LLNL-TR-651632
NIF-5020544-AK

National Ignition Facility

Operations Management Plan

August 2011

LAWRENCE LIVERMORE NATIONAL LABORATORY
LLNS • Livermore, California • 94550

ECMS CM RELEASE 20110826 18:31 5020544 AK (pdf format)

APPROVALS AND STAKEHOLDERS

The following roles are affected by this procedure. The current incumbents have been notified of the document changes.

Stakeholders

N/A

This procedure has been signed electronically in the Enterprise Configuration Management System (ECMS) by the following people:

Action	Name	Title
Reviewed by	Terry Land	NIF Site Manager
Reviewed by	Bruno Van Wonterghem	NIF Operations Manager
Approved by	Ralph Patterson	Deputy Principle Associate Director, NIF

TABLE OF CONTENTS

1.0 INTRODUCTION AND BACKGROUND

Lawrence Livermore National Laboratory's (LLNL) National Ignition Facility (NIF) is a key component of the National Nuclear Security Administration's (NNSA) Stockpile Stewardship Program, whose purpose is to maintain the safety, reliability, and effectiveness of our nation's nuclear stockpile without underground nuclear testing. The NIF is crucial to the Stockpile Stewardship Program because it is the only facility that can create the conditions of extreme temperature and pressure—conditions that exist only in stars or in exploding nuclear weapons—that are relevant to understanding how our modern nuclear weapons operate. As such, the NIF's primary mission is to attain fusion ignition in the laboratory. Fusion ignition not only supports Stockpile Stewardship needs, but also provides the basis for future decisions about fusion's potential as a long-term energy source. Additionally, NIF provides scientists with access to high-energy-density regimes that can yield new insight and understanding in the areas of astrophysics, hydrodynamics, material properties, plasma physics, and radiative properties.

The use of the NIF to support the Stockpile Stewardship Program and the advancement of basic high-energy-density science understanding is planned and managed through program-level execution plans and NIF directorate-level management teams. An example of a plan is the *National Ignition Campaign Execution Plan.*[1]

The *NIF Operations Management Plan* provides an overview of the NIF Operations organization and describes how the NIF is supported by the LLNL infrastructure and how it is safely and responsibly managed and operated. Detailed information on NIF management of the organization is found in a series of supporting plans, policies, and procedures. A list of related acronyms can be found in Appendix A of this document.

2.0 PURPOSE

The purpose of this document is to provide a roadmap of how the NIF Operations organization functions. It provides a guide to understanding the requirements, document flow down, organizational vision and mission, performance metrics, and interrelationship of the NIF Operations organization with other directorate and laboratory organizations. This document also provides a listing of roles and responsibilities, core processes, procedures, authority matrices, change control boards, and other information necessary for successfully functioning in the NIF Operations organization. This document, the *NIF Shot Operations Plan,*[2] and the *NIF Maintenance Plan*[3] together represent the primary documents satisfying our Conduct of Operations compliance requirement.

3.0 LOCATION AND DESCRIPTION

3.1 National Ignition Facility

This document governs operations of the NIF, including the Laser and Target Area Building (LTAB) (B581), the Optics Assembly Building (OAB) (B681), and associated utility pads and outbuildings (B582, B682, B683, and B684).

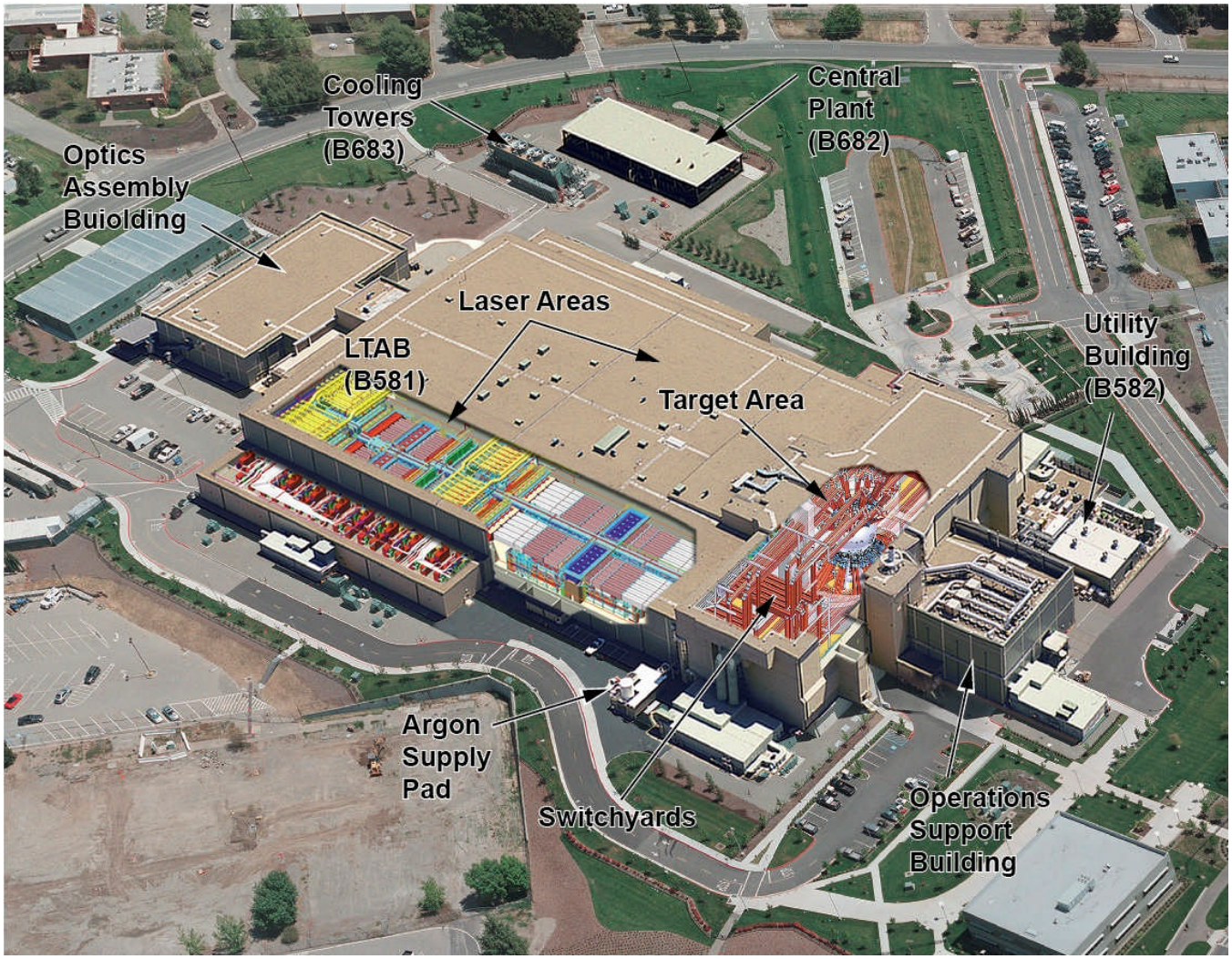

Figure 1. The National Ignition Facility.

3.2 NIF Description

The NIF laser is capable of providing an output pulse with the required energy of 1.8 MJ and an output pulse power of 500 TW at a wavelength of 0.35 μm with specified symmetry, beam balance, and pulse shape. Figure 2 shows the experimental facility, which houses the multi-beam, neodymium-doped glass laser capable of generating and delivering laser pulses to a target chamber. In the 10-m-diameter shielded target chamber, the light from the NIF beams can be tightly focused to enable weapons physics, weapons effects, inertial confinement fusion, and basic science experiments.

User-supplied diagnostics are used to make the accurate measurements of the high temperature and pressure states of matter. Data from those diagnostics are recorded by the NIF data acquisition system.

NIF consists of eight primary systems:

- Conventional Facilities.
- Laser Systems.
- Beampath Utility Systems

- Target Diagnostic Systems.
- Target Experimental Systems.
- Control Systems and Software Applications.
- Transport and Handling.
- Maintenance and Service Areas.

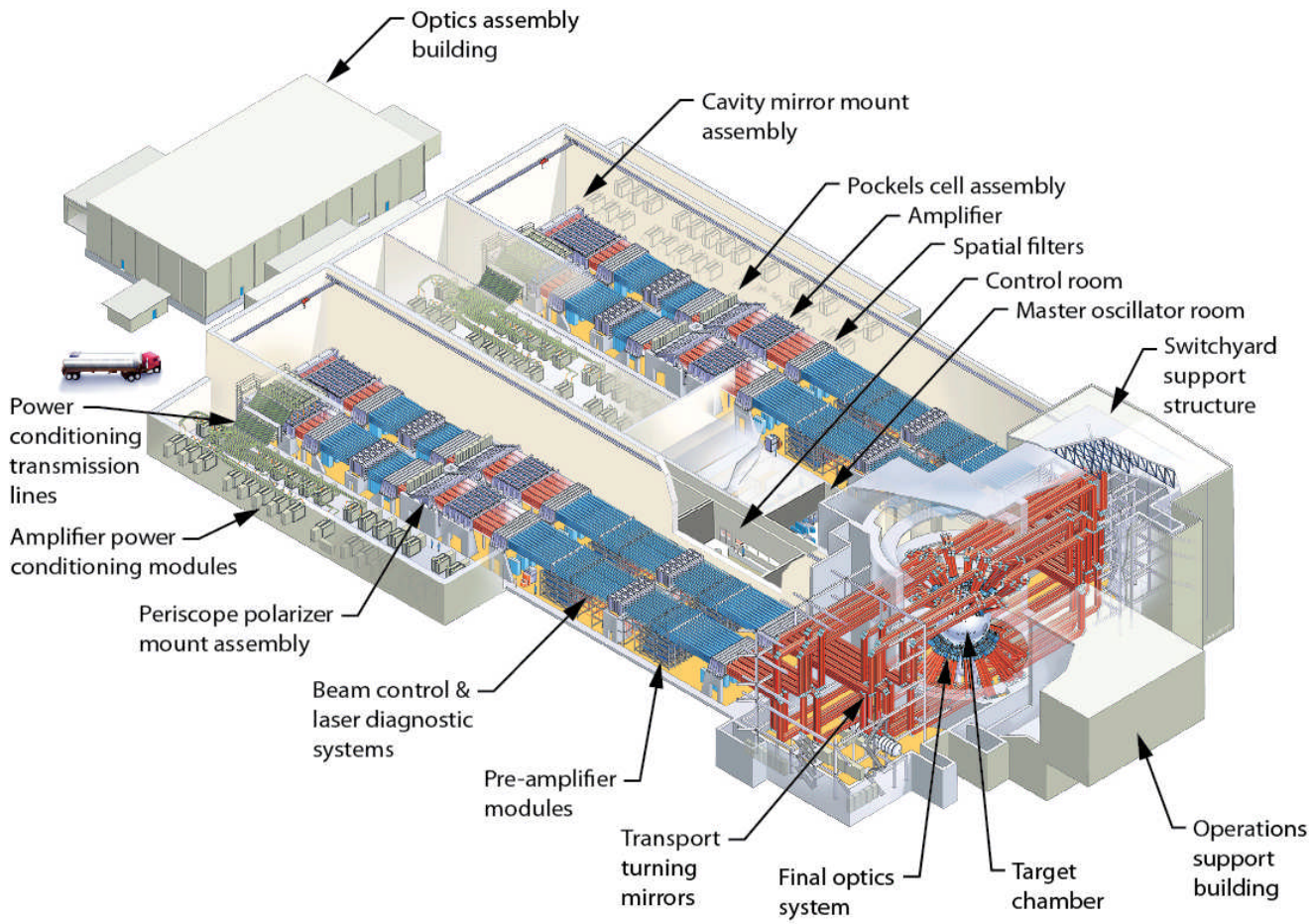

Figure 2. NIF Laser and Target Area Building.

4.0 NIF OPERATIONS VISION AND MISSION

4.1 Operations Vision

The NIF Operations organization is a world-class operations organization that proactively leverages its multi-billion-dollar asset to ensure that premier science experiments are accomplished in a reliable, safe, and cost-effective environment. The organization is professional, disciplined, and offers outstanding interface support for experimentalists, while meeting all Department of Energy (DOE), LLNL, and state requirements. NIF Operations staff is exceptionally well trained, technically excellent, inquisitive, and constantly striving for improved performance and technical results. The team environment and aggressive technical challenges promote professional growth, staff retention, and an

esprit de corps as the team heads towards history-making experimental results. The Operations team core values maintain that all activities are performed safely, with quality, respect toward co-workers and with integrity.

