NIF Special Equipment Construction Health and Safety Plan

July 28, 1997

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NIF Special Equipment Construction Health and Safety Plan

July 28, 1997

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**NIF Special Equipment
Construction Health and Safety Plan**

July 28, 1997

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Acronyms

ANSI	American National Standards Institute
CD	Critical Decision
CF	Conventional Facility
CM	Construction manager
CSP	Construction Safety Program
DAPE	Deputy Associate Project Engineer
DefTrack	Deficiency tracking database
DOE	Department of Energy
ES&H	Environmental Safety and Health
FM	Field manager
FSP	Facility Safety Procedure
FY	Fiscal year
GISO	General Industry Safety Orders
IIPP	Injury and Illness Prevention Program
JHA	Job Hazard Analysis
LANL	Los Alamos National Laboratory
LCW	Low conductivity water
LLNL	Lawrence Livermore National Laboratory
LRU	Line replacement unit
LTAB	Laser and Target Area Building
MSDS	Material Safety Data Sheet
NIF	National Ignition Facility
NRR	Noise Reduction Rating
OAB	Optics Assembly Building
OCIP	Owner Controlled Insurance Program
OM	Operation manager
OSHA	Occupational Safety and Health Administration
OSP	Operational Safety Procedure
PEIS	Programmatic Environmental Impact Statement
QA	Quality Assurance
SE	Special Equipment
SLO	Supplemental labor only
SNL	Sandia National Laboratories
SWPPP	Storm Water Pollution Prevention Plan
WBS	Work Breakdown Structure

1.0 Purpose

The purpose of this plan is to identify how the construction and deployment activities of the National Ignition Facility (NIF) Special Equipment (SE) will be safely executed. This plan includes an identification of (1) the safety-related responsibilities of the SE people and their interaction with other organizations involved; (2) safety related requirements, policies, and documentation; (3) a list of the potential hazards unique to SE systems and the mechanisms that will be implemented to control them to acceptable levels; (4) a summary of Environmental Safety and Health (ES&H) training requirements; and (5) requirements of contractor safety plans that will be developed and used by all SE contractors participating in site activities. This plan is a subsidiary document to the *NIF Construction Safety Program* (CSP)¹ and is intended to compliment the requirements stated therein with additional details specific to the safety needs of the SE construction-related activities. If a conflict arises between these two documents, the CSP will supersede. It is important to note that this plan does not list all of the potential hazards and their controls because the design and safety analysis process is still ongoing. Additional safety issues will be addressed in the *Final Safety Analysis Report*, *Operational Safety Procedures* (OSPs), and other plans and procedures as described in Section 3.0 of this plan.

2.0 Scope

The SE Construction Health and Safety Plan for the NIF sets forth the responsibilities, guidelines, rules, policy, and regulations for all workers involved in the SE construction, installation, and acceptance testing. This document will be enforced from the first day that SE workers commence activities, expected to be in fiscal year (FY) 99, to the last day of acceptance testing when responsibility of the final subsystem is turned over from SE staff to the NIF Operation staff. This document is applicable only to site activities, which are defined as those that occur within the perimeter of the fenced-off construction zone and associated Special Equipment laydown and construction areas listed in Appendix B. Prototype development efforts occurring elsewhere are not included under this plan. The *Facility Safety Procedure* (FSP) will become the governing safety document for the NIF facility after completion of Critical Decision 4 (CD4—project completion milestone). The SE project elements are required to implement measures that create a universal awareness of and promote safe job practices at the site. This includes all Lawrence Livermore National Laboratory (LLNL), Los Alamos National Laboratory (LANL), Sandia National Laboratories (SNL), University of Rochester, supplemental labor organization, and subcontractor employees; visitors; and guests serving the SE project.

3.0 Plan

3.1 Responsibilities

The SE Organization is responsible for the deployment of hardware defined within elements 1.3, 1.4, 1.5, 1.7, and 1.8 of the NIF Work Breakdown Structure (WBS), see Figure 1. The systems included are the laser, beam transport, computer control, laser control, and target area systems, respectively. This document covers activities that are included in these systems and are executed within the site boundaries as described above.

The top level identification of responsibilities for site safety is defined in Appendix A of this plan. A complete list of responsibilities is included in the CSP. These responsibilities are augmented below with further clarification of the safety responsibilities within the SE Organization, between the SE Organization and other project elements, and that of the SE contractors.

The Associate Project Engineer for SE is responsible for the safety of all people and hardware on the site that are part of the SE WBS. Successful execution of this responsibility requires that safety is integrated into all the elements of design, procurement, fabrication, receiving, assembly, installation, and test. As shown in the organizational charts, Figures 2 and 3, safety is implemented for all of these activities with a team of engineers and specialists combined to most effectively address safety during each phase of the project. During design, procurement, and assembly, the System Engineers are responsible for factoring safety into the design of each of their subsystems. Their efforts are supported by the Environment Safety & Health Team 2 who assist with the integration and coordination of safety across all of these elements. In addition, a Safety Coordinator has been assigned within the Laser Program Assurance Office to monitor safety activities, resolve issues, interact with interfacing organizations, enlist other safety personnel as required, and otherwise ensure safety compliance. This includes the monitoring of SE contractors to ensure that they are in compliance with their safety plans.

