tools or other materials onto the bucket, platform, toeboards or guard rail system can increase the weight in the bucket or platform and the surface area of the platform or the load.
31. Operators shall not place or attach fixed or overhanging loads to any part of the machine.
32. Operators shall not place loads outside the platform perimeter.
33. Operators shall not use an aerial lifts or self-propelled elevating work platform as a crane.
34. Operators shall not use the machine to push or pull another object. Operators shall never use the boom to push the aerial lift along the ground or attempt to free a machine by lifting the wheels off the ground with the boom.
35. Operators shall not place ladders or scaffolds in platform or bucket, across handrails, or against any part of an aerial lifts and self-propelled elevating work platforms.
36. Operators shall not operate a machine in the path of any crane or moving overhead machinery unless the controls of the crane have been locked out and/or precautions have been taken to prevent any potential collision.
37. Operators shall not operate the machine or charge the battery in areas where potentially flammable or explosive gases or particles may be present.
38. Operators shall not use batteries that weigh less than the original equipment. Operators shall always wear protective clothing and eyewear when working with batteries.
39. No stunt driving or horseplay is allowed while operating a machine.

24. Lockout/Tag Requirements

All energy sources that have been deenergized for the purpose of construction, maintenance, repair, and/or modification shall be controlled through the use of lockout and tag procedures to prevent unintended reenergization. NIF Construction contractors/subcontractors should note that LLNL has elected to apply the Federal OSHA, General Industry Standards on lockout and tag (29CFR 1910.147) for construction-related energy control.

A “zero energy” state shall be applied to all operations involving:

1. Water pressure.
2. Hot water in excessive of 120 degrees.
3. Fuel gasses (in pipelines or cylinders).
4. Compressed air.
5. Hydraulics.
6. Mechanical (stored energy).
7. Electrical Energy.
8. Steam
9. Gravity
10. Exposure to systems that contain materials that are toxic or otherwise injurious to ones health upon contact or inhalation.

Responsibilities

1. Each employer shall develop, document, and utilize energy control procedures as required.
2. All workers must be instructed on the safety significance, purpose, and use of the lockout/tagout procedures, and these instructions must be repeated at least every six months. The employer must maintain a record of these instructions. Each new or transferred employee shall be instructed immediately upon assignment where this procedure may become a factor to the employee’s safety. Training records shall be made available for review.
3. Each employer shall advise all other affected persons when their safety will be impacted by an energy control action.
4. Each employer must conduct periodic inspections of the energy control procedure at least annually to ensure that the procedure and the requirements of the program are being followed. Inspection documentation shall be delivered to Construction Management.

Basic Rules for the Use of Lockout/Tagout Procedures

1. All equipment shall be locked and tagged out to protect against unintended or inadvertent operation when such operation could cause injury to personnel
2. Each worker working on the equipment must apply his/her own individual lock and tag. This will generally be done in one of two ways:
 - a. Individual Lockout:

The employee will shut down, lockout, and verify that all energy is controlled in the equipment before proceeding with the work.
 - b. Group Lockout:

One employee (such as a foreman) will shut down, lock out, and verify the equipment. He/she will use a multiple lockout device and/or place the key(s) in a lockout box or comparable mechanism near the equipment. As other employees in the group come to work on the equipment, they will place their locks on the multiple lockout device or lockout box, and remove them when they finish. This will ensure that the equipment cannot be restarted until all employees are finished working.
3. No one shall attempt to operate any switch or other energy isolating device when it is locked and tagged out.
4. Any unauthorized person found tampering with or removing lockout/tagout equipment will be subject to disciplinary actions as outlined in the Contractor's Program or under LLNL Policy.
5. Locks, lockout devices, and tags shall be standardized across the construction project in accordance with the LLNL Lockout and Tag Program.
6. An orderly transfer of lockout and tagout devices shall take place when personnel or shifts change as described in the NIF Lockout and Tag Procedure. Control of energy sources that extends beyond a single shift or personnel change shall be logged in the NIF Project Lockout/Tagout Log Book maintained by Construction Management.
7. Group lockout and tag procedures shall be followed when maintenance, repair, and/or modification activities are performed by a crew, craft, different contractors, or other group.
8. A written procedure is required for the lockout of equipment with multiple energy sources to ensure that all of the energy is controlled.
9. The preferred hierarchy for isolating hazardous processes from workers is:
 - a. Block-bleed-block (double block and bleed).
 - b. Block and blank/blind.
 - c. Where none of the above is possible, special procedures must be in place to ensure worker safety.
10. Use only positive shutoff valves (gate, globe, ball, plug, needle, etc.) as isolation valves. Do not use control valves, valves that have been modified for continuous flow, or check valves for isolation.

11. Push buttons, selector switches, interlocks, and other control circuit-type devices shall not be used as energy-isolating devices.

NIF Lockout and Tag Procedure

Purpose

This procedure establishes the minimum requirements for the lockout and tagging of hazardous energy sources whenever new installation of equipment or potentially energized systems (electrical circuits, piping, etc.), or maintenance or servicing is done on potentially energized systems, machines, or equipment. It shall be used to ensure that the system, machine, or equipment is stopped, isolated from all potentially hazardous energy sources, and locked out and tagged before authorized employees perform any new installation, servicing or maintenance.

Definitions

Authorized employee: A person who locks out and tags out systems, machines, or equipment to perform installation, servicing, or maintenance on that system, machine, or equipment. An affected employee becomes an authorized employee when that employee's duties include performing installation, servicing, or maintenance covered under this section.

Affected employee: An employee whose job requires him/her to install a system or operate or use a machine or equipment on which servicing or maintenance is being performed under lockout and tagout, or whose job requires him/her to work in a area in which system installation or such servicing or maintenance is being performed.

Group lockout: When installation, servicing and/or maintenance is performed by a crew, craft, department, different contractor, or other group under the control of an authorized employee.

Compliance with this Procedure

The Lockout and Tag Program applies to all NIF personnel. Only authorized employees shall perform the lockout/tag in accordance with the NIF Lockout and Tag Program. All employees, upon observing a machine or piece of equipment that is locked out and tagged, shall not attempt to start, energize, or use the machine or equipment. Failure to comply with this procedure may result in disciplinary action.

Lockout and Tag Procedure

(A) Sequence of Lockout/Tag

1. The supervisor notifies all affected employees that system installation work, servicing, or maintenance of their machines or equipment is required and that it must be shut down and locked out/tagged.
2. If the system or equipment is operating, disconnect the system (e.g., open the switch or breaker), and shut down equipment or machines using the normal shutdown procedure (e.g., depress the stop button; open the switch; and close valve).
3. Deactivate the energy-isolating device(s) listed in Step A-2 to isolate the equipment or machine from the energy source(s).
4. Lock out the energy-isolating device(s) with the authorized employee's lock(s) and attach a completed tag to each lock. Note that multiple sources of energy may need to be controlled (e.g., a machine or equipment may have more than one source of energy such as electrical and hydraulic). Only NIF-approved lockout devices and tags shall be used. Both a lockout device (e.g., a lock) and a tagout device (e.g., a danger tag) are required. Tagging only is not permitted. Contact NIF Project safety for guidance regarding instances in which lockout devices cannot be attached.
5. Stored or residual energy (such as that in capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure) must be dissipated or restrained by methods such as grounding, repositioning, blocking, or bleeding down.
6. Verify (**TEST**) the isolation of the energy sources from the system, machine, or equipment. The method must ensure that the equipment is disconnected from the energy source(s). First check that no one is exposed, then verify that the equipment is isolated by pressing the push button or operating other normal control(s), or by testing the equipment to make certain it will not operate. Use of appropriate test equipment may be required to verify that the equipment is deenergized. Whenever the authorized employee will be working near normally energized equipment or parts, these must be verified as deenergized using appropriate test equipment. Test equipment shall be verified as operational prior to use.

CAUTION: Return operating control(s) to the neutral ("off") position after verifying that the equipment is isolated.

CAUTION: Ensure the integrity of the lockout and tag procedure following any extended absence of the authorized employee.

7. THE SYSTEM, MACHINE, or EQUIPMENT IS NOW LOCKED OUT/TAGGED.
Work can now safely begin on the deenergized system, equipment, or machine.

(B) Sequence of Restoring the Equipment to Service

When installation of systems, servicing or maintenance is completed and the system, equipment, or machine is ready to be returned to a normal operating condition, follow the sequence of actions below.