4.2 Operations Mission

The NIF Operations organization provides facilities, equipment, people, and procedures to plan and execute experimental campaigns in support of the NIF & PS Directorate. The Operations Organization's main role is to effectively manage the NIF, a role that includes performing shot operations; maintaining the facility and equipment, including calibration; planning and implementing upgrades to the facility and equipment to expand operational capabilities; deploying diagnostics and experimental platforms; defining and implementing operational policies and procedures; ensuring the safety of personnel and equipment; managing the facility's configuration and ensuring compliance with the safety basis and applicable regulations; ensuring the security of data, equipment, and assets; staffing and training facility personnel; and performing interfacing functions with the NIF & PS Directorate and other LLNL and institutional organizations. The Operations organization also manages the use of the facility, by allocating time, space, and resources to building, commissioning, operations, and maintenance activities.

5.0 NIF OPERATIONS SAFETY POLICY

5.1 Personnel Safety

All work in the NIF shall be performed in accordance with LLNL environmental safety, health, and quality (ESH&Q) policies, the NIF Facility Safety Plan (FSP)[4] and other applicable Integration Work Sheets (IWSs) and in a manner that protects the health and safety of employees and the public, preserves the quality of the environment, and prevents property damage.

All workers in the NIF are held accountable for meeting the ESH&Q requirements and expectations, as documented in the LLNL ES&H Manual, Operational Safety Plans (OSPs), and FSP. Workers may not deviate from any approved safety plan without approval and authorization by management. Of particular concern are any deviations from approved procedures requiring the use of Personal Protective Equipment (PPE), Lockout Tagout (LOTO), the bypassing of interlocks, or compliance with radiological controls. Administrative actions may be taken for any individual who willfully violates these requirements.

Each worker is responsible for immediately stopping work if it is observed that an operation presents an imminent danger to health, safety, the environment, or equipment. Activities will not resume until the issue has been appropriately addressed, as discussed in Section 5.7.

Workers are encouraged to bring their safety concerns to the attention of their immediate supervisor. Workers who fail to receive an adequate response to a safety concern are encouraged to contact any of the following: NIF Operations Manager (NOM), NIF Site Manager, NIF Radiation Safety Officer, NIF ES&H Manager, or the Deputy Principle Associate Director (DPAD) for NIF.

The Integrated Safety Management[5] (ISM) process is employed in all activity planning. No activity may be conducted that compromises safety for schedule.

5.2 Safety Meetings

Group safety meetings are conducted weekly. All personnel working at the NIF are expected to attend one of these meetings each week. The NIF Site Manager (NSM) sets the agenda and oversees the scheduling for these meetings. The meetings are led by NIF line management personnel and are a forum for promulgating key information to NIF employees, providing and soliciting feedback, setting management expectations, and discussing current safety concerns and issues.

5.3 Walkabouts

Management at all levels in the NIF Operations organization is responsible for assessing ongoing operations to assure the protection of personnel, the environment, and the capital investment. A structured management walkabout process is the principal self-assessment practice. Walkabouts are a key tool for ensuring on-site management presence, fulfilling the core function of feedback and improvement, and confirming that IWSs are being implemented correctly. Walkabouts provide a mechanism to match senior management expectations for work, safety, and quality management processes with performance of mid-level managers, first-line supervisors, and workers.

The purpose of the walkabout is to:

- Perform self-assessments of management and work execution in accordance with the requirements of the IWS/OSP, and the ES&H Manual.
- Provide employees with a mechanism for direct feedback and improvement.
- Solicit recommendation for improvement
- Evaluate all levels of safety implementation at the NIF.
- Determine if employees are working safely and implementing proper protocols
- Determine if teams have what they need to do their jobs safely

These management safety assessments will be supplemented by independent audits by the NIF & Photon Science Directorate.

Weekly walkabouts are established on the NIF Site Walkabout calendar. Annual walkabouts are performed in accordance with the *NIF Self-Assessment Program Safety Walkabout Process.*[6]

5.4 Incident Response and Management Review

The timely evaluation of incidents is an invaluable component of ISM and a useful management tool because it provides feedback and improvement to the safety process. The NIF's policy is that all accidents are preventable and that all incidents related to the NIF that result in personnel injury, illness, or impact to the environment should be investigated. Incidents resulting in equipment or facility damage will be investigated when the potential exists to improve procedures or methods.

Incidents include personal injury, property damage, and "near misses." A near miss is a procedural violation or error that could have caused a serious environmental hazard, personnel injury, equipment damage, or could have affected facility safety. The final decision on classifying an incident as a near miss will be made by the DPAD for NIF, in consultation with the NIF ES&H Manager, NOM, NIF Assurance Manager, and the line management involved with the incident.

All incidents must be reported immediately to the work supervisor, Responsible Individual (RI) and Authorizing Individual (AI) in accordance with the *NIF & PS Directorate Off-Normal Event Initial*

Response and Notification Procedure.[7] The NIF ES&H Manager will monitor the implementation and manage the incident investigation process, per the *NIF & PS Management Review*[8] procedure.

5.5 Operational Safety Review Committee

A committee of senior management and Subject Matter Experts (SMEs) has been charted to act as the Operational Safety Review Committee. The committee will be convened at the discretion of the NOM and/or Authorizing Individual (AI) to review operational safety concerns (discovered conditions) and advise on proposed actions. The committee will conduct an immediate risk analysis, review proposed options, recommend (to the NOM and/or AI) the level of operations that may be continued with any concomitant impairments or mitigations, recommend course(s) of action to repair the situation, and document the above. The NSM will serve as the chair and document the meeting notes.

5.6 Integrated Safety Management Implementation

The NOM is responsible for implementing ISM for the NIF under the DPAD for NIF. Work authorization flows through the line management chain, to the designated Authorizing Individual (AI), to the RI, to Daily Work Team Leaders (DWTLs), and finally to the workers. There are three management chains that exist within the NIF—shot operations, non-shot operations under *OSP 581.11, NIF Laser System Installation, Commissioning, and Operation*,[9] and non-shot operations under other IWSs. Figures 3 and 4 show the flow down of ISM responsibilities for these three instances.

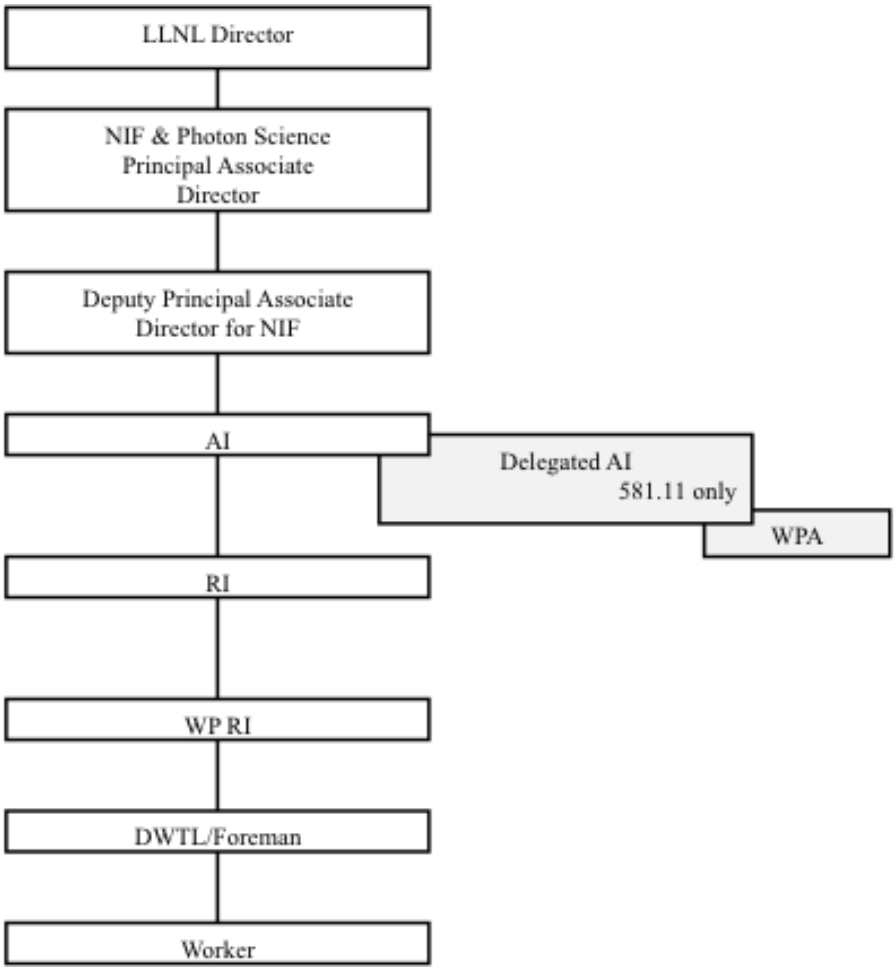

Figure 3. NIF Operations ISM flow down chart, for non-shot operations under OSP 581.11[9] or other IWSs.

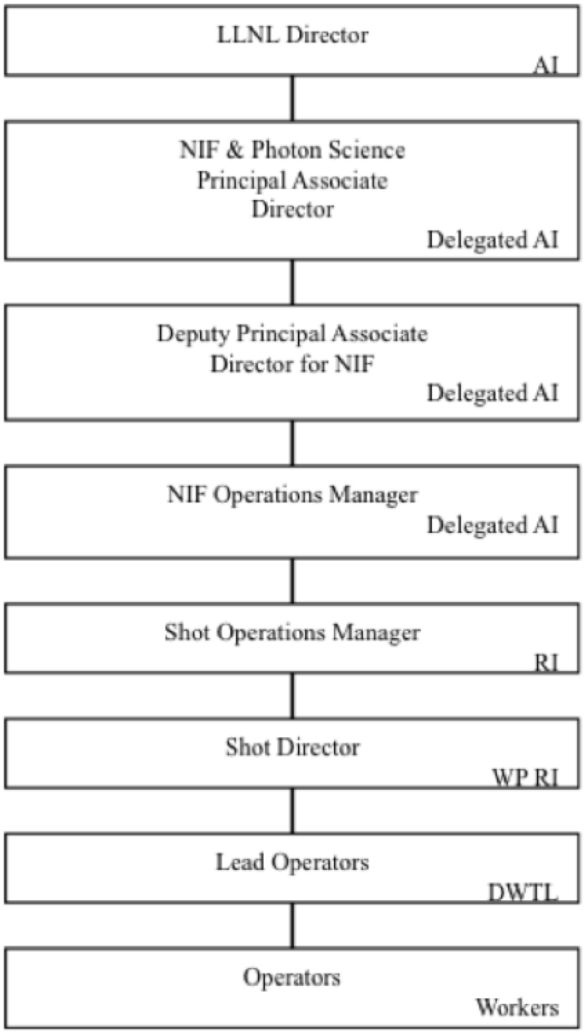

Figure 4. NIF Operations ISM flow down chart. Line management responsibility for shot operations under OSP 581.11.[9]

ISM Delegations:

Authorizing Individuals: AIs have the overall authority and responsibility for safety management and work authorization. The NOM may delegate the role of AI (see figures above) with DPAD for NIF approval. AIs may delegate Work Permit Approval (WPA) authority with NOM concurrence.

Responsible Individuals: RIs are appointed by the applicable AIs and are responsible for safe planning of work, preparing work teams for work activities, directing the work in a safe manner, and self assessment of the process (feedback and improvement). There are two types of RIs:

- IWS RI—responsible for initiating the Job Hazards Analysis (JHA)/IWS for new or modified activities under his/her responsibility. IWS RIs are responsible for the work and personnel identified on the JHA/IWS.
- Work Permit RI (WPRI)—responsible for generating a Work Permit for a job under an approved IWS and responsible for the safe execution of work authorized by a Work Permit and verification of training of the work team.