During construction two construction managers (CMs) who are members of the SE Organization have been assigned to coordinate all SE installation and deployment activities on site and ensure that these activities are executed safely. The laser CM is responsible for coordinating the installation of all hardware in the laser bay, capacitor bay, and switchyard. The target area CM is responsible for coordinating the installation of all hardware in the target area building. The SE CMs and Conventional Facility (CF) CM report to the NIF Site Manager during this phase of construction. The three CMs will coordinate their respective work activities/plans with one another, and as appropriate, one CM may take the lead in this coordination effort. As shown in Figure 3, the hierarchy of responsibility changes as the conventional facility construction is completed, and the project is transitioned into an operating facility.

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Figure 1. NIF Work Breakdown Structure

Figure 2. Site management hierarchy before completion of conventional facility construction.

Figure 3. Site management after conventional facility construction completion.

When conventional facilities construction is completed, (expected to be in FY01) the NIF Site Manager turns responsibility of the building over to the Associate Project Engineer for Operations who will appoint an Operation Manager (OM). The SE CMs will then report to the OM for the remaining time necessary to complete installation activities. Later, when SE installation activities are complete, the SE Field Manager (FM), who will manage all SE site activities for the remainder of the project, will also report to the OM.

During that time acceptance testing of the SE hardware will be executed culminating with the hand-off of the equipment to operations. The result of this transition of responsibility is shown in Figure 3.

3.2 Requirements and Documentation

The CSP, Appendix A, "Safety Requirements,"² lists the applicable safety standards and written requirements.

The manner in which safety documentation will be used to control site activities is shown in Figure 4. As shown, the CSP and this plan are enforced for all activities up to the time that conventional facility construction is completed. After that time the *Facility Safety Procedure* (FSP) becomes active. OSPs will be utilized to control safety for specific activities during both of these phases. The *LLNL Health & Safety Manual*,³ Chapter 2, "Integrating ES&H Into Laboratory Activities," contains LLNL policy on the preparation of these procedures. The OSP will provide detailed information on the specific activities, associated hazards, and necessary controls identified during the SE design and final safety analysis process. More routine hazards will be controlled by adhering to the requirements of the *LLNL Health & Safety Manual*.

Figure 4. Time-phased method of site safety documentation.

3.3 Special Equipment Hazards

Activities that pose a significant hazard to SE personnel or equipment will be reviewed during Title II Engineering as part of the standard design review process defined in the Title II Plan, NIF 1249. Mitigation methods shall be identified and incorporated as part of all deployment procedures according to Chapter 2 of the *LLNL Health & Safety Manual*. If a safety concern arises, no activity will be allowed to continue until the concern is reviewed and appropriate corrective action taken. The SE Systems Engineer shall ensure that any changes in operations that increase the hazard level, introduce additional hazards, or decrease safety shall not be made until the change has been reviewed by the ES&H team and SE management, and appropriate safety documentation and controls are in place. A safety review team appointed by the SE Deputy Associate Project Engineer (DAPE) will review these corrective actions to ensure their adequacy and proper implementation.

During construction when equipment is initially being installed, some of the planned safety systems used to control operation phases hazards may not be fully activated or integrated. Such safety systems include access control systems, integrated oxygen deficiency detectors, integrated laser interlocks and warning systems, integrated high voltage interlocks and warning systems, and complete access platforms and handrails. Therefore, it will be necessary to use interim controls during the construction phase. For example it may be necessary to use controls such as:

- Locking and tagging access doors.
- Locking and tagging hazardous equipment.
- Utilizing ropes, barricades, temporary warning signs and lights.
- Off-shift testing when limited personnel are in the area.
- Initiating safety watches.
- Issuing confined space entry permits.
- Issuing hot work permits.
- Requiring personnel protective equipment.

The following is a list of examples of the potential hazards associated with SE activities. Other hazards that are applicable to more standard construction activities are covered in the CSP and are also applicable to SE activities. The list below supplements the CSP with other hazards unique to activities that involve SE personnel and contractors. This is not a complete list of the potential hazards. Additional hazards and controls will be identified during design reviews, the preparation of OSPs, the final safety analysis process, and the Chapter 2 work planning process.

Table 1. Potential Hazards Associated with SE Activities.

Activity	Potential Hazards	Controls
Laser and Capacitor Bay Installation Activities		
A. Conventional Facilities/Special Equipment Installation Interface	1. Conventional facilities will be doing overhead rough and finish work in the laser bays while SE installation activities are underway.	1. The laser bay conventional facilities construction efforts and special equipment construction efforts will be coordinated to preclude accidents. This is particularly true in the laser bays. The overhead work will be performed off of an overhead work platform that will ride on the laser bay crane rails. Access to zones underneath this area will be strictly controlled to promote a safe working environment while permitting necessary work to proceed.
B. Installation of Laser Bay foundation attachments (concrete monoliths)	1. Personnel falls 2. Material handling	1. Training, fall protection devices and equipment. 2. Training, procedures, temporary physical barricades.
C. Installation/alignment and cleaning of laser bay spatial filter vessels	1. Personnel falls 2. Material handling 3. Alignment 4. Cleaning/confined space entry	1. Training, fall protection devices and equipment. 2. Training, procedures, temporary physical barricades. 3. Training, procedures, temporary physical barricades. 4. Training, procedures.
D. Installation of laser bay steel structures; PAM structures, Periscope structures, amplifier structures, LM1	1. Personnel falls 2. Material handling 3. Alignment 4. Cleaning/confined space entry	1. Training, fall protection devices and equipment. 2. Training, procedures, temporary physical barricades. 3. Training, procedures, temporary physical barricades. 4. Training, procedures.
E. Installation of spatial filter beam tubes	1. Personnel falls 2. Material handling 3. Alignment 4. Cleaning/confined space entry	1. Training, fall protection devices and equipment. 2. Training, procedures, temporary physical barricades. 3. Training, procedures, temporary physical barricades. 4. Training, procedures.