1. Check the system, machine, equipment and the immediate area to ensure that nonessential items have been removed, that all components are operationally intact, and that all guards or other protective features are restored.
2. Check the work area to ensure that all personnel are safely positioned away from the system, machine, or equipment.
3. Verify that the controls are in the neutral position.
4. Remove the lockout devices and associated tags, then energize or reenergize the system, equipment, or machine. Each lockout device and tag shall be removed only by the authorized employee who attached them. In cases where the authorized employee who attached the lockout and tag devices is not available to remove them, the devices may be removed under the direction of the employer. Contact NIF Project safety for guidance. Note that removal of some forms of blocking devices may require reenergizing the machine before the blocking device can be safely removed.
5. Notify the Supervisor who, in turn, informs the affected employees that system installation, servicing, or maintenance is completed and the system, machine, or equipment is ready for use.

(C) Lockout and Tagout during Shift or Personnel Changes

To maintain continuity in the protection provided for those involved in the lockout and tag procedure and for the orderly transfer of the lockout and tag device, the steps below are necessary when personnel or shifts change:

1. Personnel Change. The arriving authorized employee's lock and tag shall be applied before the departing authorized employee's lock and tag are removed.
2. Shift Change. The lock and tag of at least one authorized employee on the arriving shift shall be applied before any locks and tags of the departing shift are removed. The departing crew will inform the arriving crew of the status of the equipment and the work in progress.
3. Control of energy sources beyond a single shift or personnel change shall be recorded in a log book maintained by each contractor/subcontractor or by the Construction Manager.

(D) Group Lockouts

When the number of workers performing the installation, servicing, and/or maintenance makes it impractical for each of them to apply their individual lock and tag directly to the energy isolating device(s), a group lockout procedure shall be used. The group lockout procedure shall afford the workers a level of protection

equivalent to that provided by the implementation of a personal lockout device. Group lockouts shall be implemented through the layered use of group lockout devices such as hasps, which accept multiple locks, lock boxes, or comparable mechanisms.

1. Group lockouts shall be under the control of a designated authorized employee (group leader, supervisor, foreman, worker, etc.). When more than one crew, craft, department, etc. is involved, the designated authorized employee shall be responsible for overall job-associated lockout control and shall coordinate affected work forces and ensure continuity of protection.
2. Primary responsibility is vested in the designated authorized employee or other authorized employee (for example, a foreman) for a set number of employees working under the protection of a group lockout/tag device.
3. Each authorized employee shall ascertain the exposure status of individual group members with regard to the lockout of the system, machine, or equipment.
4. When group lockouts are used, each worker must also apply his/her personal lock and tag to the group lockout device when they are working on the system, equipment, or machine, and shall remove those devices when they stop working on the system, equipment, or machine.

(E) Testing or Positioning of Machine, Equipment, or Components Thereof.

“Bumping,” testing or positioning of machines, equipment, or components thereof may require the lockout and tag devices to be temporarily removed. The following sequence of actions shall be followed:

1. Clear the machine or equipment of tools and materials as in Step B-1 above.
2. Check the work area to ensure that all personnel are safely positioned away from the system, machine, or equipment.
3. Remove the lockout and tag devices according to Step B-4 above.
4. Energize and proceed with testing or positioning.
5. Deenergize all systems and reapply energy control measures in accordance with Steps A-1 thru 6 to continue the installation, servicing and/or maintenance.

References

1. Construction Safety Program for the National Ignition Facility, Appendix A, Section 24 “Lockout/Tag Requirements.”
2. “Uniform Controls for the Use of Locks and Tags at the NIF,” a guidance document prepared by the NIF Safety Coordinator.
3. 29 CFR 1910.147 “The control of hazardous energy (lockout/tagout).”

25. Rigging

All rigging shall be used and maintained in a safe manner to prevent injury to workers or dropping of loads.

Responsibilities

1. Each employer shall develop, document, and utilize rigging safety procedures as required.
2. All workers involved with rigging must be instructed in the safety significance, purpose, selection and use of rigging, and rigging procedures, and maintain a record thereof. Training records shall be made available for review.
3. Each employer shall advise all other affected persons when their safety will be impacted by cranes and hoists.
4. Each employer must conduct inspections of rigging under their control prior to use and quarterly to ensure that the requirements are being followed. Rigging shall be inspected by a designated competent person. Inspection documentation shall be delivered to Construction Management.
5. Each employer shall submit a list of qualified riggers to Construction Management.
6. A NIF Hoisting and Rigging Safety Review is required prior to performing hoisting and rigging. Please refer to CSP, Appendix A, Section 26.

Basic Rules for Rigging Safety

1. Rigging of loads shall be performed by workers trained, qualified, and authorized to perform such work.
2. Rigging shall be adequate to support the intended loads. Special lifting devices, spreader bars, custom designed grabs, clamps, etc., shall be capable of handling the intended loads. These devices shall be marked to indicate safe working loads, and shall be proof-tested prior to use to 125 percent of their rated loads.
3. When temporary rigging such as wire rope lashing, come-alongs, chain falls, etc., are used for support during all erection sequences for machines, piping, platforms, walkways, and steel members such rigging shall not be removed until all leveling and alignment is complete and the item is secured in its permanent location.
4. Job or shop hooks formed from bolts, rods, rebar, etc., will not be used.
5. No "Christmas Treeing" shall be allowed on the construction project.
6. Rigging equipment will be inspected before each use, and as necessary during its use, to ensure that it is sound. All rigging equipment including, but not limited to, slings (wire and nylon), chain-falls, come-alongs, spreaders, lifting beams,

etc., shall be inspected on a quarterly basis. Records will be maintained and copied to the Safety Coordinator. The inspection shall be performed by a competent person and the rigging equipment color coded in accordance with the suggested color code for the quarter.

7. Defective rigging shall be tagged “Do Not Use” and immediately removed from service and repaired or destroyed to prevent their reuse.
8. Proper storage shall be provided for slings and other rigging.
9. Protection shall be provided between the sling and any sharp, unyielding surfaces.
10. Reels of wire rope must not be dropped from a car or truck. To keep the wire rope clean and dry during storage, it should be coated with a protective material (LEPRO) to seal out air and moisture. Whether in storage or in use, all wire rope should be kept well lubricated. Wire rope will not be stored where it might be exposed to acid fumes or other corrosive agents.
11. To avoid kinks, the reel of wire rope must be mounted on jacks or a turntable to allow it to revolve as rope is pulled off. During installation, the rope should be made to turn the same direction off the reel as onto the drum to avoid reverse bends. During the break in period, the new rope should be run without a load. The first load should be gradually increased to set the wire.
12. Wire rope will be discarded when found to contain: Six randomly distributed broken wires in one rope lay, three broken wires in one strand of one rope lay, or when the rope shows signs of excessive wear, kinks, corrosion, or other defects. Wire ropes with splices will not have less than three tucks.
13. “U” bolt wire rope clips shall be applied so that the “U” section is in contact with the “dead end” of the rope. Only drop-forged “U” bolts shall be used.
14. Drums and sheaves shall be of the proper size to match the flexibility of the cable. Sheaves shall be of the proper size so as not to pinch the cable. The grooves of drums and sheaves should be kept smooth, free of burrs or defects. Sheaves, drums, and rollers should be properly aligned. Misalignment causes excessive wear to the cable and, over a period of time, may wear off an entire flange of sheaves. Overwinding and cross-winding should be avoided; either will abrade and distort the rope. Check the groove diameter of all sheaves with a “groove gauge.” Using wire rope in an oversized sheave causes the rope to become flattened or distorted; using undersized grooves will pinch and tear the strands of wire. Check the sheaves and blocks for worn bearings. Allowing the sheaves to wobble on the pins will cause the wire rope to rub and wear the sides of the sheaves’ throat.
15. Do not overload trash and material skip boxes.
16. When using chain hoists and lever operated chain hoists:
 - Never use the load chain as a sling or choker.
 - Do not load the point of the load chain’s hook. Make sure the load is bottomed in the hook.

- Safety-latch or mouse all hooks.
 - If one load hook must handle more than one lifting cable or chain, use a shackle to join the lifting cables or chain, and place the shackle in the hook. Do not allow the hook's safety latch to support any part of the load.
 - Do not use chain hoists with chain that is twisted, kinked, or damaged. Make sure that multi-reeved chains are not twisted.
 - Do not use chain hoists or lever-operated chain hoists to lift or support people.
 - Before moving or rotating the load, make sure the load and the hoist will clear all obstacles.
 - Avoid making angle lifts of greater than 30° with a chain hoist. When drifting loads that use two or more chain hoists, be certain to pull the hand chain in line with the sheave.
 - Never use a chain hoist for a horizontal pull because it is difficult to engage the sprocket properly. Use lever hoists for these conditions.
 - Use only manual power to operate manual chain hoists.
 - Use a hoist with the correct capacity for the weight to be lifted.
17. Lever-operated hoists may be used safely to lift or pull a load at any angle or in any position. When using lever-operated chain hoists, observe the following minimum safety precautions:
- Rig the load chain carefully and keep it straight.
 - Do not use hoist-handle extensions.
 - To avoid serious chain damage or breakage, do not bend the load chain over objects under loading conditions.
 - Never gouge the side of the hoist frame with the load chain. Keep the load chain aligned with the work.
18. To avoid dropping a load when using a lever-operated hoist, make sure the pawl is engaged properly when the direction of load travel is changed.