Daily Work Team Leader (DWTL)/Foreman: DWTL candidates are nominated by the WPRI, concurred with by the NOM, NSM or designee and approved by the WPA. Qualified DWTLs, or Foremen for craft teams, oversee work teams in the field and are assigned on the work permit by the WPRI. DWTLs are also responsible for:

- Leading the team to accomplish the work safely and reliably within the Integrated Worksheet (IWS)/Procured-Services Worksheet (PWS) & Work Permit (WP) scope
- Leading the Safe Plan of Action SPA meeting
- Ensuring team members are 'fit for duty'
- Conducting the Daily Work Team Meeting
- Ensuring identified controls are properly implemented including LOTO & PPE
- Using the required work procedures and checklists
- Monitoring the work safety of the work team
- Recognizing when work cannot proceed as planned and pausing work
- Closing out work at the end of each shift

5.6.1 OSP 581.11 Management

OSP 581.11, NIF Laser System Installation, Commissioning, and Operation[9] is managed in ECMS, not through the institutional eIWS system, because of its size and complexity. Each new revision of the OSP authorizes and controls new hazards or the extension of existing hazards to new areas of the facility. Each new release is written such that hazards are controlled before they are introduced. Sometimes this results in controls being implemented for hazards that do not yet exist. Under certain circumstances, exceptions may be required for OSP 581.11 controls. These exceptions will be documented in a temporary exception memo and approved by the AI. These memos are posted in the Work Control Office (WCO) and included in an Engineering Change Request (ECR) in ECMS so that they are available to all users.

5.7 Stop Work and Restart Policy

It is LLNL's and NIF Operations' safety policy that any individual is empowered to stop any work immediately if the situation is judged to be unsafe.

When it is determined that a work activity's operating limits or controls are not being followed, or when common sense indicates that people, property, or the environment are in imminent or substantial danger of being hurt or damaged, work must be stopped or suspended until appropriate actions are taken. The *NIF & PS Directorate Off-Normal Event and Notification Procedure.*[7] should be followed.

Once work is stopped, the AI and/or the RI shall perform a preliminary investigation to determine why the work was stopped. If the work was stopped because of a misunderstanding of the actual situation and the work could proceed safely, the work may be restarted with concurrence by the AI. If an incident occurred, a Management Review will be initiated and the initial investigation completed before resumption of activities. Refer to Procedure 5.11, *NIF & PS Management Review.*[8] Work may only resume after authorization by the AI.

6.0 NIF OPERATIONS ORGANIZATION

The NIF Operations organization is shown in Figure 5, below. The organizational functions are described in the following paragraphs.

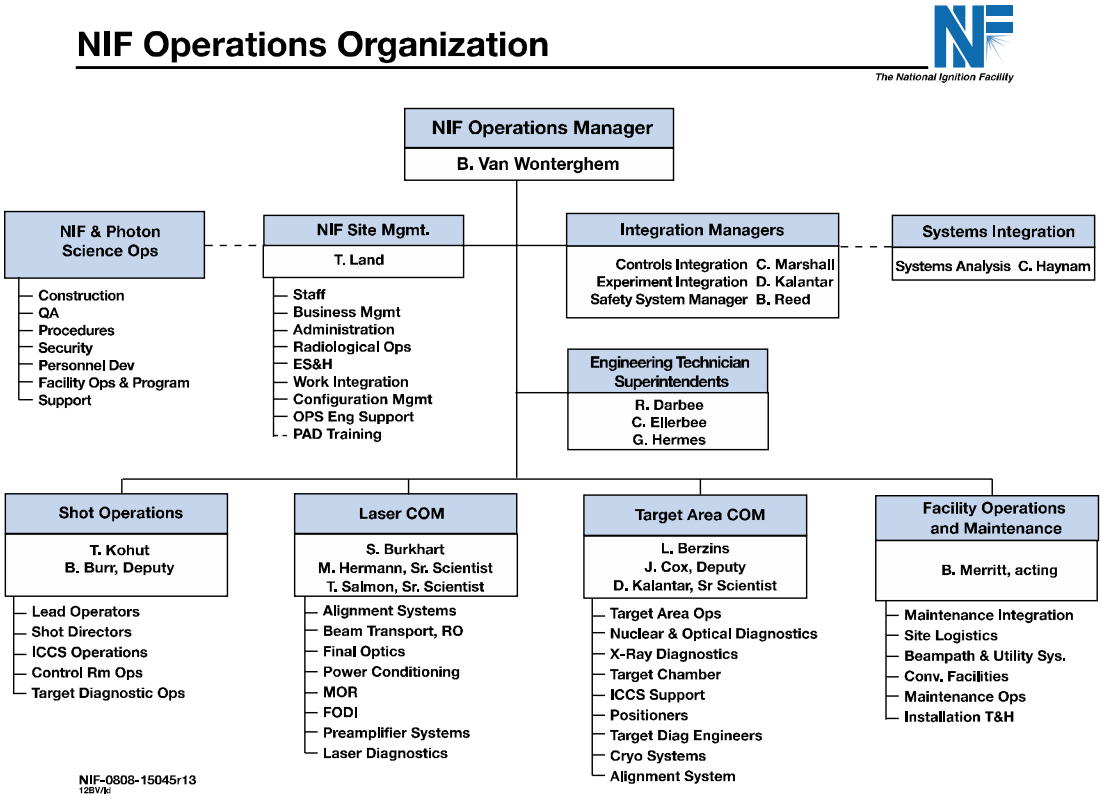

Figure 5: NIF Operations Management Organization.

6.1 Organizational Functions

NIF Operations management has the overall responsibility for the safe, cost-effective, reliable performance of the NIF. Staff assignments include project controls and administration for the organization.

NIF Site Management is responsible for implementation of conduct of operations, safety basis compliance, standards and policies, work coordination, Configuration Management (CM), security, ES&H, Safety Program, hazardous material operations, radiological operations, training and business and staff administration.

Shot Operations is responsible for conducting scheduled shot sequences safely, reliably, and cost effectively. Shot Operations staffs and manages the control room operation.

Facility Operations and Maintenance operates and maintains the NIF conventional facility and other commissioned systems that support laser system operations, as well as provides maintenance management, calibration services and logistics support functions.

Commissioning, Operations, and Maintenance (COM) organizations are responsible for the technical equipment within the NIF. They are divided into the Laser and Target Area. Each COM is

responsible for ensuring that their systems are performing safely, cost effectively, and reliably, while meeting technical requirements.

Management Descriptions can be found in Appendix B.

6.2 Working Groups

A series of working groups within NIF Operations are used to ensure the proper broad-based technical expertise is available during any activity with multiple stakeholders or very broad implications. These groups are commissioned, perform a task, and then typically decommissioned—the nature of these groups is therefore quite dynamic. The NOM is responsible for commissioning the working groups and ensuring proper representation.

Charters for long-standing working groups should be maintained by the NSM and approved by the NOM.

6.3 Change Control Boards

Change Control Board (CCB)5s serve as advisory boards to address various technical and operational issues. The formal CCB structure for baseline change control is described in the *National Ignition Campaign (NIC) Execution Plan*.[1] When a change is being considered by a CCB5 and it goes beyond the approved baseline, it is promoted to the NOM for evaluation and then escalation to the CCB4 for review and approval.

Charters for CCB5s shall be maintained by the NSM and approved by the NOM.

6.4 NIF Operations Manager Approval Required

The NOM approval is required for the following:

- Shot Setup Approval
- Deviations from approved shot rules of engagement.
- Bypassing or disabling any functionality of the Safety Interlock System (SIS)
- Facility startup after unplanned major utility shutdowns or natural disasters.
- Deviations from standard procedures.
- Issuing yield control keys

The NOM accomplishes work through the Operations organization's managers, to whom the NOM has delegated authority. Below are tables defining delegated roles, procedure approval, and work approval.

6.4.1 Delegation of Authority Tables

Table 1. Assignment of Roles.

Item	Appointed By	Approved By
Adjudicating Authority	NSM	NOM
Alternate FPOC	NSM	NOM
Authorizing Individual	NOM	DPAD NIF
COM Manager	NOM	NOM

Item	Appointed By	Approved By
Configured System Manager	NSM	NOM
DWTL	Work Permit RI	NOM/NIF Site Manager
Energy Owner	COM Manager	NOM
Facility Duty Officer	NSM	NOM
Field Supervisor	Manager	COM Manager
FPOC	NSM	NOM
IWS RI	Authorizing Individual	NOM
Lead Operator	Shot Operations Manager (SOM)	NOM
Shot Director	SOM	NOM
System Manager	COM Manager	NOM
Target Area Coordinator	TCOM Manager	Shot Operations Manager
Work Control Officer	Senior Work Control Officer	NOM
Work Permit Approver	Authorizing Individual	NOM
WPRI	IWS AI	Associate Project Manager

Table 2. Delegation of Work Procedure Signature Authority.

NOM Procedure Delegation Table	
Procedure Type	**Delegate**
Acceptance Test Procedures	COM, FOM, SOM
Installation Qualification Procedures	COM, FOM, SOM
Operational Qualification Procedures	COM, FOM, SOM, system level and Configured System remains with NOM
Performance Test Procedures	NOM
Maintenance Procedures affecting CSS	NOM
Operations Procedures affecting CSS	NOM
Maintenance Procedures not affecting CSS	COM, FOM, SOM
Operational Procedures not affecting CSS	COM, FOM, SOM
Energy Isolation Procedures	COM, FOM, SOM

Table 3. Delegation of Work Approval Authority.

NOM Work Approval Delegation Table	
Authority Type	**Delegate**
Off-hours approval	NSM and SOM
Multi-day LOTO	NSM and SOM
OSP 581.11 RI	Alternate RIs listed in OSP 581.11
Overtime	NSM, COM, FOM, SOM

6.5 NIF Operations Manager Notification

Regardless of the delegations above, certain situations require notification of the NOM.

The NOM shall be notified as soon as practical when:

- A NIF emergency, as defined in NIF Procedure 5.21, *NIF & PS Directorate Off-Normal Event Initial Response and Notification Procedure,*[7] occurs (in addition to notifications required by that procedure).
- Facility operating limits or design limits are violated.
- Imminently hazardous conditions exist that cannot be mitigated.
- Safety systems or interlocks become inoperable without the appropriate mitigations in place.
- Equipment failure or mis-operation occurs that could affect facility capability, availability, or safety.
- Actual or attempted sabotage is suspected.
- An Associate Project Manager (APM), System Manager (SM), or safety representative deems an investigation is appropriate.
- Any near miss occurs (A procedural violation or personnel error that caused or could have caused a serious environmental hazard, personnel injury, equipment damage, or could have affected facility safety).
- A DOE Occurrence Report or other state/federal agency (e.g., Environmental Protection Agency) report is appropriate.
- Radiological or toxic material is lost/released, or excess limits or significant inventory discrepancy.
- Personnel radiological contamination or overexposure, personnel exceeding their Administrative Control Level (ACL).

The NOM will subsequently ensure that other appropriate managers are notified of these problems.

6.6 Management Changes and Manager Turnovers

When managers turn over responsibilities from one to another, it is important that roles and responsibilities be reviewed and discussed to ensure the new manager fully understands the breadth of their responsibilities, current issues, and future plans. This turnover will include, as applicable, a review of the following for assigned personnel and equipment:

- Roles and Responsibilities as stated in this Plan
- IWS AI or RI assignments
- Livermore Training Records and Information Network (LTRAIN) Questionnaire for new training requirements of new manager
- LTRAIN for training and qualification status of assigned staff
- Issue Tracking System (ITS) action items
- Location, Component, and State (LoCoS) Problem Logs, Restrictions and Work Permits
- System Maintenance and Reliability Tracking (SMaRT) Work Orders
- Operations and maintenance schedules for the next three months

- Planned upgrades (designs, procurements, construction/installations, commissioning)
- Operations and maintenance procedures
- Existing contracts with vendors/suppliers
- Tour of the equipment areas or portions of the facility being turned over

This review will include items of concern as deemed appropriate by the outgoing manager. The next level manager will confirm that the above items have been satisfactorily reviewed and understood by the new manager prior to officially appointing the new manager.

When there are specific qualifications associated with the management position, the appointing authority (see Section 6.4.1) will determine whether those qualifications must be completed prior to the manager assuming his/her duties, or if other interim measures would be appropriate to allow the manager to function in his/her new role while those qualifications are completed.