Table 1. (cont.)

Activity	Potential Hazards	Controls
Laser and Capacitor Bay Installation Activities (cont.)		
F. Installation of interstage beam tubes	<ol style="list-style-type: none"> 1. Personnel falls 2. Material handling 3. Alignment 4. Cleaning/confined space entry 	<ol style="list-style-type: none"> 1. Training, fall protection devices and equipment. 2. Training, procedures, temporary physical barricades. 3. Training, procedures, temporary physical barricades. 4. Training, procedures.
G. Installation of Amplifier Busses	<ol style="list-style-type: none"> 1. Personnel falls 2. Material handling 3. Alignment 4. Cleaning/confined space entry 	<ol style="list-style-type: none"> 1. Training, fall protection devices and equipment. 2. Training, procedures, temporary physical barricades. 3. Training, procedures, temporary physical barricades. 4. Training, procedures.
H. Installation of Laser Bay SE Mechanical Utilities (Low Conductivity Water, Special Equipment Fire Sprinklers, Compressed Air etc. and Process Systems (Spatial Filter Vacuum System, Amplifier Cooling System etc.)	<ol style="list-style-type: none"> 1. Personnel falls 2. Material handling 3. Pressurized fluid systems 4. Electrical Hazards 	<ol style="list-style-type: none"> 1. Training, fall protection devices and equipment. 2. Training, procedures, temporary physical barricades. 3. Training, procedures, temporary physical barricades. 4. Training, procedures.
I. Installation of Line Replaceable Units (Amplifier Cassettes, Spatial Filter Lenses, Periscope Mirror Units, etc.)	<ol style="list-style-type: none"> 1. Personnel falls 2. Material handling 3. Electrical Hazards 	<ol style="list-style-type: none"> 1. Training, fall protection devices and equipment. 2. Training, procedures, temporary physical barricades. 3. Training, procedures.
J. Installation of Special Equipment Electrical services (lighting, cable trays, control wiring etc.)	<ol style="list-style-type: none"> 1. Personnel falls 2. Material handling 3. Electrical Hazards 	<ol style="list-style-type: none"> 1. Training, fall protection devices and equipment. 2. Training, procedures, temporary physical barricades. 3. Training, procedures.
K. Activation and testing of power supply sub-assemblies	<ol style="list-style-type: none"> 1. Electrical shock 	<ol style="list-style-type: none"> 1. EE Safety policy, written procedures.

Table 1. (cont.)

Activity	Potential Hazards	Controls
Laser and Capacitor Bay Installation Activities (cont.)		
L. Integration of sub-assemblies into power supply modules	1. Electrical shock	1. Access controls, lockout/tagout, administrative personnel sweeps, warning signs, OSP.
M. Supply power to laser amplifiers	1. Electrical shock, flashlamp explosion	1. Integrated access control, enclosed flashlamps.
N. Acceptance Testing Efforts Acceptance testing of installed special equipment (For example, Spatial filter vacuum system in conjunction with spatial filter vessels and beam tubes. There will be many other combined systems as that mentioned above.)	1. Personnel falls 2. Material handling 3. Alignment 4. Cleaning/confined space entry 5. Electrical Hazards 6. Laser light 7. Implosion of glass components such as spatial filters	1. Training, fall protection devices and equipment. 2. Training, procedures, temporary physical barricades. 3. Training, procedures, temporary physical barricades. 4. Training, procedures. 5. Training, procedures. 6. Training, procedures, access controls. 7. Procedures, rupture disks, keep out zones, personnel protective devices.
Switchyard Installation Activities		
A. Installation of Switchyard Steel Structures	1. Personnel falls 2. Material handling	1. Training, fall protection devices and equipment. 2. Training, procedures, temporary physical barricades.
B. Installation of Switchyard Beam Tubes	1. Personnel falls 2. Material handling 3. Confined Space	1. Training, fall protection devices and equipment. 2. Training, procedures, temporary physical barricades. 3. Training, procedures.
C. Installation of Roving Switchyard Mirror Enclosure	1. Personnel falls 2. Material handling 3. Confined Space	1. Training, fall protection devices and equipment. 2. Training, procedures, temporary physical barricades. 3. Training, procedures.

Table 1. (cont.)