26. Cranes

All cranes and hoists shall be operated in a safe manner to prevent injury to workers, collapse or tip over, or damage to property.

Responsibilities

1. Each employer shall develop, document, and utilize crane and hoist safety procedures as required.
2. Before erecting any fixed or mobile tower crane, each employer shall submit to the Construction Manager for review and approval a detailed written plan showing the tower crane design, bracing, nature and weight of anticipated loads, operating procedures, or other provisions to be made to protect workers from the hazard of tower crane collapse or tip over, a statement of current crane inspection certification, etc. The erection and operation of a fixed or mobile tower crane shall comply with the standards established by State of California, CCR Title 8.
3. Prior to set up and operation of all mobile cranes, each employer shall present the crane for a safety inspection or review of current crane inspection certification by the Construction Manager or his representative. The employer shall ensure and provide certification information as required by OSHA. Certification information shall verify that a thorough, annual inspection of the equipment has been made by a professional engineer or agency recognized by the governing body. Equipment owners are required by OSHA to maintain a record of the dates and results of inspections for each hosting machine and piece of equipment. Cranes found to be defective or not current in their annual inspection shall not be permitted to operate until all deficiencies have been corrected.
4. All workers involved with crane and hoist activities must be instructed on the safety significance, purpose, and use of crane and hoist safety procedures, and maintain a record thereof. Training records shall be made available for review.
5. Each employer shall advise all other affected persons when their safety will be impacted by cranes and hoists.
6. Each employer shall submit a list of qualified crane and hoist operators to Construction Management.
7. Each employer must conduct daily inspections of cranes and hoists under their control to ensure that the requirements are being followed. Cranes and hoists shall be inspected by a designated competent person. Inspection documentation shall be delivered to Construction Management.
8. A NIF Hoisting and Rigging Safety Review is required for any activity or operation involving a crane or overhead hoist (including manual-lever, hand-

chain, electric, or air-powered hoists) prior to performing any hoisting and rigging.

Basic Rules for Crane and Hoist Safety

1. Cranes and hoists shall be operated only by persons trained, qualified, and authorized to operate such equipment.
2. Cranes and hoists shall not be overloaded. Side pulls shall be avoided. Avoid sudden stops or starts that generate shock loading.
3. Loads shall not be passed or carried over workers. Employees shall not work beneath suspended loads until the load is safely blocked or landed.
4. Workers are not allowed to ride on loads, hooks, cables, load blocks, rigging etc.
5. All crane operation in proximity to electrical distribution and transmission lines shall be protected as outlined by OSHA requirements. A minimum separation distance of ten feet between the crane or load and an energized line is required at all times during operation.
6. All crane and hoist hooks shall have safety latches.
7. Cranes shall be operated in accordance with the following requirements:
The Supervisor of the crane operator shall:
 - a. Ensure that assignment of any operator places someone experienced and qualified in conjunction with a particular piece of equipment.
 - b. Survey the specific area where the crane will be operating, making certain that all interfering conditions and factors are pointed out to the operator, and that appropriate preventive action is taken prior to the start of operation.
 - c. Provide adequate job instruction to the operator.
 - d. Specifically instruct the operator that if any portion of the machine does not function properly, the machine is to be stopped, the Supervisor is to be contacted, and further instructions will be delivered.
 - e. Instruct the operator that he/she must be able to see the boom tip at all times. Be certain to keep height of rig below the limits established by the FAA.
 - f. Ensure proper operating and mechanical condition of the machine.
 - g. Exercise extremely good judgment about being present, and directly contributing to the handling of extremely heavy or difficult lifts.
 - h. Have the swing radius of the counterweight barricaded.
8. The Supervisor of personnel using the crane shall:
 - a. Survey the specific area in which the crane will be working making certain that all interfering conditions and factors are noted and that appropriate preventative action is planned and implemented before starting operation.

- b. Give adequate job instructions to all personnel concerned (especially the crane operator).
 - c. Assign a signal person(or more if required) who is knowledgeable about rigging practices, crane capacity and operating procedures to provide all signals to the crane operator.
 - d. Fully instruct the signal personas to the planned use of the crane. (In all cases involving assignment of one signal person or multiple signal persons, ensure that each understands his/her responsibilities.)
 - e. Whenever there is any question that the weight of a load to be handled or that the handling requirements of a particular load might overload the crane, the foreman shall have the weight of the load confirmed (by contacting the vendor directly or by some other means).
9. A signal person must be present at all times whenever:
- a. The crane is to be working within a boom's length of an electric power line(s).
 - b. The operator cannot clearly see the hook or load at times.
 - c. The machine is being backed or moved and the operator cannot see some parts of the machine or its path of travel.
10. The signal person shall:
- a. Position himself/herself in full view of the operator and, if using hand signals, be close enough for the signals to be seen clearly. His/Her position shall allow a full view of the load and equipment at all times, yet be such that there is no danger of being injured.
 - b. Be qualified by experience, knowledgeable in the operation, and able to coordinate actions with the crane operator by signals.
 - c. Be responsible for keeping all authorized personnel beyond the crane's operating radius.
 - d. Direct the load, ensuring that it never passes over the other personnel.
 - e. Stay in constant communication with the crane operator by either using approved hand signals, radio, sound-powered phones, or equivalent means of communication. High visibility gloves or vests may be used to help distinguish signal persons from other personnel, especially during night or inclement weather.
11. This procedure provides guidance for control of lifts with cranes that are considered to be "critical" lifts and not repetitive lifts.
- a. General Lifts that fall into this category are those lifts which:
 - i. Could cause significant work delay.
 - ii. Could cause undetectable damage resulting in future operational or safety problems.
 - iii. Could result in significant release of radioactivity or other undesirable conditions.

- iv. Could present a potentially unacceptable risk of personnel injury or property damage.
 - v. Exceed 75% of the crane's rated capacity for the crane configuration.
 - vi. Require two cranes to make the lift.
 - vii. Are located such that the load or the crane boom could fall onto electric power lines, transformers, pipelines, or vessels or reactors containing flammable, explosive, or hazardous gases or liquids, etc.
 - viii. Utilize poles and derricks that have been erected for a specific lift.
- b. Interpretation. Crane configuration as used in this procedure refers to variable parts of the crane such as boom length, boom angle, counterweight, outrigger's extended and set, tracks extended or retracted, and various jib attachments, headache ball, load block, lifting devices, etc.). All these items affect the gross capacity of the crane and shall be taken into consideration prior to lift.
 - c. Guidelines. If, in completing the permit, it is determined the lift equals or exceeds 95% of the crane configuration capacity for the greatest radius the load will achieve during pick, swing or set, the lift will not be made. If, changing the crane configuration within the manufacturing specifications, a greater gross capacity may be gained, the change shall be made. If not, a larger capacity crane shall be ordered and used. Bridge cranes are permitted to be operated up to, but shall not exceed, 100% of their rated capacity.
 - d. Responsibilities. A "Crane Lift" Permit will be completed by the employer prior to making any "critical lift." After the permit has been completed by the supervisor, the required personnel will review and sign-off on the lift permit in order listed on the permit. The NIF Associate Project Manager's signature is required for all "critical lifts." A copy of the permit will be placed in the cab of the lift-crane and the original will be filed in the employer's on-site office.
 - e. Other Hazards. For any electrical or other hazard(s) involved or associated with the operations, the appropriate hazard permit(s) will also be completed prior to the lift.
12. The use of a crane to hoist workers on a personnel platform is prohibited, except when the erection, use, and dismantling of conventional means of reaching the work site, such as a personnel hoist, ladder, stairway, aerial lift, elevating work platform or scaffold, would be more hazardous, or is not possible because of structural design or work site conditions. Federal Occupational, Safety, and Health Administration (OSHA) Standard 29 CFR – 1926.550(g), at a minimum, must be followed whenever hoisting employees by crane. The BIS Associate Project Manager approval signature is required prior to each time a crane-suspended work platform is to be used.
13. The following are additional requirements when operating overhead cranes and hoists:

- a. At the start of each work shift, operators shall perform a visual and functional inspection of the hoist and its controls including:
 - i. Test the upper-limit switch by slowly raising the unloaded hook block until the limit switch trips.
 - ii. Visually inspect the hook, load lines, trolley, and bridge as much as possible.
 - ii. If provided, test the lower-limit switch.
 - iv. Test all direction and speed controls for both bridge and trolley travel.
 - v. Test all bridge and trolley limit switches if operation will bring the equipment in close proximity to the limit switches.
 - vi. Test the pendant emergency stop
 - vii. Test the hoist brake to verify there is no drift without a load.
 - viii. If provided, test the bridge movement alarm.
 - ix. Lockout and tag for repair any crane or hoist that fails any of the above tests.
 - b. Center the hook over the load to keep the cables from slipping out of the drum grooves and overlapping and to prevent the load from swinging when it is lifted. Inspect the drum to verify that the cable is in the grooves.
 - c. Use a tag line.
 - d. Plan and check the travel path to avoid personnel and obstructions.
 - e. Lift the load only high enough to clear the tallest obstruction in the travel path.
 - f. Start and stop slowly.
 - g. Land the load when the move is finished.
 - h. Never leave suspended loads unattended. In an emergency in which the crane or hoist has become inoperative, if a load must be left suspended, barricade and post signs in the surrounding area, under the load, and on all four sides. Lock open and tag the crane or hoist's main electrical disconnect switch.
 - i. When completed with the lift, raise the hook at least 7 feet above the floor.
 - j. Store the pendant away from aisles and work areas, or raise it at least 7 feet above the floor.
 - k. Place emergency stop switch (or push button) in the OFF position.
14. Use of an overhead crane or hoist as a work platform should only be considered when conventional means of reaching an elevated work site are hazardous or not possible. Platforms shall meet the requirements in ASME B30.2: Platforms shall be provided with guardrails (42 inches high plus intermediate railing) and toeboards; The dimension of the working space in the vertical direction from the floor surface of the platform to the nearest overhead obstruction shall be a minimum of 48 inches at the location where a person is working on the

platform; Crane travel shall be prohibited or restricted while a person is on a platform and the overhead platform clearance is less than 78 inches at any location in the path of travel of the crane; platforms shall be designed to sustain a distributed load of at least 50 pounds per square foot. Workers shall not ride a moving bridge crane without an approved JHA or OSP, which shall specify the following as a minimum:

- a. Personnel shall not board any bridge crane unless the main disconnect switch is locked and tagged open.
 - b. Personnel shall not use bridge cranes without a permanent platform (catwalk) as a work platform. Bridge catwalks shall have a permanent ladder access.
 - c. Personnel shall ride seated on the floor of a permanent platform with approved safety handrails, wear safety harnesses attached to designated anchors, and be in clear view of the crane operator at all times.
 - d. Operators shall lock and tag open the main (or power) disconnect switch on the bridge catwalk when the crane is parked.
15. Multicrane operations (e.g., multiple tower cranes or tower cranes and mobile cranes) shall be conducted in a controlled manner such that contact between cranes, crane booms and load lines, load lines and loads, etc., of different cranes is avoided. The following rules shall apply:
- a. At the beginning of each operator's shift, communication shall be established and confirmed between operators of each crane. A brief explanation of the work to be done, if known, should be exchanged. All crane radios shall be checked at this time and periodically throughout the course of the shift.
 - b. Crane operators are primarily responsible for the safe operation of the cranes.
 - c. Safety will be maintained regardless of outside influences. The crane that is positioned and working shall have the right of way.
 - d. The crane coming into the area of conflict bears the responsibility of contacting the other crane and alerting the other operator of his/her intentions. Verbal response from the operator in the positioned crane is required before entering the area.
 - e. Operators of both cranes understand that visual coordination is predicated on the knowledge that one crane may have partially obstructed view when swinging into the conflict zone. When the operator of the crane with the obstructed view is swinging in from that direction, he/she shall inform the operator of the other crane of his/her intentions. The crane with the unobstructed view will then confirm or deny acceptability for the other crane to enter the conflict zone.
 - f. When proximity and speed of closure presents a concern to either operator, he/she will inform the other operator immediately and they will stop all movement until coordination can be agreed upon by both operators.

- g. Operators shall adhere to minimum clearance distance of ten (10) feet between each other unless both operators concur that further encroachment is safe and a radio-equipped spotter is used.
- h. In the event of contact, all crane operations shall cease immediately, and safety personnel and management shall be contacted. The situation will be reviewed, and the affected portions of the cranes will be inspected before operations resume.
- i. Under no circumstances are the cranes permitted to contact any part (i.e., line to boom, line to line) of each other.
- j. Adherence to these rules is mandatory. Any confirmed violation of these procedures may result in disciplinary action, up to and including termination.
- k. These rules are to be posted in the cab of each crane.

NIF HOISTING & RIGGING Safety Review

ALL HOISTING OPERATIONS MUST BE PLANNED TO INSURE THE SAFETY OF ALL WORKERS IN THE IMMEDIATE AREA

A hoisting and rigging safety review is required for any activity or operation involving a crane or overhead hoist (including manual-lever, hand-chain, electric or air powered hoists).

This hoisting and rigging safety review does not replace the need for a detailed submitted plan for critical picks, or items specified in the NIF Construction Safety Program.

To be completed by the Responsible Individual for the lift:

Hoisting Contractor or Work Group: _____
CSP or Work Package: _____
Location: _____
Name of Competent Rigging Person: _____
Material to be Hoisted: _____
Hoisting Mechanism: _____
Briefly Describe Operation: _____

I verify that the above location and proposed procedure has been reviewed by the competent rigging person for the contractor or work group:

Signed: _____ Date: _____

This Review is good for only one shift.

A completed copy of this review must be delivered to the Construction Manager (QMC or Area Manager).

NIF Hoisting and Rigging Safety Review

General Operating Rules

- (F) Assign a “Competent” rigger (knows weight reductions on chokers, hand signals, and has authority to make changes) to each lift.
- ☐ Determine the weight of the load.
- (G) Determine the loads on all rigging (chokers, shackles, lifting eyes, accessories, etc.).
- ☐ Do not exceed the rated capacity of the hoist, crane, rigging, or accessories.
- ☐ Avoid passing a load over other workers.
- ☐ Do not permit workers assisting with the lift to pass beneath or place body parts under suspended loads.
- ☐ Do not permit workers to stand or ride on suspended loads.
- ☐ Check chokers/straps/webbing/other rigging for damage. Do not use damaged or defective equipment.
- ☐ Ensure there are legible load rating tags on webbing chokers.
- ☐ Check safety latches on all hooks.
- ☐ Position the hook above the center of gravity of the load before lifting. Do not perform side pulls with cranes or hoists.
- ☐ Do not leave a suspended load unattended unless specific precautions have been instituted and are in place.
- ☐ Ensure that personnel involved understand how the lift is to be made.

Crane Hoisting

- ☐ Inform operator of pick description and destination.
- ☐ Attach an appropriate tag line (no knots, properly attached, minimum 6’ length).
- ☐ Have back-up communications to crane operator (radios).
- ☐ No Christmas-treeing of loads.

Manually Operated Hoist

- ☐ Test all controls before making a lift.
- ☐ Check mechanical hoist and all rigging and accessories for damage.
- ☐ Know limits of pick points (where hoist is attached). The supporting structure or anchoring means shall have a load rating at least equal to that of the hoist.
- ☐ Know load capacity of all components.
- ☐ Ensure all connections are positive and secured.
- ☐ Do not use a lever extension (“Cheater”) on manual-lever-operated hoists.

27. Housekeeping

These rules apply to the NIF Project site, laydown areas, and adjacent areas of LLNL used to support NIF construction activities. Failure by a contractor/subcontractor to keep areas under their control in a safe and clean condition may cause a stop-work order to be issued by the NIF Construction Manager.

Responsibilities

1. All employers and workers shall attempt to keep areas under their control in a safe and clean condition. Housekeeping Rules for the NIF Project Site
1. Clean-Up. Keep your work area clean and safe at all times. Always keep yourself, the equipment you operate or are using and your place of work as clean as practicable. All contractors are responsible for clean “broom swept” areas. Dust control is the responsibility of all contractors.
2. Employee Facilities. Cooperate in keeping change rooms, toilets, first aid and drinking facilities in clean, sanitary condition.
3. Good Housekeeping. Good housekeeping will reduce confusion on the project and will result in a safer, more efficient operation.
4. Nails & Exposed Rebar. Protruding nails, rebar, screws or other metal in form lumber, boards, etc., must be immediately removed, bent over or capped to prevent puncture injuries.
5. Oily Rags and Wastes. Oily rags, waste or other combustible debris shall be kept in metal container provided for that purpose. Saturated oily rags must be managed as hazardous waste.
6. Removal of Debris/Garbage. When cleaning up, do not throw or drop materials from elevated levels to lower levels unless the area below is properly barricaded and adequate warnings are posted.
7. Slipping Hazards. Clean up or eliminate slipping hazards such as grease, oil, water, ice, snow or other liquids on walkways, ladders, stairways, scaffolds or other access ways or working areas.
8. Trash and Debris. Deposit trash, refuse, debris, lunch papers and other waste in the proper refuse containers.
9. Tripping Hazards. Help keep the work area, especially roadways, access ways, aisles, stairways, scaffolds and ladders clear of obstructions which may cause tripping or other hazards.