6.7 Uniform Policy and Dress Code

NIF Operations uniform shirts are available and highly recommended for NIF Operations personnel working in the facility for more than 20 hours per week. This attire is required to be worn by Control Room staff when on shift. Personnel will receive six shirts. NIF uniform attire remains the property of NIF Operations and shall not be used for personal or non-business purposes. Uniform attire will be cared for by the owner and returned when no longer working for NIF Operations. Damaged attire will be turned in and replaced, with NSM approval. The distribution of NIF uniform attire will be approved by the appropriate supervisor and the NSM.

7.0 NIF OPERATIONAL MODES AND SUPPORTING SHIFTS

The LTAB is operated 24 hours per day, up to 7 days per week.

NIF operations consist of two modes: Shot Operation—when a laser shot is being conducted (when a shot checklist is being executed), and Maintenance/Non-Shot Operations. The line management responsibility for safety is shown for each mode in Section 5.5 of this plan.

7.1 Shot Operations

The NIF is managed by a shot operations team through a shot-specific line management organization during the execution of a shot checklist. Shot operations are controlled by a Shot Director (SD) located in the NIF Control Room. The shot operations team includes Lead Operators (LOs), sub-systems operators, and associated support for other systems as required. The SD is the WPRI during shot operations. During shot operations, final adjustments, calibrations, and settings are accomplished and the shot is executed by following a master shot checklist. The facility is released for non-shot work by the SD or LO dropping the sweeps and reversing applicable safety signs, which unlocks the doors in the controlled areas.

7.2 Maintenance/Non-Shot Operations

The NIF is managed by the line management organization during the time that shot operations are not being executed. Non-shot operations include facility, special equipment, and conventional equipment maintenance and upgrades; configuration for an upcoming shot; pre-operational checks and calibration; and holding periods when shot operations in progress are disrupted for a significant period of time.

7.3 Working Hours, Shifts, and Breaks

7.3.1 Shift Schedules

Facility shift schedules shall be implemented and maintained by the NSM and approved by the NOM. Different activities may work on different weekly schedules and/or shifts conforming to LLNL policies.

7.3.2 Shift Turnover

Due to the complexity of the facility and the variety of activities, a formal turnover process is required to ensure proper communications. Shift Turnover for Shot Operations and Maintenance staff is conducted per the *NIF Shot Operations Plan*[2] and the *NIF Maintenance Plan,*[3] respectively.

7.3.3 Working Alone

Personnel shall not work alone and unsupervised on the NIF when performing any hazardous activity. Performing office-type administrative duties, routine walk-through inspections, or other non-hazardous activities deemed appropriate by line management are acceptable to perform alone.

7.3.4 Off-Hours Work

Employees working when a WCO or SD is not staffed are considered to be performing off-hours work. Work being planned for periods when normal management and safety personnel are not present on site requires particular attention to ensure that it can be conducted safely. Off-hours work requires a special work permit with approval of the NOM, NSM or SOM. Refer to NIF Procedure 5.8, *NIF Project Site Work Permits*[10] for details.

7.3.5 Workers Designated as "On-Call"

The NIF OPS On-Call program is established to have dedicated support available as needed. The list of on-call support is maintained in LoCoS on the support tab.

On-call Facility Duty Officer and Field Supervisor will be invoked for off hours when no Shot Director or Work Control Officer is on duty (typically major holidays); refer to *NIF Operations Facility Duty Officer Response Procedure,*[11] and NIF Procedure 11.2, *NIF Operations On-Call Field Supervisor Response*.[12]

Other organizations supporting NIF Operations, such as Engineering and controls may run independent on call programs to support shift operations.

8.0 COMMUNICATIONS

The effective and safe operation of NIF requires that operations-related communications be concise, precise, and formal. To ensure effective communications, the following standardized procedures apply.

8.1 NIF Operations Gram/NIF Grams/Exception Memos and Temporary Standing Orders

8.1.1 NIF Operations Grams and NIF Grams

Facility-wide notifications are made through one of two email notification lists:

- The personnel authorized with access to the NIF. The NIF Operations Gram (NOG) is used to communicate to personnel with access to the NIF. The NSM or NOM will approve all NOG messages.
- NIF & Photon Science Directorate personnel. NIF Grams must be reviewed by the NOM and approved by the Deputy Principal Associate Director of NIF & Photon Sciences.

8.1.2 NIF Operational Memos/Orders

Facility-wide notifications are made through one of two memo formats:

- Exception memos to OSP 581.11 are governed by NIF Procedure 6.4, *Control of CM Documents*.[13] These memos will be posted on the 581.11 Exception Memo bulletin board in R1026.

- Temporary Standing Orders covering areas other than those affecting 581.11 will be issued as needed by the NOM. They will remain active until incorporated in other policy or procedural documentation and do not affect the safety basis of the facility. The NOM Administrative Assistant will track and number these memos and maintain a binder with the Shot Director listing effective Temporary Standing Orders. Temporary Standing Orders are short term and normally meant to have a life of not more than 6 months.

8.2 All-Hands Meetings

In order to ensure regular communications at the working level, all-hands safety meetings are held weekly; refer to Section 0.

Additionally, as determined by NIF Operations management, special all-hands sessions are held on an as-needed basis to discuss critical events relating to the NIF or LLNL.

8.3 Required Reading

Both the *NIF Shot Operations Plan*[2] and the *NIF Maintenance Plan*[3] define required reading programs for their respective teams. This program is composed of various elements, some of which are documented in qualification cards, as well as others of a more time sensitive nature that may be available in various binders. Management is responsible for communicating required reading material.

8.4 Radio Channels Assignment

Radio channels are allocated by the NSM as follows:

- Channel 1 will be the shot operations/control room channel, and will only be used for this purpose.
  - In the event of an incident, Channel 1 becomes the primary communications channel and all other communications shall use another channel.

- Channel 2 is for Maintenance, ICS, Transport & Handling, and Target Area Operations.
- Channel 3 is for Radcon techs and construction subcontractors.

8.5 Pagers and Cell Phones

NIF Operations staff typically need to be available and therefore are asked to wear, at a minimum, a pager during working hours. Certain staff are issued cell/smart phones for enhanced communications.

8.6 NIF Operations Phone List

A NIF Operations Phone List will be maintained for key personnel, including work, home, and cell phones. In addition, all personnel issued site Access Control Cards must provide off-hours contact information to be used in the event of shot sweep access list discrepancy resolution. A copy of the list will be available to on-call personnel and senior management. Further distribution will be controlled by the NSM. This list will be maintained by the NIF Operations Administrator.

As required, personnel will only be contacted concerning personnel injury, safety issues, major facility impacts, or natural events. Work supervisors will have access to the NIF Operations Phone List so that they can contact support organizations relevant to their operations. Note that, for off-hours support, the on-call program should be utilized as the first option and only call individuals if needed. The Operations Phone List will be kept in the Control Room and WCO binder.

8.7 Public Address Systems

Announcing systems (public address or PA systems) should only be used for information that everyone in the facility needs to know. For routine use, the SD, LO, Work Control Officer (WCO), NSM, NOM and SIS Manager are the only personnel authorized to use the PA system.

Announcing systems should not be used to routinely page personnel, unless the SD or LO decides this is the only appropriate method to find the specified person.

The Laboratory controls the Evacuation Page System, which is a separate but parallel system of speakers located throughout the facility. Emergency and general-interest announcements may be made automatically or manually by Laboratory officials over this circuit.

When a PA system announcement is being made, all non-emergency communications (radio and face-to-face) will cease for the duration of the announcement. This will enable all personnel to hear and understand the announcement.

8.8 Telephones

Telephones are available to coordinate activities throughout the facility. Personal phone calls may be made, but their duration should be kept to a minimum, and they must not interfere with operations. Phone locations are controlled by the NSM.

9.0 LOGS

Logs are the record of events in the facility and provide a history of facility operations. Due to the highly automated nature of the facility, most logs are recorded electronically and very few paper logs are maintained. Operators enter comments about equipment or evolutions in the Operations Logs in LoCoS, where the entry is tied to a specific system or component. Equipment problems are entered into the Problem Log module of LoCoS, and further documented through SMaRT Work Orders and equipment histories (where used) and LoCoS Work Permits. Most equipment parameters are monitored and controlled electronically, with automated archiving of system operating parameters and alarms. All electronic logs and archives are available to operators at the appropriate workstations. Where the necessary information is not logged electronically, paper logs are used. Requirements for specific events or information requiring logging is defined in the *NIF Shot Operations Plan*[2] and the *NIF Maintenance Plan.*[3]

10.0 PROBLEM DOCUMENTATION AND REPORTING

Problems with hardware and software are reported to SMs and others affected. A detailed description of the problem should be documented by using the Problem Log module in LoCoS, in accordance with NIF Procedure 3.2, *Problem Reporting & Disposition of Nonconforming Material*.[14] Issues are also communicated in various reports or emails (e.g., Shot Operations Shift Summary). Troubleshooting and actions to resolve the problem should be thoroughly documented in LoCoS, SMaRT, or with JIRA, as appropriate. COMs are expected to ensure timely disposition and resolution of problems through periodic reviews and tracking of metrics.

Safety-related corrective actions from Management Reviews and other safety reviews are tracked with the Issues Tracking System (ITS) in accordance with NIF & Photon Science Directorate Procedure 1.8, *Action Management*.[15]

11.0 INTERFACES WITH NIF OPERATIONS

11.1 Managing Interfaces

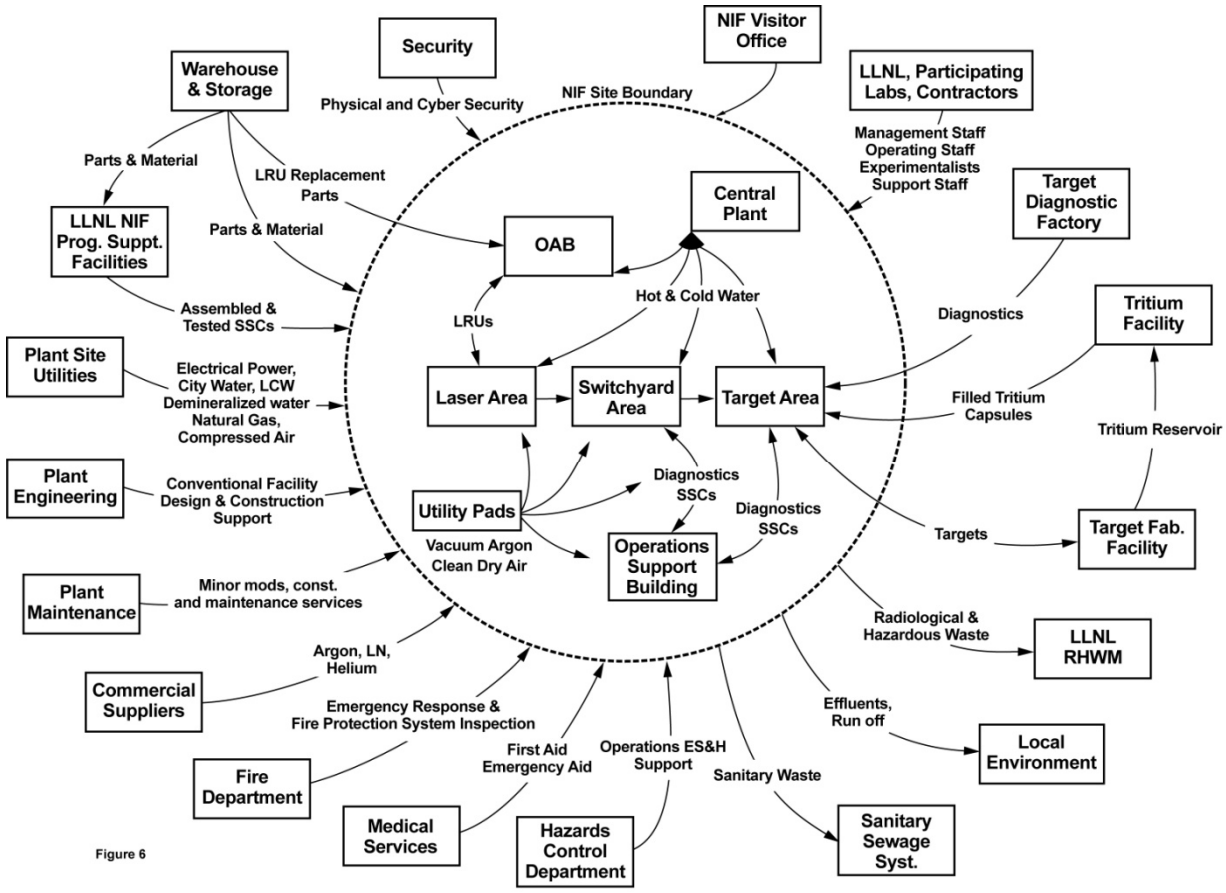

Figure 6. NIF and Interfacing Entities.