Activity	Potential Hazards	Controls
Switchyard Installation Activities (cont.)		
D. Installation of Diagnostics Equipment	<ol style="list-style-type: none"> 1. Personnel falls 2. Material handling 3. Pressurized fluid systems 4. Electrical Hazards 5. Confined space (diagnostics vessel) 	<ol style="list-style-type: none"> 1. Training, fall protection devices and equipment. 2. Training, procedures, temporary physical barricades. 3. Training, procedures, temporary physical barricades. 4. Training, procedures. 5. Training, procedures.
E. Installation of Switchyard Mechanical Utilities (Compressed Air, and Special Equipment Process Systems (Argon delivery system etc.)	<ol style="list-style-type: none"> 1. Personnel falls 2. Material handling 3. Pressurized fluid systems 4. Electrical Hazards 	<ol style="list-style-type: none"> 1. Training, fall protection devices and equipment. 2. Training, procedures, temporary physical barricades. 3. Training, procedures, temporary physical barricades. 4. Training, procedures.
F. Acceptance Testing Efforts Acceptance testing of installed special equipment (For example, Spatial filter vacuum system in conjunction with spatial filter vessels and beam tubes. There will be many other combined systems as that mentioned above.)	<ol style="list-style-type: none"> 1. Personnel falls 2. Material handling 3. Alignment 4. Cleaning/confined space entry 5. Electrical Hazards 6. Laser light 7. Implosion of glass components such as spatial filters 	<ol style="list-style-type: none"> 1. Training, fall protection devices and equipment. 2. Training, procedures, temporary physical barricades. 3. Training, procedures, temporary physical barricades. 4. Training, procedures. 5. Training, procedures. 6. Training, procedures, access controls. 7. Procedures, rupture disks, keep out zones, personnel protective equipment.
G. Installation of target chamber or sections into building shell	<ol style="list-style-type: none"> 1. Material handling 2. Fall protection 3. High consequence crane operations 	<ol style="list-style-type: none"> 1. Training, procedures, temporary physical barricades. 2. Training, fall protective devices. 3. Certified heavy lift contractor, written procedure, access control.
H. Welding target chamber components	<ol style="list-style-type: none"> 1. Welding fumes, Fire 	<ol style="list-style-type: none"> 1. Ventilation, personal protective equipment.

Table 1. (cont.)

Activity	Potential Hazards	Controls
Switchyard Installation Activities (cont.)		
I. Radiography of high stress welds	1. Ionization radiation	1. Written procedure, training, access control, radiation monitoring.
J. Target chamber entry	1. Confined space hazards	1. Ventilation, air monitoring, permits or procedure.
K. Target chamber final fabrication alignments	1. Laser light	1. Personnel protective equipment, training.
L. Installing target chamber mirror support structures	1. Materials handling, fall protection	1. Certified outside or internal lift contractor, written procedure, access control training, full protection devices.
M. Use of inert gases in beamlines	1. Oxygen depleted atmospheres	1. Oxygen monitoring, ventilation.

3.4 ES&H Information and Training

General training requirements are included in the CSP Section I.A. 13-14, I.B. and V1.

LLNL employees and non-LLNL employees (as defined in the CSP Section I.A.14) will receive appropriate LLNL ES&H training, or equivalent, or shall be continuously escorted and supervised by personnel knowledgeable in the hazards to which they may be exposed. It is the responsibility of the employees' supervisor to assess training needs and see that they are met and documented. In addition the SE CM will confirm these training requirements. Training requirements will also be listed in individual OSPs. The following is a partial list of the required LLNL Health and Safety Courses based on the major hazards that have been currently identified.

3.5 Contractor Safety Plans

Firms or individuals contracted or subcontracted for NIF site work through the SE organization will submit site-specific safety plans as required by the CSP Section I.B. In addition, prospective contractors should submit a summary of the elements of their safety plan with their bid submittal. The following is a sample format that may be adapted by contractors to fulfill the requirement for a safety plan. These plans will reflect the nature and scope of the work to be performed, therefore all of these sections may not be applicable. An explanation of each section is contained in the CSP, Appendix A. The final safety plans will be submitted to the responsible contract

Table 2. NIF SE Required Health and Safety Courses.

LLNL Course	Required for:
HS 5960 Fall Protection	Employees who use fall protection equipment or work on ladders more than 20 ft. high.
HS 5700 Intermediate Crane Safety	Crane operators who lift 2000 lb. to 5 tons.
HS 5690 Incidental Crane Safety	Overhead crane operators who use cranes or hoists and rigging to lift 2000 lb. or less.
HS 5200 Laser Safety	Employees who work with or near exposed class 2,3, or 4 laser light or who service any system containing such light.
HS 5210 Capacitor Safety Orientation	Employees who work around capacitor banks or who use capacitors that store energy of 20J or more.
HS 5220 Electrical Hazards Awareness	Employees who work on electrical or electronic equipment from 50V to 600 V.
HS 5230 High Voltage Safety	Employees who work around high voltage equipment including capacitor banks.
HS 5250 Working on Energized R&D Equipment	Employees who work on energized R&D equipment with exposed conductors.
HS 4150 Confined Space Entry	Employees who enter confined spaces—attendants and entry supervisors.
HS 4152 Confined Space Instruments	Employees who use instruments to test confined space atmospheres prior to and during entry.
HS 4050 Health Hazard Communication	Supervisors of employees who work with hazardous chemicals.
HS 0001 New Employee Safety Orientation	New LLNL employees and non-LLNL employees.
Conventional Facilities NIF Safety Orientation	All unescorted entrants to the NIF construction area.

administrator or purchasing agent and routed to the SE CM, System Engineer, ES&H Team 2, and to the NIF Assurances Office for review and approval. Contractors are encouraged to submit their written plans early to avoid possible delay in beginning their work.