28. Material Handling and Storage

These rules apply to the NIF Project site, laydown areas, and adjacent areas of LLNL used to support NIF construction activities. Failure by a contractor/subcontractor to keep areas under their control in a safe and clean condition may cause a stop-work order to be issued by the NIF Construction Manager.

Responsibilities

1. Each employer shall develop, document, and utilize material-handling and storage safety procedures as required.
2. All workers shall comply with NIF material-handling and storage requirements.

Material Handling and Storage Rules for the NIF Project Site

1. Access. When storing materials remember to leave adequate access ways. Do not block aisles or exits. Do not attempt to take shortcuts by climbing on or over stored materials.
2. Flammable/Toxic. Flammable and toxic or other harmful materials shall be stored in properly designated, well-ventilated areas. Observe and abide by “No Smoking” and other warning signs. Handling and Storage shall be in compliance with the requirements of sections 3 and 5 of Appendix A of the NIF Construction Safety Program.
3. Heavy Loads. Do not attempt to lift heavy loads without assistance. Learn how to lift properly by bending your knees and keeping your feet together. Avoid strain by lifting with your legs and arms, not your back. Use mechanical lifting equipment whenever possible and when necessary to avoid injury.
4. Life Lines. When working on material stored in silos, hoppers, tanks or similar storage areas, wear a safety harness attached to a life-line and have somebody standing by in case of an emergency.
5. Noncompatible Materials. Avoid stacking noncompatible materials in the same pile.
6. Storage. Storage of materials shall not create a hazardous or unsafe condition.

29. Lead

Due to the legacy aspects of compounds and paints that contain lead, lead shall not be used except as a shielding material unless there is no practical substitute and lead shall always be used only with the prior approval by the Laboratory. Any work involving the use of lead that is authorized by the Laboratory shall be conducted in a safe manner to prevent exposure to workers.

If lead work is authorized by the Laboratory, the cognizant Construction Safety Representative, in conjunction with the QMC or AM, shall issue a Lead Work Permit in accordance with Supplement 21.20 of the LLNL *ES&H Manual* to the individuals conducting the specific work, and a copy of the permit will be sent to ES&H Team 2 and the Construction Manager.

Responsibilities

1. Each employer using or exposing workers to lead must establish a lead safety program to ensure compliance with LLNL requirements of LLNL *ES&H Manual* Supplement 21.20, (a copy is available through the Construction Manager), Federal OSHA, and California OSHA requirements.
2. Each employer shall develop, document, and utilize lead safety procedures as required.

30. Concrete and Masonry Construction

All concrete and masonry construction shall be conducted in a safe manner to prevent injury to workers.

Responsibilities

1. Each employer shall develop, document, and utilize concrete and masonry construction safety procedures as required.
2. All workers involved with concrete and masonry must be instructed on the safety significance, purpose, and use of concrete and masonry construction safety procedures, and maintain a record thereof. Training records shall be made available for review.

Basic Rules for Concrete and Masonry Construction

1. Fall protection shall be provided to workers when they are exposed to a fall hazard of 6 feet or more. Fall protection shall meet the requirements of Section 16 and OSHA concrete and masonry construction requirements.
2. Mason's scaffolds shall meet OSHA requirements.
3. Ladders, scaffolds, lifts, stairs, etc., shall be used to reach elevated locations. Climbing or sliding down structural steel or formwork from one level to another is not permitted.
4. Loads shall not be placed on a concrete structure unless the structure or portion of the structure is capable of supporting the loads. This must be determined by a person who is qualified in structural design.
5. All protruding reinforcing steel onto and into which a worker could fall shall be guarded to eliminate the hazard of impalement.
6. Pneumatic pipes and hoses used to pump concrete shall have all connections restrained in addition to the mechanical coupling.
7. No worker shall ride concrete buckets.
8. No worker shall work under concrete buckets while the buckets are being elevated or lowered into position. Concrete buckets shall be routed to pass over the fewest number of workers.
9. Concrete workers shall wear proper personal protective equipment. Rubber boots or rubber over-boots are required on all workers who must step in wet concrete. Rubber gloves are required on all workers who will have hand contact with wet cement or concrete. Head (hard hat) and face protection (face shield, safety glasses, or goggles) are required on workers who handle or work in close proximity to concrete being applied through a pneumatic hose. Rain gear may also be required when placing concrete.

10. Workers whose clothing, gloves, or boots, especially leather, become wet with cement or concrete shall remove the clothing, gloves, or boots and change to new clothing. Hands or skin shall be kept clean of wet or dried cement. These precautions are to prevent skin irritation and cement burns.
11. Hearing protection may be required when noise levels from concrete operations exceed accepted standards.
12. Bull float handles used where they might contact energized electric lines shall be insulated or of nonconductive material.
13. Use lockout and tag procedure, see Section 24, when servicing or repairing any concrete or masonry equipment such as mixers, pumps, compressors, etc.
14. Formwork must be capable of supporting the intended loads without failure. Shoring that is found to be damaged or weakened shall not be used or shall be reinforced immediately. Shoring shall be inspected immediately prior to, during, and immediately after concrete placement.
15. Formwork and shoring shall not be removed until the concrete has gained sufficient strength to support its own weight and other imposed loads.
16. Precast concrete wall units, tilt-up wall panels, and structural framing shall be adequately supported to prevent overturning and to prevent collapse.
17. No workers are allowed under precast concrete members being lifted or tilted into position except those workers required for the erection of those members. Establish a limited access zone on either side of a precast member equal to the height of the member plus four feet. Do not remove the supporting load line until the member is set in place and is secured or adequately braced to prevent tip over or collapse.
18. Establish a limited access zone whenever a masonry wall is being constructed. The limited access zone shall be equal to the height of the wall plus four feet, and shall run the entire length of the wall. No other workers besides those actively constructing the wall shall be allowed into the limited access zone.
19. Masonry wall over eight feet in height shall be adequately braced to prevent overturning and to prevent collapse.
20. Masonry saws must be guarded with at least a semicircular enclosure over the blade. Operators of masonry saws must wear a face shield.
21. For safety requirements during lift slab concrete construction refer to OSHA requirements.

31. Lasers

All lasers shall be operated and maintained in a safe manner to prevent injury to workers. This section applies to the use of lasers as a construction tool, i.e., for surveying, setting ceiling and floor elevations, locating and aligning equipment, and also for the acceptance testing of NIF laser components and systems. It does not apply to operation of NIF laser components and systems once acceptance testing has been completed.

Before the start of a job involving Class IIIb or Class IV lasers, the System Manager or the QMC shall notify the Construction Safety Representative who will alert the LLNL Laser Safety Officer for a site evaluation. Safety procedures (Operational Safety Plan) may be required for operation of these lasers.

Responsibilities

1. Each employer shall establish laser safety controls to ensure compliance with ANSI Z136.1-1993 requirements.
2. Each employer shall develop, document, and utilize laser safety procedures as required.
3. All workers involved with the use of lasers must be instructed on the safe use of lasers and maintaining a record thereof. Operators of lasers shall be trained in accordance with the manufacturer's operating manual and other rules as required. Operators shall be trained either on the same model laser or one having operating characteristics and controls consistent with the one to be used. Training records shall be made available for review.
4. Each employer shall advise all other affected persons when their safety will be impacted by the operation and use of lasers.

Section 1. Lasers Used for Construction and Surveying

Only qualified and trained workers shall be assigned to install, adjust, and operate laser equipment.

1. Operators of construction and surveying lasers shall read and understand the manufacturer's instructions and understand the hazards associated with the laser equipment.
2. Proof of qualification of the laser equipment operator shall be available and in possession of the operator at all times.
3. Workers, when working in areas in which a potential exposure to direct or reflected laser light greater than 0.005 Watts (5 milliwatts) exists, shall be provided with antilaser eye protection. Laser eyewear shall be suitable to protect

for the specific wavelength of the laser and be of optical density adequate for the energy involved.

4. Beam shutters or caps shall be utilized, or the laser turned off, when laser transmission is not actually required. When the laser is left unattended or not in use for a substantial period of time, such as during lunch break or overnight, the laser shall be turned off.
5. The laser beam shall not be intentionally directed at employees.
6. Laser equipment shall bear a label to indicate maximum output or laser hazard classification.
7. Laser units in operation should be set up above or below eye height when possible.
8. Workers should not stare into any laser beam regardless of hazard classification. They should avoid looking or staring at reflected or diffuse beams.
9. The laser protective eyewear shall be worn at all times when required.
10. Areas in which lasers are used shall be posted with standard laser signs and labels appropriate to the wavelength and hazard classification.