All interfaces are managed and controlled by the NOM or appropriate designee. These interfaces may be managed with a memorandum of understanding, a contractual agreement, a control document, or appropriate LLNL or NIF procedures.

All work done within the NIF boundary is centrally coordinated by the NIF Work Control Office through a Work Permit process. Access to the NIF is controlled and all unescorted entrants must have completed the required training and obtain approvals defined in *NIF Site Access*.[16] Personnel requiring access who have not been authorized unescorted access must be escorted per *NIF Site Work Escort*.[17] The suppliers of skilled workers from any external source, whether by memorandum of understanding or by subcontract, must ensure that such workers are trained appropriately for their task(s) per the *NIF & Photon Science Directorate Training Plan*.[18]

11.2 Interface Points

Key interfaces with NIF Operations can be categorized as within the NIF Directorate, within LLNL, and outside LLNL. These interfaces are defined in the table below.

Table 4. Interface Points with the NIF.

Point	Interface Issue	Operations Interface Point	Interface Point
Internal to Directorate	Safety	NIF ES&H Manager	Directorate ES&H Manager
Internal to Directorate	Security	NIF Site Manager	NIF & PS Security Manager
Internal to Directorate	Staffing	NIF Operations Manager	Principal DAD for Operations
Internal to Directorate	Warehouse & Storage Logistics	Logistics Coordinator	NIF Warehouse
Internal to Directorate	Factories	COM	APM for Factories
Internal to Directorate	Hazards Control	NIF ES&H Manager	ES&H Team 2
Internal to Directorate	Targets & Target Fabrication	Target Area COM	Optics and Targets APM
Internal to Directorate	Campaign Planning	NIF Operations Manager	NIF Experiments Director
External to Directorate	BAAQMD	Facility Operations and Maintenance Manager	LLNL Environmental Protection Department
External to Directorate	Staffing	NIF Operations Manager	NIF Directorate Operations Manager
External to Directorate	Fire Alarms	Fire Protection CSM	Fire Chief/ Fire Marshall
External to Directorate	Physical Security	NIF Site Manager	Protective Force Division
External to Directorate	Cyber Security	NIF Site Manager	Information and Personnel Security Division
External to Directorate	Utilities	Facility Operations and Maintenance Manager	LLNL Plant Engineering
External to Directorate	Minor Maintenance & Upgrades	Facility Operations and Maintenance Manager	LLNL Plant Engineering
External to Directorate	Medical Services	Work Control Officer	LLNL Emergency Services
External to Directorate	Radiological and Hazardous Waste Management	Site Waste Manager	LLNL RHWM
External to Directorate	Radiological Materials	Radiological Safety Officer	LLNL Materials Management
External to Directorate	Stack Monitor	Radiological Safety Officer	Environmental Protection Division (EPD)

Point	Interface Issue	Operations Interface Point	Interface Point
External to LLNL	Logistics Support & Spare Parts	Facility Operations and Maintenance Manager	Various contractors
External to LLNL	Major Upgrades - Engineering	COMs	NIF Engineering
External to LLNL	Major Upgrades - Construction	NIF Site Manager	NIF & PS Directorate Construction Manager

12.0 REQUIREMENTS FLOW DOWN

NIF Operations functions within the context of the NIF and Photon Science Directorate, LLNL, the DOE/NNSA, and state and federal laws. The flow down of requirements into the NIF Operations organization is represented in the figure below. For clarity, the Conduct of Operations scope is represented.

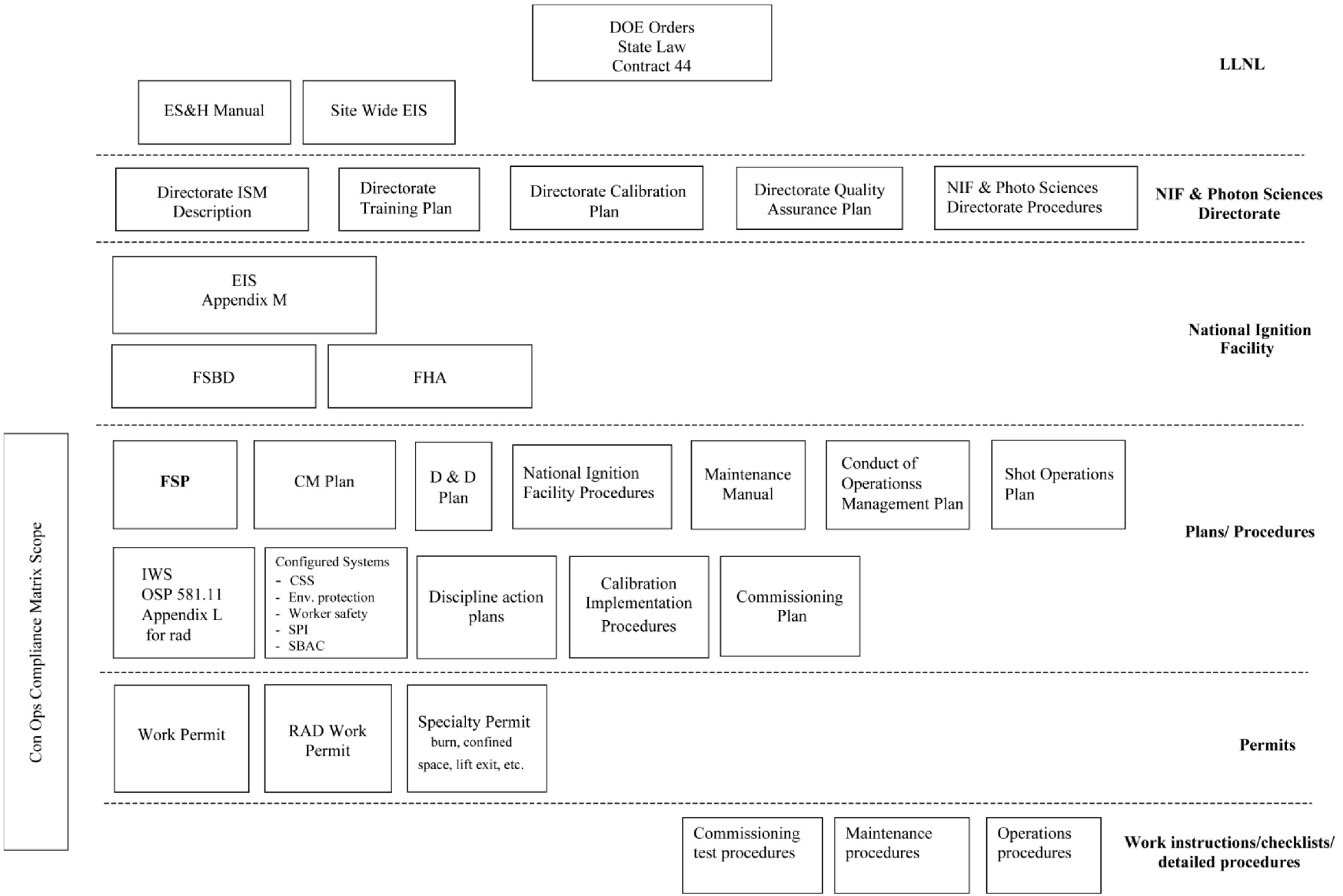

Figure 7. Diagram of Requirements Flow Down.

12.1 Conduct of Operations Requirement Matrix

The NIF is currently operated as a Low Hazard, less than category 3, Radiological facility. The requirement matrix worksheet was developed based on compliance with the Conduct of Operations requirements that are applicable to the NIF. The matrix table is based on the *Conduct of Operations for LLNL Facilities.*[19] This document implements the *DOE Order 5480.19*[20] and is intended to be used to document the applicability and compliance status of a facility with Conduct of Operations requirements. The requirement matrix is updated as compliance is achieved and as programs, personnel, and facility equipment change. Compliance with Conduct of Operations requirements, as specified in the matrix, results in plans and procedures to ensure that business is being done in accordance with the DOE order.

The *Compliance Matrix for the Conduct of Operations*[21] is managed by the NSM and a current copy can be found in ECMS.

13.0 CONDUCT OF OPERATIONS

Together, this *NIF Operations Management Plan*, the *NIF Shot Operations Plan,*[2] and the *NIF Maintenance Plan*[3] comprise the Conduct of Operations for NIF Operations. The Conduct of Operations must comply with *DOE Order 5480.19*[20] and *Conduct of Operations for LLNL Facilities*,[19] the latter of which provides specific guidance on complying with the DOE Order. Each of the 18 sections of *Conduct of Operations for LLNL Facilities*[19] addresses a specific topic related to conducting operations; the topics are addressed in these three documents. It is the responsibility of the NSM to ensure that NIF employees comply with the Conduct of Operations documents.

14.0 NIF SITE MANAGEMENT ORGANIZATION

14.1 Site Management Mission

The NIF Site Management organization's mission is to provide a "one-stop shop" for NIF, integrating all staff support functions to allow the maintenance, operations and commissioning activities to proceed safely, securely and in a coordinated manner. This includes defining standards and policies, authorizing and coordinating work activities, developing and implementing configuration management, and planning and implementing a training program. The organization also provides facility management to ensure continued compliance with LLNL ESH&Q, NIF Directorate policies and integration services for all work activities, tours, events, and other access needs. In addition, the Integration organization establishes and implements standards for training, worker behavior, cleanliness, safety, and security.

14.2 Tours

NIF is a highly attractive asset attracting thousands of visitors and VIPs each year. VIP tours are hosted by the NIF&PS Directorate, and all tours are managed by the NIF Operations organization. NIF tours are conducted in accordance with NIF Procedure 5.7, *NIF Site Tours*.[22]

14.3 Security

As a national asset with non-negligible hazards, it is appropriate to restrict access to those who need to access the NIF to perform work or their assigned duties.

Several levels of physical barriers have been established in support of site security.

- Site access: A fenced perimeter has been established, including TESA locks on all personnel gates and motorized vehicle gates.
- Building perimeter access: A combination of TESA locks and personnel access control systems are installed on all exterior doors to limit access to authorized individuals.
- Limited personnel access areas: Further access to limited personnel access areas is controlled by the Access Control System (ACS).

Personnel access is managed by the NSM.

Security for all activity at LLNL is governed by the LLNL Site Safeguards and Security Plan (SSSP).

14.4 Training

Training at NIF ensures that workers obtain and maintain the competencies necessary to successfully execute their work assignments and that they perform their work in a competent, safe, and environmentally sound manner. Qualification and training for NIF Operations are described in the *NIF Training Plan.*[18] The training program ensures that personnel involved in operating, testing, calibrating, maintaining and upgrading the NIF for operations have the skills and knowledge necessary to perform their work assignments safely and meet operations objectives. Each worker has a specific training plan that is displayed and tracked in LTRAIN.

Worker training needs are derived from either a safety or technical work requirement. These requirements are documented and authorized by either program or facility management through the use of the eIWS system LTRAIN is used to verify individual workers' training compliance for assigned tasks.

14.4.1 On-Shift Training

The *NIF Training Plan*[18] specifies that training will be conducted by qualified personnel. On-shift training (or On-the-Job Training) should be conducted one-on-one as much as possible and unnecessary distractions should be kept to a minimum.

When trainees are participating in maintenance or operations, the qualified instructor remains responsible for all actions of their trainee, and the instructor shall intervene as required. Trainees will be closely supervised and controlled by their instructor. Trainees should receive approval of the instructor before operating any equipment to give the instructor ample time to intervene. Trainee operation of equipment should be immediately suspended during unanticipated or abnormal events, accident conditions, or whenever the operations personnel or on-shift instructor believes suspension is necessary to ensure safe and reliable facility operation.