1. General Rules—Code of Safe Practices
2. Personal Protective Equipment
3. Hazardous Material Control
4. Traffic Control
5. Fire Prevention
6. Sanitation and First Aid
7. Confined Space Entry Requirements
8. Reserved
9. Ladders and Stairways
10. Scaffolding and Lift Safety
11. Machinery, Vehicles and Heavy Equipment

12. Welding and Cutting - General
13. Arc Welding
14. Oxygen/Acetylene Welding and Cutting
15. Excavation, Trenching and Shoring
16. Fall Protection
17. Steel Erection
18. Working with Asbestos
19. Radiation Safety
20. Hand Tools
21. Electrical Safety
22. Nonelectrical Work Performed Near Exposed High Voltage
Power Distribution Equipment
23. Reserved
24. Lockout/Tagout Requirements
25. Rigging
26. Cranes
27. Housekeeping
28. Material Handling and Storage
29. Lead
30. Concrete and Masonry Construction

Safety plans must also address other requirements of the CSP, most notably Section 1.B., "NIF Construction Contractors and Subcontractors," and other sections.

4.0 References

1. *Construction Safety Program for the National Ignition Facility*, UCRL-ID-125990.
2. *Construction Safety Program for the National Ignition Facility, Appendix A: Safety Requirements*, UCRL-ID-125990 App. A.
3. *Health & Safety Manual M-010*, Lawrence Livermore National Laboratory.
4. *Construction Safety Program for the National Ignition Facility, Appendix B: LLNL Procedures and Policies*, UCRL-ID-125990 App. B.

Appendix A

Selected NIF ES&H Responsibilities

Associate Project Engineer for Special Equipment (SE)

The Associate Project Engineer for SE is responsible for the design, procurement, installation, and acceptance testing of the NIF SE. Associate Project Engineer responsibilities include the following:

- Manage and direct the System Engineers for all NIF SE.
- Manage and direct the SE Construction Managers (CMs) (e.g., Laser CM and Target Area CM).
- Design, procure, install, and acceptance test all SE.
- Ensure that the SE design meets applicable ES&H, performance category, Quality Assurance (QA), security, and other regulatory requirements.
- Define the SE interface input for the NIF.
- Ensure that the installation of NIF SE is performed in accordance with applicable ES&H standards and the Facilities requirements for the NIF.
- Ensure that preparation of the Safety Plan for SE is completed.
- Ensure that all contractors/subcontractors for SE have adequate Safety Plans.
- Interface with the Associate Project Engineers for Conventional Facilities and Activation and Start-up.
- Provide adequate funding for administering safety programs for SE and associated contractors/subcontractors.
- Concur with the CSP for NIF.

Special Equipment Construction Managers

The SE Construction Managers are responsible for overseeing the safety of LLNL employees, non-LLNL employees, construction contractors, and construction subcontractors (associated with the SE Element of NIF) during the construction of the NIF. The position reports to the Associate Project Engineer for SE. Some duties (i.e., "responsibilities") may be delegated to the Construction Safety Officer upon agreement; however, accountability for performance of such duties remains with the SE CM. SE CM responsibilities include the following:

- Support the Contracting Officer in the bid/award process for construction contractors and subcontractors.
- Ensure that the SE installation is coordinated with Conventional Facilities activities and Activation and Start-up operations and resolve interferences.

- Ensure that the LLNL employees, non-LLNL employees, construction contractors, and construction subcontractors (associated with the SE Element) are performing all work in accordance with applicable ES&H standards and the Facilities requirements for NIF.
- Act as Element liaison with the Safety Coordinator.
- Be a member of the Project Safety Team.
- Ensure the development of a Safety Plan for SE.
- Ensure that construction contractors/subcontractors for SE have adequate Safety Plans.
- Review construction contractors'/subcontractors' Safety Plans for SE.
- Confirm all SE worker safety education and orientation requirements are met.
- Ensure that safety compliance audits are performed and documented.
- Review the results of the SE audits for compliance, recommendations made for correction and prevention of recurrence, and follow-up measures taken to ensure compliance.
- Review records of all accidents experienced by SE workers.
- Keep SE contractors'/subcontractors' safety representatives advised on the adequacy of their safety program.
- Verify that the following safety requirements are met for SE:
 - A safe and healthy work environment is established and maintained by adherence to the guidelines and procedures issued in the latest document of the federal, state, and site specific requirements.
 - All SE personnel and contractors/subcontractors implement and abide by the ES&H rules and regulations set forth by all regulatory agencies as well as those identified in the CSP for NIF.
 - Work activities are pre-planned in order to identify and control any safety and health issues that may pose a hazard to workers or others.
 - Meetings are conducted with NIF Project Management to develop accident prevention measures.
 - NIF Management is kept apprised of all contractor/subcontractor safety programs.
 - Communications with contractors/subcontractors are maintained.
 - CSP general requirements are applied to visitors.
 - Specific job safety training is completed.
 - Safety audits are performed and deficiencies corrected.
 - Investigation of all injuries, accidents, and incidents are conducted.
 - Safety inspections with SE contractors/subcontractors are reviewed.
 - Job hazard analyses are performed.
 - Site safety personnel are assigned and managed.
 - Contractor/subcontractor safety records and performance audits are conducted.
 - Contractor/subcontractors safety plan are reviewed and approved prior to contractor/subcontractor mobilization.
 - Contractor/subcontractor safety meetings are attended by LLNL representatives.