Section 2. Laser Installation and Acceptance Testing of NIF Operational Lasers

1. Site evaluations shall be made by the LLNL Laser Safety Officer (or deputy LSO) when the use of Class IIIb or IV lasers are proposed. A Safety Plan related to a specific application will be required, with concurrence of the LLNL LSO.
2. Areas in which lasers are used shall be posted with standard laser signs and labels appropriate to the wavelength and hazard classification.
3. Appropriate laser barriers or shields shall be installed when necessary.
4. Only trained workers shall be assigned to install, adjust, and operate laser equipment.
5. Laser protective eyewear shall be worn at all times when required.
6. Electrical hazards associated with laser testing or operation shall be controlled in accordance with CSP, Appendix A, Section 21 Electrical Safety.

32. Pressure Safety

This section deals with pressure safety concerns including pressure and leak testing, and vacuum safety.

Responsibilities

1. Each employer shall develop, document, and utilize pressure safety procedures as required.
2. All workers assigned to install, test, adjust, and operate and maintain pressurized equipment must be trained for this type of work and for exposure to pressure and vacuum related hazards. Training records shall be made available for review.
3. Each employer shall advise all other affected persons when their safety will be impacted by the testing, operation, and use of pressurized equipment.

Definitions

1. **Low Pressure** – Gas pressure less than 150 psig (1MPa), or liquid pressure less than 1500 psig (10MPa).
2. **Intermediate Pressure** – Gas pressure from 150 to 3000 psig (1 –20 MPa gauge), or liquid pressure from 1500 to 5000 psig (10 – 35 MPa).
3. **High Pressure** – Gas pressure greater than 3000 psig (20 MPa gauge), or liquid pressure greater than 5000 psig (35 MPa gauge).
4. **Maximum allowable working pressure (MAWP)** – The maximum pressure at which a vessel is designed to operate safely. Working pressure, rated pressure, service pressure, and design pressure are the same as MAWP. NOTE: The setting of vessel or system pressure relief devices must not exceed the MAWP (ASME requirement).
5. **Maximum Operating Pressure (MOP)** – The maximum pressure at which a pressure component is normally operated, usually 10–20% below MAWP.
6. **Pressure Vessel** – A relatively high-volume pressure component (such as a spherical or cylindrical container) that has a cross section larger than the associated pipe or tubing.
7. **Manned-Area Operation** – Pressurization in environments where vessel failure might cause personal injury. Such vessels or systems have been approved for operation, within specified limits, with personnel present.
8. **Pressure Relief Devices** – Devices (relief valves or rupture-disc assemblies) designed to protect those components that are rated at less than the system supply pressure. All manned-area gas-pressure vessels must be protected by a relief device that is set at a pressure not exceeding the MAWP of the vessel or system.

9. **Remote Operation** – Pressurization in environments where vessel or system component failure would not cause personal injury. Remote operation equipment must be installed in test cells or behind certified barricades, or be operated from a safe location. Manned area operation (of a remote-operation vessel or system) for the purpose of leak checking or troubleshooting is limited to a maximum of 20% of the established and previously attained MAWP or 20% of the successful test pressure.

Basic Rules for Pressure Safety

General Controls:

1. Only qualified and trained workers shall be assigned to install, test, adjust, and operate and maintain pressurized equipment.
2. Gauges shall be graduated to about twice the MAWP of the system—never graduated to less than 1.2 times the MAWP.
3. Gauge materials shall be compatible with the system fluid.
4. Do not consider a pressure regulator by itself as satisfactory overpressure protection. A regulator controls the delivery pressure. A pressure relief device protects from overpressurization.
5. Never place a valve between a relief device and the component it is installed to protect.
6. Never set a relief device above the MAWP of the lowest rated system component(s) it is installed to protect.
7. Locate and orient relief devices so that their discharge is not hazardous to personnel.
8. Install relief devices of adequate total flow capacity. When all supply ports are open, the pressure must never exceed 110% of the MAWP.
9. Do not reset relief devices unless specifically authorized to do so.
10. Use ASME code-approved (or LLNL-stocked) relief devices whenever possible.
11. Use metal pipe and tubing rated at or above the MAWP.
12. Use flexible hose only where it is impractical to use metal tubing or pipe.
13. Make sure there is no oil or organic materials in gauges used on oxygen systems.
14. Cryogenic liquids are gases that have been transformed into extremely cold liquids. They have many hazards including the potential to freeze tissue. Workers must be protected from freeze hazards by wearing the appropriate personal protection when handling cryogenic liquids. Wear loose fitting gloves. Wear cuffless trousers over boots. Wear eye and face protection.
15. When cryogenic liquids change to their gaseous state, they can expand to many times their liquid volume (~700:1 for liquid nitrogen, ~550:1 for carbon dioxide). Hazards include system overpressurization and asphyxiation in confined spaces.

16. Requirements for gas cylinder handling, transportation, storage, and use are discussed in CSP, Appendix A, Section 14.

Recommended Precautions for Leak Checking and Pressure Testing:

1. Use safety manifolds (see Figures 32-1 and 32-2) for performing gas and hydrostatic pressure testing.
2. Do not use an open flame for leak checking.
3. Contractors/subcontractors shall have an approved test procedure prior to performing leak checking and pressure testing.
4. Notify all affected persons in the area of the test.
5. Post warning signs and install barriers as necessary.
6. In general, testing with gas is more dangerous than testing with liquid because of the stored energy when testing with gas. Test with liquid whenever possible. When testing with liquid, the increased weight of the vessel/system versus its supporting method must be considered.
7. All tests with gas must be approved in writing by the BIS Associate Project Manager, prior to their implementation.
8. If you detect a leak during pressure testing and decide to repair it before completing the test, reduce the pressure to as low as possible (not over one-half the immediately preceding test pressure) for locating the leak.
9. Leak check remote-operation vessels and systems remotely. Manned-area leak checking of successfully pressure-tested, remote-operation vessels and systems is limited to a maximum of 20% of the test pressure.
10. Never attempt to repair a system or vessel when it is pressurized, unless specifically authorized by a safety procedure (e.g., Operational Safety Plan).
11. No undocumented vessels or systems may be leak checked in a manned-area mode at pressures higher than 20% of the test pressure.
12. When the pressure test has been completed, vent test pressure to zero (0) psi gauge before removing any components or installing the pressure relief device.

Vacuum Systems

1. Vacuum systems that are used or operated only as vacuum systems shall be designed to withstand the intended external pressure.
2. Vacuum systems are designed for external pressure and contain components that make an overpressure internal proof test inappropriate; therefore, other means shall be used to document the safety of these systems.
3. Vacuum systems that have the capability of operating at greater than 2 psi gauge shall be designed, tested, and protected as pressure vessels.
4. Vacuum systems connected to high-pressure gas sources may require the use of pressure relief devices to protect the system for overpressurization.

- When purging or backfilling vacuum systems, protect the system with pressure relief device(s) or other adequate means to protect the lowest-rated component of the system (glass, windows, ion gauges, etc.).