Personnel will complete qualifications through the use of Qualification Cards, as specified in the *NIF Training Plan*[18] and the *NIF Qualification Card Procedure*.[23] These qualification cards include an appropriate amount of On-the-Job Training for relevant Configured Items (CIs).

Routine and refresher training may be conducted during periodic safety meetings and Daily Work Team Meetings that includes discussions of relevant Lessons Learned.

14.5 Configuration Management

14.5.1 Configuration Management Process

Configuration Management is an integrated management system designed to maintain the relationship between requirements, data, execution, and the physical/functional configurations. This involves the systematic identification of NIF configurations and the management of changes to those configurations. The NIF configuration is defined as the as-built, tested, and verified NIF, facilities, and process equipment delivered by the NIF Project and accepted for NIF operations. The term "configuration" encompasses not only the physical items delivered but also the controlled safety and performance requirements and criteria that those items have been verified to satisfy.

Configured Items (CIs) are items within Configured Systems (CSs) that have been identified as needing additional controls in order for the system to be able to perform its intended performance or safety function. A CI list is generated for each CS by the Configured System Manager (CSM), which is reviewed and approved by the Failure Modes and Effects Analysis (FMEA) Working Group and subsequently entered into ECMS. CIs can specifically be hardware, software, design requirements, procedures, programs, and documentation. Controls have been established to ensure that physical and design configurations are maintained as required per the *NIF Configuration Management Plan.*[24]

The functionality of the CS is managed by the CSM. Any work that affects the performance of CIs must subsequently be reviewed and approved by the CSM. If the work will affect the ability of the system to perform its safety functions, impairment controls must be put in place. The SM is responsible for ensuring that the physical configuration and functionality of the CIs is maintained. New systems or additions to existing systems will be evaluated for new CIs and impacts to CSs using the existing WAP and Work Control processes.

The NIF CM process is applied in a graded manner. Those elements related to public safety, worker safety, the environment, significant programmatic impact, and Safety Basis administrative controls are CIs and undergo more rigorous review than those that support functional requirements and facility functions. There are five types of CIs defined in the NIF CM Plan. These are:

- Credited Safety Systems (CSS), derived from the Tier 2 Safety Basis Document for the Building 581-582 Complex;[25]
- Worker Safety (WS), derived from the NIF FSP;[4]
- Environmental Protection (EP), derived from the LLNL Site-Wide Environmental Impact Statement (SWEIS),[26] Appendix M;
- Significant Programmatic Impact (SPI), derived from the NIF Shot Operations Plan;[2] and
- Safety Basis Administrative Controls (SBAC), derived from the Tier 2 Safety Basis Document.[25]

14.5.2 Configuration Management Tools

Information systems are used to collect, store, and maintain CM items:

- **Requirements Management System (RMS)**: used to establish, maintain, and control information comprising the functional and technical baselines (primary/functional criteria, system design requirements, and sub-system design requirements).

- **Enterprise Configuration Management System (ECMS)**: used by NIF for controlling the configuration of design documentation and operations and maintenance procedures.
- **Glovia**: used to store production, inventory, manufacturing, and installation data. Glovia is used to establish, maintain, and control the as-built configuration of the laser beamlines.
- **Location Component and States Tracking System (LoCoS)**: used to display hardware configurations and the status and location of serialized parts within the NIF facility. LoCoS is also used for documenting hardware problems and restrictions and for coordinating work with Work Permits.
- **System Maintenance and Reliability Tracking (SMaRT):** used to maintain maintenance procedures and schedules and equipment history.

14.5.3 Document Control

The objective of the document control element of CM is to identify and maintain documents to be controlled within the CM program and to keep those documents consistent with the physical configuration and design requirements. This program is managed by the Configuration Manager. NIF document control involves the following functions:

- Identifying the types and specific documents to be included within the CM program.
- Storing identified documents.
- Controlling and tracking document changes.
- Retrieving documents in a timely manner.

Documents and records should be stored, retained, controlled, and tracked in accordance with the *NIF & PS Directorate Configuration Management Plan*[24] and NIF Procedure 6.4, *Control of CM Documents*.[13] NIF documents that are identified as being under CM are controlled and tracked to ensure that only the currently approved versions of documents are in use. All NIF CM-controlled documents must be entered into, and managed in, ECMS. Documents are designated as CM-controlled if they are designated as CIs or if requested by the COM, NOM, or NSM.

14.6 Record Retention and Archiving

A Document Retention Center (DRC) has been established and is managed by the Configuration Manager. The DRC will provide long-term storage for documentation that needs to be retained that is not stored electronically in an information data retention system, such as SMaRT, LoCoS, or ECMS. CM design documents and the records for CSs are retained in ECMS.

Master documents generated as a result of implementing this procedure should be controlled online within ECMS and made available for electronic viewing. Releases, changes, reviews, approvals, disapprovals, and dispositions of documentation and records will all take place within ECMS.

The information in Table 5 should be retained for the stated durations.

Table 5. Record Retention Requirements.

Records	Retention Requirement
LoCoS Operations and Maintenance Logs	Life of Facility (last week immediately available to the Control Room)
LoCoS Problem Logs	Life of Facility
Master Shot Setup Sheet	Life of Facility
Audits	3 years
Surveillances	3 years
Incident Analysis	3 years
Shot Check Lists	1 month
Qualification Cards	Cards for current operators Only
Procedures	Most Current Only
Sweep Checklists	Most Current Only
ACS and Key Tree Personnel Lists	Most Current Only

14.7 Baseline Change Control

The technical, cost, and schedule baselines are defined and managed through the *National Ignition Campaign Execution Plan,*[1] which is centered on programmatic objectives that must be coordinated with the NIF operational configuration.

14.8 Off-Normal Preparedness, Response, and Notification

The NIF and Photon Science Directorate *What to Do in An Emergency*[27] brochure provides basic emergency response actions. The *NIF & PS Directorate Off-Normal Event and Notification Procedure,*[7] NIF Procedure 5.21, reiterates the basic emergency response actions and provides notification instructions following an emergency.

Reactions to major emergencies are coordinated and managed by the NIF & Photon Sciences Directorate ESH&Q organization. In the event of a major emergency, such as an earthquake or fire, personnel will be directed to leave the building and proceed to the facility assembly point, per *NIF Emergency Preparedness and Response Plan.*[28] Annual evacuation drills are conducted for all work shifts in order to reinforce emergency response actions. In the event of an LLNL-wide shelter-in-place (SIP) event (either hazardous material or security related), the WCO is the SIP Leader for B581/B681 and will ensure appropriate actions are taken and announcements are made.

A NIF Operations phone list will be maintained for key personnel, including work, home, and cell phones.

14.8.1 Off-Normal Responses

During normal working hours the WCO/Shot Director on duty coordinates with the AI to respond to facility off-normal events, assuming the duty of the AI until relieved. During swing or owl shifts the SD is the WCO, and is thus responsible for this function.

During non-normal working hours, whenever a WCO or SD is not on duty, the NOM shall designate NIF Operations Facility Duty Officers, and On-Call Field Supervisors to make notifications in accordance with the *NIF & PS Directorate Off-Normal Event and Notification Procedure,*[7] NIF Procedure 5.21, and manage the initial response to significant off-normal events within and affecting the NIF. These responsibilities, and the administration of the rosters and schedules are defined in *NIF Operations Facility Duty Officer Response Procedure,*[11] *NIF On-Call Field Supervisor Response Procedure,*[12]

14.9 Work Control

14.9.1 Work Authorization

Work that is executed on the NIF has to be planned and coordinated. Proper work planning and authorization are crucial for achieving safety. Work planning requires:

1. Developing the detailed scope of work; schedule and interfaces
2. Analyzing the associated hazards; and
3. Developing a plan to mitigate those hazards.

The NIF has a challenging set of work activities and operations requiring a higher level of coordination. Work must be authorized before it can proceed, and the work area and activity must be reviewed before the start of each work task. The initiating steps for work planning and authorization begin with the JHA/IWS/OSP. This process ensures that the work is properly planned and authorized. The organization authorizing a work activity is responsible for ensuring that a JHA/IWS is prepared, reviewed, and approved prior to performing any work, refer to *NIF Project Site Work Authorization: Job Hazard Analysis/Integration Work Sheet Procedure.*[29]

In certain instances prior to the AI approving the IWS/JHA, a Work Authorization Point (WAP) or Management Prestart Review (MPR) must be conducted. An MPR is required if a significant new hazard is introduced, as described in *Safety and Performance Review Board, Management Prestart Reviews, and Working Group Reviews.*[30] WAPs are required whenever an activity is being performed for the first time, when significant changes to the processes involved have occurred, when the work has the potential to affect the facility safety basis, or when requested by the AI. Refer to the *Work Authorization Review Procedure,*[31] NIF Procedure 5.19 for specific details.

Work planning and execution

Department Planner

The Department planner for each area is responsible for understanding the maintenance and other work that needs to be accomplished. They gather this information from the SMs and SMaRT, where applicable. The Department Planners chair the weekly planning meetings and work with the SMs to prepare maintenance window packages and present them to the SubFLIP for scheduling. The Work Center Planner assists the Department Planner in organizing and tracking progress of the work packages from execution to closeout.

Work Center Supervisors

The Work Center Supervisors are knowledgeable of what it takes (manpower, time, equipment) to do the jobs and assist in weekly planning. They work with planners to resource level weekly plans and lay out manpower to support the daily work plan. They are responsible for reviewing work permits for scope, hazards and controls (serving as WPRI) and ensuring that work is safe, well planned and ready to proceed.

Field Supervisors

The Field Supervisors are in the field supervising the technician teams assigned to their areas. They work with the Work Center Supervisor to develop daily work plans and make the daily job assignments. They also conduct the shift turnover meeting (prepare report and distribute).

Field Supervisors conduct pre-job walks with the teams and ensure LOTO and controls associated with permits are understood. They ensure there is a qualified DWTL for each job. They

provide oversight of the work teams and conduct LOTO verifications and SPA process spot checks, provide technical support to teams as needed, coordinate support with other areas and de-conflict work activities, ensure work team jobs are progressing as planned, and provide job performance/safety feedback to technicians and management.

14.9.2 Work Permits

All work performed at the NIF is managed and controlled by a Work Permit process.[10] Work Permits specifying scope of work, and associated hazards and their controls, are initiated by the WPRI and approved by the WPA. Prior to commencing work, the WPRI submits the Work Permit to the Work Control Officer at the Work Control Center for review, coordination and integration with other work activities and priorities and for final release.

LoCoS is used to create, manage, and archive work permits. Refer to *NIF Site Work Permits.*[10]

14.9.3 Radiological Controls

As part of using radiological materials and Beryllium (Be) into Target Bay systems and conducting shots with significant neutron yields, *OSP 581.11, Appendix L*[9] provides controls for radiological and Be hazards as they are introduced. Work Permits and associated radiological/ Be work permits (RWPs) when required will specifically address the need to implement the associated requirements for the intended work. Unless specifically approved otherwise by the NOM, all radiological and Be work in B581/582 will be conducted under these procedures. The Radiation Safety Officer is responsible for the radiological and Be control program.

14.9.4 Role of Work Control Office

The function of the Work Control Office is to ensure that all work activities are integrated on a daily basis. This step is essential for establishing that concurrent work activities have been appropriately prioritized and are compatible with other ongoing work and with current facility conditions. The Work Control Office provides the last layer of review to ensure that the hazards have been properly identified and the appropriate controls are specified and available for implementation. Additionally, the Work Control Officer is the point of contact for emergency response notifications and coordinating changes in facility conditions, including process utility state changes and facility LOTO configuration. During hours when senior management is not present, the WCO represents senior management and is responsible for all work being conducted in the facility.

14.10 Procedures

NIF procedures can be divided into a number of types, based on intended purpose and audience. General categories include:

- NIF Policies: management guidelines that pertain to all activities occurring inside the perimeter fence of the NIF Site: B581,B582. B681, B682, B683 and grounds.
- NIF Plans: plans that identify policies governing administrative and operational procedures. They include details relating to the scope of the program goals, period of performance, organizational structure of the program, and the location of influence or activity.
- NIF Management Procedures: procedures that describe management processes governing the operations of the NIF Complex.