- All necessary contractor/supervisor supervisors attend a customized site-specific 10-hour Occupational Safety and Health Administration (OSHA) class for supervision.

System Engineers

The System Engineers are each responsible for a major project activity (e.g., Laser Systems). The System Engineers report to the Associate Project Engineers/Associate Program Leader.

- The System Engineer will take on all applicable safety responsibilities of the CM when a CM has not been assigned for the project activity of a System Engineer. See responsibilities of the "SE Construction Managers" above.

Construction Safety Officers

Construction Safety Officers are assigned to the various Elements of NIF and report to the Deputy Associate Project Engineer (DAPE) for Construction, the Field CM, a SE CM, a System Engineer, and/or the Activation and Start-up designee (to be determined). He/she is responsible for overseeing the safety of LLNL employees, non-LLNL employees, construction contractors, and construction subcontractors associated with the NIF Element to which he/she is assigned during the construction of the NIF. Additional duties (i.e., responsibilities) may be delegated by the DAPE for Construction, the Field CM, the SE CMs, the System Engineers, or the Activation and Start-up designee (to be determined) upon agreement. Construction Safety Officer responsibilities include the following:

- Support the DAPE for Construction, the Field CM, the SE CMs, the System Engineer(s), and/or the Activation and Start-up designee (to be determined) of the assigned NIF Element.
- Act as point contact and interface with the Hazards Control ES&H Team on construction site related ES&H issues pertaining to the assigned NIF Element.
- Review ES&H aspects of construction site work of the assigned Element with construction site work of other Elements.
- Assist with resolving ES&H issues.
- Review work practices of LLNL employees, non-LLNL employees, construction contractors, and construction subcontractors (associated with the assigned Element) to assure all work is being performed in accordance with applicable ES&H.
- Perform formal safety compliance audits and inspections and document findings.
- Review the results of safety compliance audits and inspections of the DAPE for Construction, the Field CM, the SE CMs, the System Engineer(s) and/or the Activation and Start-up designee (to be determined); provide recommendations for correction (and prevention of recurrence) of non-compliance findings; and identify necessary follow-up measures to ensure future compliance.

- Assist the DAPE for Construction, the Field CM, the SE CMs, the System Engineer(s), and/or the Activation and Start-up designee (to be determined) with investigations of injuries, accidents, and incidents.
- Assist with preparation (and modifications) of the Safety Plan for the assigned NIF Element.
- Review Safety Plans of primary contractors/subcontractors to ensure such plans are consistent with LLNL policies and the NIF Facilities requirements.
- Request and coordinate support of the Hazards Control ES&H Team to resolve specific safety issues.
- Be a member of the Project Safety Team.

Construction Inspectors

The Construction Inspectors are the primary field contact to the subcontractor for a specific NIF Element. Construction Inspector responsibilities include the following:

- Assure Quality Control for general, mechanical, and electrical engineering work.
- Monitor the contractor's/subcontractor's safety program on a day-to-day basis.
- Notify the DAPE for Construction, the Field CM, the SE CMs, or the System Engineers when improper working conditions are identified.

LLNL Employees

LLNL employees are University of California employees whose payroll and benefits are administered by LLNL. LLNL Employee responsibilities include the following:

- Know and understand the ES&H requirements of their assignments and the potential hazards in the work area.
- Perform work assignments in full compliance with applicable ES&H requirements in Laboratory manuals and guidelines and established in the Safety Plan of the NIF Element for which they are assigned.
- Participate in all training, personnel, and health monitoring programs required by LLNL.
- Immediately correct or inform the responsible supervisor of any ES&H-related problems.

Non-LLNL Employees (Excluding NIF Construction Contractors and Subcontractors)

Non-LLNL employees are visitors, students, participating guests, employees matrixed (or on assignment) from other National Laboratories, contract labor, supplemental labor and vendors, including those working for facility operations contractors. Non-LLNL employees for purposes of this document do not include NIF construction contractors and subcontractors (see below for specifics). Responsibilities of Non-LLNL Employees include the following:

- Receive appropriate LLNL ES&H training, or equivalent, or shall be escorted and supervised by personnel knowledgeable about the hazards to which they may be exposed.
- Receive the same pre-placement and ongoing medical surveillance examinations as LLNL employees based on occupational exposure(s).
- Report all supplemental labor only (SLO) work-related injuries and illnesses to NIF Program Management and Hazards Control.
- Use the same protective equipment and safety controls required for any employee working in the area.
- Follow all safety and health requirements of their own parent organization.
- Follow LLNL and other requirements governing the safe and orderly conduct of operations.
- Work only on tasks or duties for which the hazards are specified in their contract.
- Perform work assignments in accordance with applicable ES&H requirements in Laboratory manuals and guidelines and established in the Safety Plan of the NIF Element for which they are assigned.