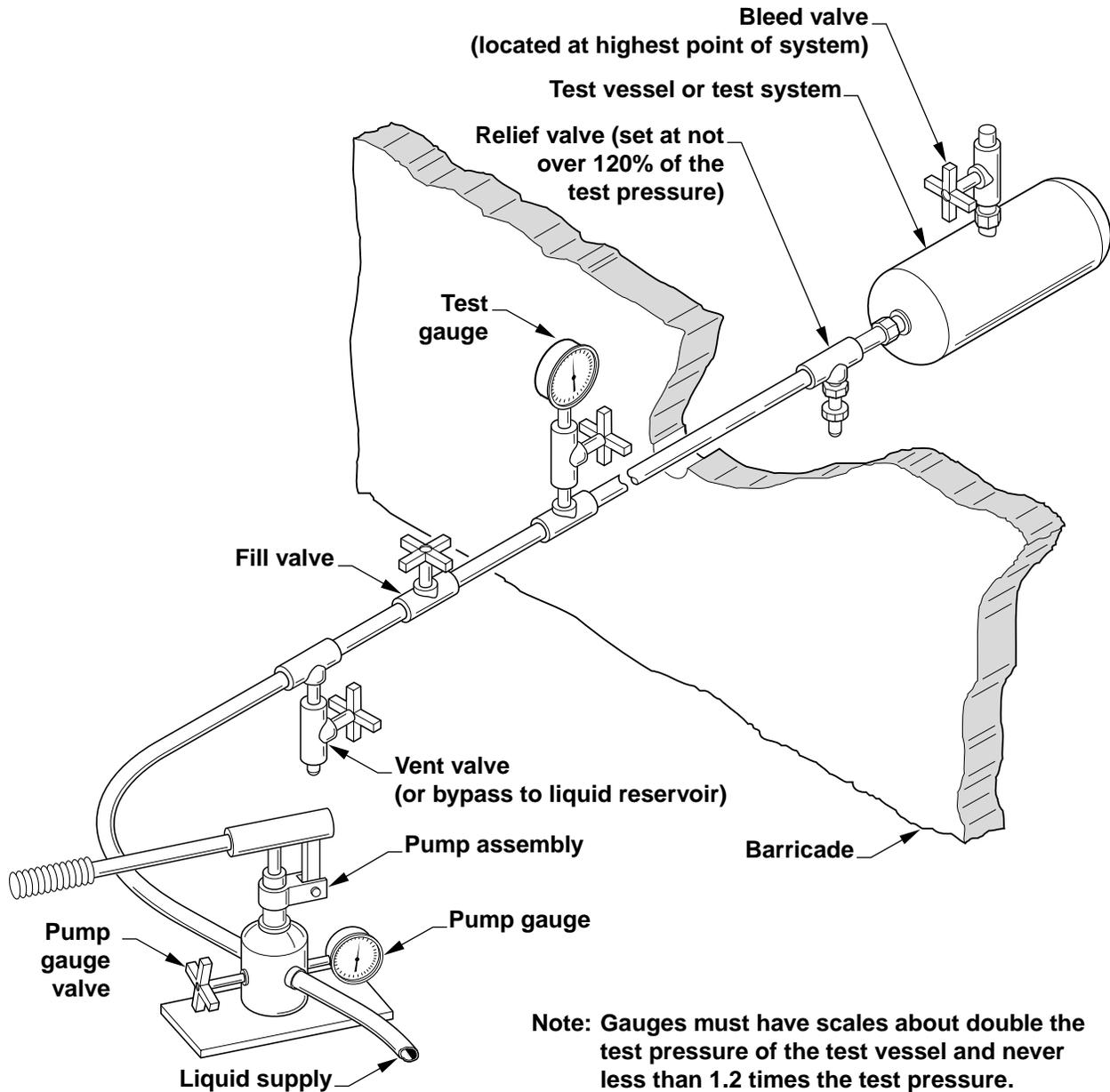


Figure 32-1. Safety manifold for hydrostatic pressure testing.

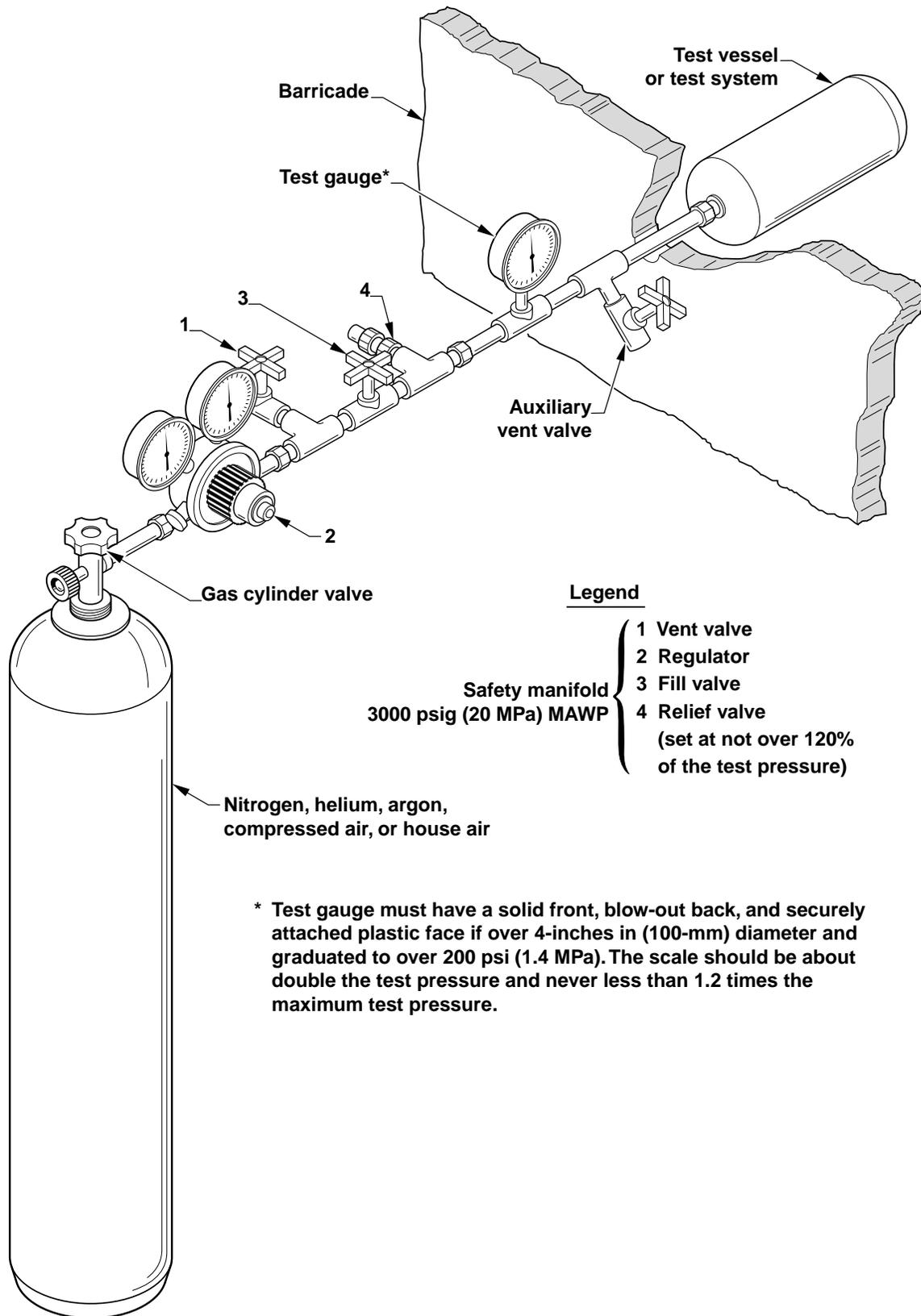


Figure 32-2. Safety manifold for pressure testing with gas.

33. Permits and Authorizations

There are several permits and authorizations required on the NIF project. These include permits for hot work, excavations and on-grade slab penetration, penetration of concrete structures (floors, walls, and ceilings), work in confined spaces, work on energized equipment, use of radioactive materials, ionizing radiation sources, or radiographic equipment, and air and storm water work. Also included are authorizations for work near energized equipment, hoisting and rigging, and for on-site work by extramural visitors, etc. All NIF workers are responsible for obtaining or assisting with the processing of these permits and authorizations as necessary prior to starting the defined activity. This section describes specific permits and authorizations and directs the reader to other sections of the CSP where they may find additional information about a specific permit or required authorization. **Caution:** All required permits and authorizations may not be addressed in this section.

Responsibilities

1. All employers and workers shall comply with LLNL permit and authorization requirements of the NIF CSP.

Required Permits and Authorizations

A. Hot Work Permit: A Hot Work Permit is required for all hot work operations including cutting, welding, brazing, soldering, using tar pots or torches for roofing or road work, using hot air guns in applying roofing, thermal spraying, using open fires for any purpose, or conducting any similar activity. At present, a blanket Hot Work Permit is issued to the NIF Project on a monthly basis. A copy of the permit (monthly or otherwise) should be reviewed with the workers and its requirements followed without exception. Please refer to Section 5, Fire Prevention.

B. Confined Space Permit: Each employer is required to maintain their own confined space program including a permit system using their own personnel and permits. A copy of the Confined Space Permit must be posted at or near the location of the confined space. Please refer to Section 7, Confined Space Safety Requirements.

C. Soil Excavation (Digging, Grading, Tunneling, Trenching, and/or Drilling) Permit: The Construction Manager is responsible for obtaining an LLNL Soil Excavation (Digging, Grading, Tunneling, Trenching, and/or Drilling) Permit. Note that this permit also applies to penetration of slabs on grade independent of buildings. Each employer is responsible for notifying the Construction Manager of their intentions to perform any of the identified actions and to assist the Construction Manager with obtaining the permit. Please refer to Section 15, Excavation, Trenching, and Shoring.

D. Concrete Structure (Floor, Wall, and Ceiling) Penetrations Permit: The Construction Manager is responsible for obtaining an LLNL Concrete Structure (Floor, Wall, and Ceiling) Penetration Permit. Contractors/subcontractors are responsible for notifying the Construction Manager of their intentions to perform any of the identified actions and to assist the Construction Manager with obtaining the permit.