- NIF Work Procedures: includes Commissioning Test Procedures, Maintenance procedures, Operational procedures, Energy Isolation Procedures (EIPs), and Information Systems procedures.

NIF Operations policies, plans, and procedures are entered into, and tracked in, ECMS.

Creating, revising, approving, and distributing procedures are described in more detail in *Control of CM Documents*, NIF Procedure *6.4,*[13] NIF procedure 5.14, *Preparation, Content, and Distribution of Operations and Maintenance Procedures,*[32] and *Preparation and Standard Content for Commissioning Test Procedures.*[33]

14.10.1 Changes to Approved Procedures

In the event that written procedures cannot be followed, the affected document shall be revised and approved in accordance with *Control of CM Documents*, NIF Procedure *6.4.*[13]

14.11 Cleanliness Protocol

The function of the NIF clean construction protocol program is to ensure a clean work environment exists to produce high-quality optics, optical components, and mechanical systems. Eliminating optics contamination positively impacts the efficiency of NIF operations over the long term. The Clean Protocol Manager leads these efforts by defining, developing, and implementing appropriate cleanliness protocols (*NIF Clean Protocols*[34]) and associated quality programs for cleanrooms and clean areas in the NIF.

14.11.1 Clean Protocol Levels

Protocol Level 1: Clean areas with no special clothing requirements. Food is not allowed in laboratory or work areas.

Protocol Level 2: Areas that require shoe cleaning.

Protocol Level 2+: In addition to Level 2 requirements, hairnets, beard covers, a smock, cleanroom gloves, and shoe covers are also required.

Protocol Level 4: Areas that require full cleanroom garb, including hoods and face-masks, full-body coveralls, booties, hairnets, beard covers and cleanroom gloves.

NOTE: Approved radiological PPE meets the applicable cleanliness protocols.

Clean Protocol Level 1 areas:

- Central Core (except PAMMA)
- Tunnel to Central Core
- Visitors' Lobby
- Capacitor Bays 1, 2, 3, and 4
- Switchyard Mezzanines
- Operational Support Building
- OAB Loading Dock and Entrance

Clean Protocol Level 2 areas:

- Laser Bays 1 and 2
- Switchyards 1 and 2
- Target Bay
- OAB Corridor

Clean Protocol Level 2+ areas:

- PASS and War Zone

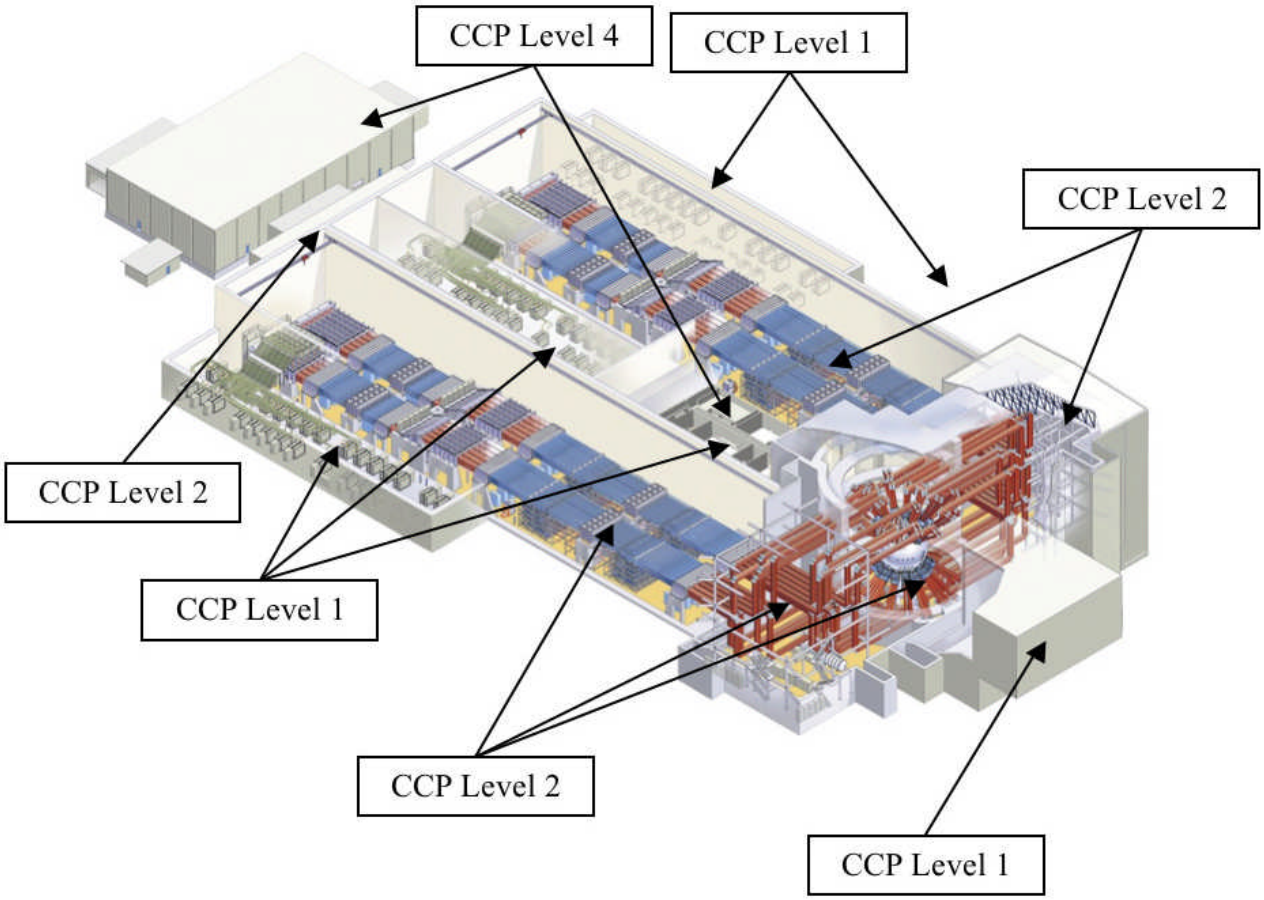

Figure 8. LTAB Cleanliness Levels.

Clean Protocol Level 4 areas:

- PAMMA
- OAB (except Loading Dock and Entrance)
- Beampath Access

Specific training courses are required before entering clean protocol areas above Level 2. All personnel are responsible for ensuring that they follow cleanliness requirements and are encouraged to don clean garments carefully and thoroughly. Line managers and custodial staff will also enforce cleanliness compliance. Custodians and technicians together are responsible for keeping clean work areas appropriately clean.

14.12 Control of Energy Sources

A Lockout Tagout (LOTO) Program is the principal procedural process used by NIF Operations to protect personnel from injury. Through this process, potentially hazardous energy sources are isolated prior to any construction, installation, system modification, repair, or maintenance activity. NIF Procedure 5.15, *NIF Site Lockout/Tagout Requirements,*[35] describes the NIF standards for proper

planning, authorization, shutting off, securing, and identifying energy sources to be isolated. Approved locks and tags have been identified. Individual areas within the NIF may augment the LOTO program with additional procedures and requirements to meet the current needs and activities of the area. All subcontractors who perform activities on the NIF subject to LOTO must have their own LOTO program that conforms to the requirements in *NIF Site Lockout/Tagout Requirements.*[35] Subcontractor LOTO programs will be reviewed by the appropriate contracting manager.

EIPs are generated for the purpose of defining step-by-step instructions to de-energize energy sources and place them in a safe condition, in order to work on affected equipment safely. Templates, guidelines, and approvals for EIPs are referred to in the *Procedure 5.14*.[32] Execution of the EIPs may only be performed by qualified individuals.

Key Trees[36] are used in NIF to provide a layer of protection to personnel entering or accessing the beampath from the optical hazards resulting from rod shots or main laser shots during operations or maintenance activities. Key Trees disable the permissives required for charging the main laser Power Conditioning System (PCS) that supplies energy to the main amplifier flashlamps and the Power Conditioning Units (PCU) that supply energy to the preamplifier module (PAM) flashlamps whenever the beampath is configured to allow main laser or rod shots to propagate into the portion of the beampath affected by the Key Tree, additional hazards sources may be similarly deenergized as applicable. Use of Key Trees is authorized by *OSP 581.11*.[9]

14.13 Control of Be and Radiological Hazards

Appendix L of OSP 581.11[9] describes the hazards and provides controls for managing radiation hazards and radioactive material at the NIF Site, and hazardous materials (particularly uranium and beryllium) used in NIF targets during NIF operations. The term radiation as used in this document refers solely to ionizing radiation (x-rays, gamma rays, neutrons and charged particles). This procedure does not address hazardous materials that are not related to NIF target chamber operations (for example, beryllium alloys used in PCS, PCU and PEPC system high-voltage cable connectors). Since Be hazards are expected to be co-mingled with radiological material hazards, and controls for the two are similar, the two are treated together. In addition, the Radiation Safety Officer (RSO) is designated as the lead in implementing Be controls under this OSP.

Radiological barriers/postings may be located in the TB, SYs and OSB. Special training is required to enter these areas. Training requirements will be posted at the area entrances. All personnel should ensure they meet requirements prior to entry. When in doubt, workers should not enter without clarification from radiological controls personnel.

14.14 Hazardous and Radiological Waste Management

The Waste Manger actively monitors and manages NIF waste streams to ensure consistent compliance with institutional ESH&Q requirements. This includes hazardous, radiological and mixed waste streams. The Waste Manager works with the institution's Radiological and Hazardous Waste Management (RHWM) group to remove hazardous waste from the NIF Site.

15.0 SHOT OPERATIONS

15.1 Shot Operations Mission

The Shot Operations organization executes shot cycles in accordance with approved procedures and checklists, ensures the availability of well-trained operators for all shifts, sets up and maintains the facility status and operation modes for required operations, and interfaces with other groups to develop more effective decision-making tools.

15.2 Top-Level Process Map

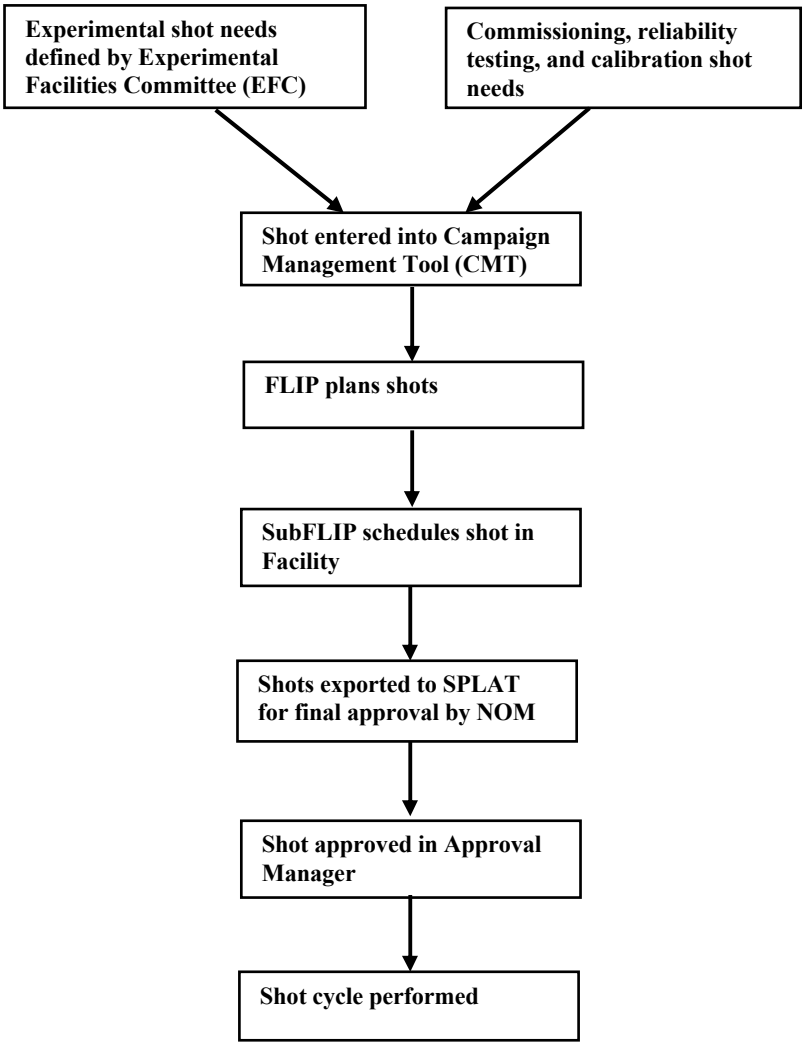

Figure 9. Shot Operations Process.