With the exception of emergency first aid and respirator review and approval, Health Services does not routinely provide medical services to non-LLNL employees. Special examinations may be provided only if requested by LLNL management or is specified in a contractual agreement.

NIF Construction Contractors and Subcontractors

NIF construction contractors and subcontractors are firms (or individuals) that are contracted or subcontracted with to perform specific work tasks on the NIF construction site. Included under this category are:

- Sverdrup Facilities, Inc. (as related to their own employees).
- Firms or individuals contracted or subcontracted with for NIF site work through the Conventional Facilities Element.
- Firms or individuals contracted or subcontracted with for NIF site work through the SE Element.
- Firms or individuals contracted or subcontracted with for NIF site work through the Activation and Start-up Element.
- Firms or individuals contracted or subcontracted with by any of the above contractors or subcontractors.

All NIF construction contractors and subcontractors shall:

- As a condition of their contract or subcontract, assume responsibility for the safety and health of their employees, agents, subcontractors and their employees, and other persons representing them on the work site.
- Assign an on-site "competent" safety representative for each contract or subcontract whose duties include the protection of persons and property and the

administration of the safety plan. The name of this individual shall be provided to the NIF Project Management upon award of the contract.

A "competent" safety representative is capable of identifying existing and predictable hazards in the surroundings or working conditions that are unsanitary, hazardous, or dangerous to employees and has authority to take prompt corrective measures to eliminate them. A "competent" safety representative is also an individual who has received the proper OSHA training necessary to understand and properly address unsafe conditions surrounding construction site exposures.

- The contractor's/subcontractor's "competent" safety representative must also attend and complete the 10-hour OSHA safety training course. This training will be provided upon contractor's request at no cost to the NIF.
- All contractors/subcontractors are required through CAL-OSHA's Injury and Illness Prevention Program (IIPP) to investigate accidents/incidents and to determine cause and to develop/implement corrective actions to prevent reoccurrence. All contractors/subcontractors must immediately notify NIF Project Management regarding any near misses or accidents. Completed accident investigation reports, findings, and corrective measures should be faxed to NIF Project Management once completed.
- Comply with CAL-OSHA's Title 8, Article #3, General Industry Safety Orders (GISO) 1505 IIPP and all applicable laws, regulations, ordinances, conditions of contract/subcontract, rules, or orders of any public authority having jurisdiction relating to the safety of persons or property.
- Ensure that all of their employees, subcontractors, and their subcontractors' employees are briefed on applicable LLNL ES&H policies/procedures and NIF's Facilities requirements. All of their employees, subcontractors, and their subcontractors' employees are required to attend a 30-minute safety orientation session that will be provided by the CM for Conventional Facilities in the onsite NIF Safety/Labor Relations trailer prior to performing any work on the site. Contractors/subcontractors shall, in accordance with law, adopt procedures providing that any employee who carelessly or callously disregards these rules or other applicable safety and health regulations shall be subject to disciplinary action up to and including discharge.
- Submit OSHA 200 logs and total man-hours worked on a monthly basis to the NIF Project Management.
- Have their safety representative participate in the safety walk-through meetings.
- The contractor/subcontractor shall ensure (with respect to their employees) that:
 - Prior to the performance of any work, each employee involved in the NIF Project knows and understands each of the ES&H and security rules that applies to the job site in which he/she is performing.
 - Each employee assumes responsibility for his/her protection. Personal protective equipment (inclusive of mandatory American National Standards Institute [ANSI] approved hard hat, appropriate Noise Reduction Rating (NRR) hearing protection, appropriate footwear, and ANSI approved safety glass) shall be used where required and maintained in proper condition.

One hundred percent personal eye wear protection is required in all construction work areas and shall be worn at all times by employees of both the contractor and subcontractors, regardless of tier. Eyewear shall conform to applicable ANSI Z87.1.

Employees on walking and or working surfaces with unprotected sides or edges six (6) feet or higher above a lower level shall be protected from falling by the use of guardrails or personal fall arrest systems. This shall include, but is not limited to, employees on the face of formwork, reinforcing steel, or structural steel during and after erection, exterior and interior masonry work, roofing work, window installation, electrical work, mechanical work, and all other trades that require work in areas where the height exceeds six (6) feet above the ground or work surface.