Concrete Structure Penetration Process: All employers are required to obtain, from the Construction Manager, permission to proceed prior to beginning any penetration action in concrete floors, slabs, walls, and/or ceilings in LLNL buildings or other concrete areas where utilities may be located. This applies to penetrations of concrete structures and includes saw cutting, core drilling, jack hammering, and using power and pneumatic activated tools, etc. Penetrations of slabs on grade, independent of buildings are covered by the Soil Excavation (Digging, Grading, Tunneling, Trenching, and/or Drilling) Permit. Of particular concern is the prevention of contact with live electrical conductors or other significant hazards (e.g., natural gas lines, water lines, air lines, etc.). The intent is to minimize the chance of injury or death to personnel and the disruption of essential services. The Construction Manager is responsible for obtaining a Concrete Structure (Floor, Wall, and Ceiling) Penetration Permit from the LLNL Plant Engineering Maintenance Operations Division. Refer to MOP-03001 Concrete Structure (Floor, Wall, and Ceiling) Penetrations Permit Procedure.

Structural integrity of any facility is not meant to be covered or certified by this procedure. Structural integrity issues should be addressed with the appropriate engineering group. Potential safety related issues that could affect the integrity of facilities (e.g., handling radioactive materials, radiation shielding, handling hazardous substances) are not addressed by this procedure. LLNL Hazards Control should be contacted when this potential exists.

Prior to penetration of any concrete floor, slab, wall and/or ceiling, attempts must be made to locate where utilities may be located. The Construction Manager (Responsible Person) for the penetration operation shall assure that the following actions are accomplished:

1. **Concrete structure penetrations less than 3 inches in depth** do not require a permit. However, the worker shall assure that the proposed work area is reviewed for the presence of embedded utilities.
 - a. At a minimum, a handheld scanner capable of detecting metal and interior wiring in concrete to a depth of 3 inches shall be used.
 - b. This review must occur prior to the start of work.
 - c. If embedded utilities are located, work may not begin until required safeguards are implemented.

The Responsible Person shall accomplish the following:

- a. Review project drawings, prints, notes, etc.
- b. Review drawings and other available historical documentation.

- c. Collect information from knowledgeable employees based on personal recollection of construction in a particular area.
 - d. Make on-site observation of existing conditions such as exposed conduit, conduit boxes, and personnel accesses, nearby equipment, and like items.
 - e. Perform any other method the Responsible Person deems necessary to assure safe working conditions.
2. **Concrete structure penetrations greater than 3 inches in depth** require a permit. The Responsible Person shall accomplish the following:
- a. Review available project drawings prepared by a licensed professional engineer.
 - b. Review drawings and other historical documentation.
 - c. Collect information from knowledgeable employees based on personal recollection of construction in a particular area.
 - d. Make on-site observation of existing conditions such as exposed conduit, conduit boxes, manholes, nearby equipment, and like items.
 - e. Verify that no voltage greater than 600 volts is present. This must be done through the Site Utilities Division (Building Service), Facility Manager (Programmatic Equipment), Building Point of Contact (POC), or Construction Manager.
 - f. Perform any additional methods the Responsible Person deems necessary to assure safe working conditions.
 - g. Mark the area to be drilled with soapstone, washable crayon, or other non-permanent means prior to the locator survey.
 - h. Have a survey of the proposed work area completed by a qualified locator service prior to any penetration actions. Locator services are available through off-site locator contractors or on site through Plant Engineering Locators. The duties of the locator service are detailed in MOP-03001. They include using active/conductive locating (radio frequency conductive equipment) as opposed to passive/inductive locating, whenever practical, or any other means necessary.
 - i. Structural review and approval is required by a California Licensed Civil/Structural Engineer when performing any penetrations to primary structural members (beams and columns) and penetrations six (6) inches and greater in diameter on floors, walls, and ceilings.
 - j. Complete a Concrete Penetration Job Safety Analysis Reference Checklist for the typical items that should be considered prior to any penetration action.

Issuance of a permit should not be considered as approval to begin penetration actions. Permission to start penetration actions shall be granted by the Responsible Person only after it has been determined that the workplace conditions are safe for these operations.

All workers performing this work shall use ground fault circuit interrupters with drilling tools and shall stand on an insulating mat. All workers performing this work shall wear the following personal protective equipment: 0–5kV rated insulating gloves with moisture-absorbing liners and rubber-soled shoes. The insulating gloves must be tested in accordance with the manufacturer's standards. Ground fault circuit interruption shall be utilized when electrical equipment is used in these operations.

A copy of the Approved Permit shall be posted at the job site.

Upon completion of the excavation project, the Responsible Person shall submit a completed permit and required documentation.

E. Work On Energized Equipment Permit: It is LLNL policy that work on or near electrical circuits and equipment should take place when they are in a deenergized state, using the lockout and tagout procedure, except when working on or near energized equipment is safer than deenergizing it or when it is essential for the equipment to remain energized. Programmatic convenience is not sufficient cause to work on or near energized equipment. However, if there are no alternatives, and work on or near an energized electrical system is required, a NIF permit is required. Please refer to Section 21, Electrical Safety.

F. Work Near Energized Equipment Authorization: When performing nonelectrical work in or near exposed high-voltage (i.e., 600 volts or greater) power distribution equipment, including electrical lines, substations, switchyards, manholes/vaults, and other similar installations, authorization shall be obtained from the NIF Construction Management and Plant Engineering, Site Utilities Division before work is started. Nonelectrical work such as wire pulling and splicing, excavating and trenching, boom/crane/manlift operations, fencing, lighting, drilling, and other construction work are included in this requirement. Please refer to Section 22 Nonelectrical Work Performed Near Exposed High-Voltage Power-Distribution Equipment.

G. NIF Integration Work Sheets: Note: The NIF Integration Work Sheet (IWS) process does not apply to CF and BIS directly controlled contractors and subcontractors. It applies only to LLNL and non-LLNL employees.

On the NIF Project site or for work outside the site boundaries that could have a potential impact to the NIF site activities, an IWS is the process by which managers and various LLNL organizations (e.g., Plant Engineering), commercial vendors (e.g., laser repair technicians), or groups request and, following review, obtain authorization to access the NIF site to perform the work. In the IWS, the facility or area in which the work will take place, the hazards associated with the activity, and the individual that will be supervising the work activity are identified to ensure coordination of the requested work with other concurrent on-site work. The requestor must complete and receive approval of the IWS from the Associate Project Manager prior to starting work on the NIF site.

An IWS is used to document the authorization for performing work. The IWS is prepared to plan activities, identify and understand the hazards, and develop and implement controls for the hazards.. The organization authorizing a work activity is responsible for ensuring that an IWS is prepared, reviewed, and approved prior to performing any work. Only LLNL and non-LLNL employees proposing operations or activities on the NIF Project site, including laydown and construction support areas, are required to prepare an IWS, in addition to a JHA and Safe Plan of Action (SPA). Contractors/subcontractors will prepare JHAs and SPAs as required.

Please refer to the main CSP Chapter III.B Work Planning and Authorization Process.. See also NIF Project Control Procedure 5.12, NIF Construction Site Work Visitor Program (NIF Construction Site Access and Work Authorization Procedure).

H. Radiation Work Permit: A Radiation Work Permit must be obtained prior to allowing subcontractors to perform services such a soil density measurements or radiography that involve the on-site use of radioactive materials or the use of radiation generating devices such as x-ray machines. Written approval must be obtained from LLNL Hazards Control before radioactive materials may be brought onto the LLNL site or before using radiation-generating devices. The Operations Activation Area Manager or other responsible individual shall submit the necessary documentation for review and approval by LLNL Hazards Control. Please refer to Section 19, Radiation Safety.

I. Storm Water Pollution Prevention Plans: All employers are required to follow the NIF Storm Water Pollution Prevention Plans (SWPPPs), which are required documents under State Water Resources Control Board Order No. 99-08-DWQ, and National Pollution Discharge Elimination System General Permit No. CAS000002. The SWPPPs are included in the contract bid documents, and a contract specific scope sheet identifies the SWPPP elements within the responsibilities of each individual contract package. Project changes affecting storm water that are outside of the scope of these plans or regulation changes could require new pollution prevention practices to be implemented by the Project.

J. Portable Generators: The Bay Area Air Quality Management District (BAAQMD) regulates the use of portable internal combustion generators. BAAQMD sets performance standards for all generators and requires air permits for larger generators above a specified horsepower threshold. The BAAQMD regulations are subject to change at any time, and the contractor must comply with BAAQMD standards and provide air permits for generators, as required by BAAQMD.

K. Hoisting and Rigging Safety Review: All hoisting and rigging operations must be authorized by completing a NIF Hoisting and Rigging Safety Review form. The purpose of this review is to ensure that all hoisting and rigging operations receive adequate safety review prior to being performed. The responsible individual for the lift shall complete the review. Please refer to CSP, Appendix A, Section 25, Rigging, and Section 26, Cranes.