- Employees do not engage in practical jokes and/or horseplay.
- An employee is not undertaking work that he or she is not properly qualified or equipped to do. In this regard, each employee shall be required to attend safety training meetings weekly and sign an attendance sheet.
- Employees are aware that use of intoxicating or unlawful substances during working hours is forbidden, and any violation will be sufficient cause for dismissal and possible arrest. Employees reporting for work while under the influence of intoxicating or unlawful substances will not be allowed to assume their duties nor will they be allowed to return to the construction site.
- Employees are informed of proper storage requirements for hazardous materials (flammable, combustible, toxic, etc.) and hazardous wastes in accordance with the NIF Construction Storm Water Pollution Prevention Plan.
- Each employee is to be provided with information and training on the Hazard Communication Standard of the employer's Hazard Communication Program and Material Safety Data Sheets (MSDSs). In addition, each contractor/sub-contractor is responsible for making provisions to provide copies of MSDSs and provide information on measures that need to be taken for personnel protection to all affected employees of other employers. Copies of MSDSs shall also be provided to the NIF Project Management.
- Contractors/subcontractors are responsible for daily cleaning of work areas and debris removal.
- Each employee must always know where he or she is in relation to work in progress and avoid hazardous situations around equipment or construction in progress. Employees must advise supervisory personnel of their work location. They shall not work alone in an isolated area until arrangements have been made for periodic contact with another employee or supervision.
- Employees must complete a pre-shift self-inspection checklist of safety hazards and discrepancies to be corrected before work begins.
- One week prior to construction activities involving either construction operations or other hazardous operations, a Job Hazard Analysis (JHA) shall be prepared and submitted to NIF Project Management for review and approval.

- At the beginning of each shift there will be at least a five minute safety meeting to discuss with each crew the day's activity and the tasks they are to perform.
- Provide modified duty when available and case management procedures for all injured employees.
- Submit to NIF Project Management:
 - A site specific safety plan—pre-work review and acceptance required.
Note: A specific safety plan may not be required if the contractor or subcontractor is specifically addressed in the safety plan for the primary contractor or primary subcontractor.
 - Name and qualifications of an on-site representative. (Note: Preapproval of the safety representative by NIF Project Management must occur prior to on-site work).
 - Current copies of weekly tool box/tailgate safety meetings, when requested.
 - JHA pre-work and specific as required.
 - Weekly project safety inspection and deficiency reports with solutions and corrections included.
 - Current inventory of hazardous substances on site accompanied by MSDSs.
 - New employee orientation log.
 - Current copy of OSHA 200 log for the project.
 - Substance and Alcohol Abuse Prevention program report.
 - Completed accident, injury, and incident reports within 24 hours of occurrence.
 - A summary of all accidents and injuries, including first aid administered, submitted weekly.

Safety Coordinator

The Safety Coordinator reports to the NIF Assurance Office. Safety Coordinator responsibilities include the following:

- Assist the DAPE for Construction, the SE CMs, and the Activation and Start-up designee (to be determined) with the coordination of concurrent construction site work activities related to ES&H among the three NIF Elements.
- Act as interface among NIF Elements on ES&H issues pertaining to the construction site work activities.
- Assist in resolution of any interferences related to ES&H issues among NIF Elements.
- Make final determination on issues of conflict (pertaining to ES&H) among NIF Elements.
- Oversee environment compliance with permits, the Mitigation Action Plan, *Programmatic Environmental Impact Statement* (PEIS), etc.
- Act as the interface with the Department of Energy (DOE) and other LLNL programs and directorates on ES&H issues pertaining to the NIF Project and the construction site activities.

- Track ES&H deficiencies and status of resolution during construction of NIF (i.e., administer the ES&H deficiency tracking database [DefTrack] for those deficiencies occurring on NIF construction site).
- Chair the Project Safety Team.

Deputy Associate Project Engineer for Construction

The Deputy Associate Project Engineer (DAPE) for Construction is responsible for directing the construction of the NIF experimental and Optics Assembly Building (OAB) facilities and overseeing the occupational safety and health of LLNL employees and non-LLNL employees (associated with the Conventional Facilities Element of NIF). The position reports to the Associate Project Engineer for Conventional Facilities. Some duties (i.e., "responsibilities") may be delegated to other safety personnel; however, accountability for performance of such duties remains with the DAPE for Construction. The DAPE responsibilities include the following:

- Manage and direct the Field CM for Conventional Facilities, acting as the Contracting Officer's Technical Representative.
- Coordinate the preparation of the construction schedule, integrating it with complementary schedules for SE.
- Ensure that the required permits (e.g., Storm Water Pollution Prevention Plan (SWPPP), digging, welding) are in place.
- Oversee the construction, inspection, testing, and acceptance testing of the conventional facilities. Support the Contracting Officer in the bid/award process for construction contractors and subcontractors.
- Ensure that construction contractors/subcontractors have adequate safety plans.
- Ensure that the construction contractors/subcontractors are performing all work in accordance with applicable ES&H standards and the CSP for NIF.
- Ensure that the construction, SE installation, and activation and start-up operations are coordinated and interferences are resolved.
- Document that work-in-place meets all contractual requirements.
- Develop and manage the Owner Controlled Insurance Program (OCIP) for Conventional Facilities.
- Ensure that all Conventional Facilities personnel are familiar with the OCIP.

Appendix B

Special Equipment Laydown and Construction Areas

Near	Description	Planned use
B290	5.3 acre laydown area, planned to be graveled and fenced	Outside storage of large Special Equipment hardware prior to installation
B392	2.3 acres just to the south of B392	Outside storage and staging of large Special Equipment hardware prior to installation
B392 tent	1.3 acres to the east of 392 tent	Tent storage and staging of large Special Equipment hardware prior to installation
B590	1.7 acres to the south of B590	Close to the LTAB outside storage, cleaning and staging of large Special Equipment hardware prior to installation
T4725	Parking lot E7	Construction area for the NIF Target Chamber vendor