15.3 Shot Planning, Approval, and Execution Process

The NIF and Photon Sciences Deputy Principal Associate Director (NIF DPAD) has overall responsibility for the scientific programs conducted on the NIF. The NIF DPAD provides overall recommendations for experiments and their relative priorities.

The NIF PAD commissions a governance process that will develop an annual plan for experiments, maintenance, and upgrades. This plan shall be compliant with the facility safety basis (with regard to maximum cumulative yield limits and other facility-level limits). Campaigns are reviewed and approved by the Experimental Facility Committee and scheduled by the Facility Laser Integration Planning (FLIP) Committee.

A WAP is required for all experimental shot campaigns. The WAP checklist ensures that a particular campaign is properly reviewed by all appropriate expert groups and that all required facility and documentation preparations are properly planned and executed. All shot WAPs are approved by the NOM who is the AI for all shots in NIF.

Campaign planning and execution timelines listed below and in the *NIF Shot Operations Plan*[2] are nominal. The NOM may specify different time requirements as required. The NOM maintains a detailed one-week look-ahead shot schedule in the SubFLIP lane of the Shot Planning Tool (SPLAT).

Campaign Timeline/Shot Approval:

1. During the campaign planning and approval process, experimenters will create specific experiments in the Campaign Management Tool. These experiments will be forwarded to the appropriate expert groups for review and processing.
2. At least 24 hours prior to the scheduled shot and when the appropriate expert reviews are completed and documented on the experiment setup, the shots are exported to the facility for final approval.
3. Final shot setups are reviewed by the Campaign RI, Target Diagnostics CCB5, beamline integrated performance (BLIP), target and laser interaction (TALIS) representatives, and a Shot Control Officer/SD and approved by the NOM. The NOM signs the shot setup and authorizes the individual shot after the associated WAP (if required) is completed and signed by the AI.
4. Shot execution, data review and retention performed per the *NIF Shot Operations Plan.*[2]

15.4 Control Room Operations

All laser and process utility operations are normally controlled from the Control Room (Room 1017) and the Master Oscillator Room (Room 1019). Other (localized) control of sub-systems outside the Control Room may be authorized by exception (for example, positioner operations may be conducted from the control console located in the OSB), and ICS controls workstations are provided throughout the facility for maintenance operations only

15.5 Target Management Process

NIF Target and Target Fill Gas Management Process[37] describes how a target and associated fill gases reach the Target Chamber for installation and shot operations—from the target's and fill gases' origination in Target Fabrication, through all of the ensuing approvals and checks, to its installation at the NIF. The procedure establishes a "chain of custody" for targets, and identifies the RIs throughout the target's life cycle, from design to installation. The procedure requires the use of a target and gas bottle/reservoir custody traveler that accompanies the target and fill gases and documents the chain of

custody, along with other information, from construction through installation. Aspects of this process affect the radiological safety of the facility, and so utmost care must be taken in the implementation of these procedures.

15.6 Safety Interlock System

The SIS is designed to control the operation of potentially hazardous process and laser system equipment by granting or denying an independent permissive to selected equipment. The system monitors the condition of various components and operator inputs, processes them through approved logic, and issues or denies permissives to the hardware as required. The SIS does not directly control any of the equipment itself; the various control systems are used to operate the systems once permissives are issued by the SIS.

The SIS should be fully operational to the maximum extent practicable, however when situations arise that require operations with portions of the system disabled, the authorization for bypass shall be given by the NOM. In addition, the RSO and Team Health Physicist must also approve bypasses that affect RGD controls. Logs will be maintained documenting these occurrences per *Safety Interlock Bypass Procedure.*[38]

15.7 Personnel Access Control System

An ACS is used throughout the Laser Bays, Switchyards, Target Bay and certain areas of the OSB to ensure that only authorized personnel are allowed to access these controlled areas. The ACS is part of a multi-layer safety system consisting of warning signs, hazard notification klaxons, a personnel sweep system and a building PA system that are used to ensure that personnel are not in the high-hazard areas of the facility during a high-power laser shot or other hazardous activities. Personnel entering controlled areas must use their assigned Access Control Card in order to unlock the doors allowing access to the controlled areas. ACS verifies that they are authorized to access the area prior to SIS unlocking the door and logs their entrance into the area.

The ACS is an administrative system. Failure of personnel to use the system properly will cause the system to present false tracking data. Personnel must not allow others to “tail gate” through an open door without properly using their access badge. Personnel must also “badge out” when exiting an area. Repeated failure to follow established procedures and use the ACS properly will result in loss of access.

Access requirements for the NIF and process for issuing, controlling, returning, and deactivating access control badges are covered in the *NIF Access* procedure.[16]

15.8 Admin Key Control

Locked boxes, containing facility administration keys, are maintained in the Control and Strategy Rooms. These boxes contain administrative keys used for room access, ladder access, equipment control (not LOTO), sweep process, energy owner keys, etc. Access to these boxes is limited to knowledgeable NIF Operations management personnel, such as the NOM, SDs, LOs, WCOs, and the NIF SIS Manager. The CROM must control and administer the keys to these boxes and also maintain a list of personnel having keys.

Personnel receiving any keys from the Control Room area must sign out/in the keys using the form next to the key boxes. Keys shall be kept by the person signing out and be promptly returned to their source box as soon as no longer required. Under no circumstances may these keys leave the NIF or be handed to other people.

Certain keys (e.g., yield category control keys) have a more limited access list, including only the NOM and SIS manager.

15.9 Rules of Engagement

The Rules of Engagement represent guidance to Shot Directors and Lead Operators for the operation of systems or equipment to preclude significant equipment damage. The process for developing the authorized operational parameters, and obtaining overriding permissions to execute a shot when parameters fall outside nominal limits, are defined in the *NIF Shot Operations Plan.*[2]

15.10 Software Upgrades

ICCS software releases are deployed in NIF after thorough QC and WAP processes to ensure that the releases are fully tested and ready for deployment, and that the facility is prepared to operate with the new software. All software changes are identified in JIRA, an online database. Each item is assigned to a particular software release. There are four different types of releases, based on the scope and quantity of changes, including major releases, minor releases, service packs, and patches.

ICCS software releases, including associated database changes, go through two phases of testing prior to deployment into NIF. The first phase is developer integration testing, which is performed by the software development team. After verification that the software is operational and ready for "formal" testing, the software is deployed to the Integration Test Facility for testing by the independent ICCS Test Team. During both test phases, software problems are identified and JIRA entries are created to address them. Those needing urgent resolution in the software release are corrected and included in the software deployment.

Details on the online testing of software, data review, and authorization to use the software for conducting shot operations are discussed in the *NIF Shot Operations Plan.*[2]

16.0 MAINTENANCE

16.1 Maintenance Mission

The Maintenance team supports the operation and maintenance of the NIF infrastructure to achieve both near-term operational requirements and long-term efficiency and availability.

16.2 Maintenance Management

Maintenance will be planned, scheduled, and executed to ensure system reliability, and availability, while minimizing the impact to shot operations. Planned preventive and reactive maintenance will be performed during scheduled maintenance windows or identified opportunities in FLIP and SubFLIP. Additional potential maintenance "opportunities" are communicated at the daily work coordination meetings. All maintenance activities will be coordinated through the Work Control Office and authorized through the Work Permit process.

The tools and processes identified below will be used to manage system preventive and reactive maintenance activities.

- Plan and schedule—Maintenance will normally be planned and scheduled using the SMaRT database. Maintenance affecting facility shot operations shall be coordinated through SubFLIP.
- Work Authorization—Work is authorized according to *NIF Work Permits.*[10]

- Execution—Maintenance will be performed according to written procedures. Planned maintenance procedures are generally executed through SMaRT and stored in ECMS. Reactive maintenance or procedures that will only be executed once may be included in the details of the work permit.
- Equipment History—A retrievable history of work performed will be maintained in the SMaRT or LoCoS database.

Maintainable equipment that is classified as a CI will be specifically identified by the CI icon in SMaRT and ECMS.

For more detailed information on maintenance, see the *NIF Maintenance Plan.*[3]

16.2.1 Configured Systems Maintenance

Certain systems performing critical functions have been designated as Configured Systems (CS) and are subject to additional controls. The overriding principle of a CS is that its configuration (i.e. conformity to approved engineering drawings) and state (i.e., operational alignment—the positions of its valves or switches, component settings and calibrations, etc.) must be maintained in a specified condition at all times in order for the facility to conduct unrestricted operations; otherwise, if departure from the design condition is unavoidable (e.g., due to component maintenance or malfunction), appropriate impairment controls or operational restrictions are implemented.

Measures to ensure the reliable functionality of a CS include the following:

- The physical configuration of the CS will be maintained per the approved design drawing at all times. Any change to the design or physical configuration of the CS occurs by a closely controlled process. If any modification to a Credited Safety System is required, a Safety Basis Change Review must be performed to ensure that the CS will continue to perform its credited safety function.
- All CSs will have an assigned Configured System Manager (CSM) who is responsible for ensuring that the CS continues to perform its design function, or, if unavoidably impaired, that appropriate mitigating measures are put in place.
- Components critical to the credited functioning of a CS are designated as Configuration Items (CIs). These CIs (which may be hardware, software, engineering drawings, or procedures) reside in various different subsystems throughout the facility that may, in themselves, be non-critical, but because of the CIs' essentiality to performance of the CS are subject to special controls.
- Although CIs remain the "property" of the SM in whose sub-system they reside (for purposes of maintenance, calibration, repair, and operation), no intentional change to the configuration or state of a CI may occur without approval of the cognizant CSM(s). In the case of unintentional changes (i.e., component failure), the CSM is immediately notified so that impact on the CS's functionality may be assessed. The general principle is that SMs have total responsibility for the individual CIs in their systems as "hardware," but the CSM has responsibility for assuring the functionality of the CSs as the sum total of constituent CIs.
- Periodically, the state of CIs within a CS are independently verified in accordance with the System's Configured System Maintenance Plan (CSMP) and the *NIF Maintenance Plan,*[3] to provide positive assurance of the CS state.

- Personnel who may be in a position to affect performance or reliability of a CS, either during maintenance or operation, are trained so that they understand the impact of their actions on the overall functionality of the CS, and the special controls discussed above.

16.3 Logistics

The NIF Site Logistics Group's mission is to effectively manage NIF space usage, commonly used tools, fall protection equipment, operational spare parts, and clean construction and radiological protocol inventories to maximize laser servicing efficiency and minimize downtime.

16.3.1 Spare Parts and Tool Cribs

The Site Logistics team manages the spare parts warehouse and the tool crib, which are closely linked with the calibration and maintenance programs (Section 16.4); the tools and parts are kept calibrated so that they can be used when needed. They also manage PPE, consumables, O_2 monitors, respirators, etc., that are picked up and inventory maintained.

16.3.2 Material Handling

Material handling is a Site Logistics role coordinating the receipt and distribution of all materials for Building 581.

Radioactive materials are handled and managed under the supervision of the Radiation Safety Officer in accordance with OSP 581.11, Appendix L.[9]

16.4 Calibrations

A NIF calibration program has been set up to ensure that instruments that require calibration are identified and calibrated regularly.

NIF Operations and Measuring and Test Equipment (M&TE) Owners work together to identify the M&TE requiring calibration. M&TE candidates are selected on a graded basis. When the results of measurement have minimal impact to ESH&Q requirements, laser performance, or equipment protection, calibration is typically not required, and these are classified as non-critical systems. Critical M&TE is equipment that meets any of the criteria defined in the ES&H Manual, Document 41.4.[39]

Special attention to items classified as Critical M&TE is required to ensure the accuracy and integrity of inspection and test data derived during the control of processes, product acceptance, commissioning, maintenance, and experimental operations. The *NIF Programs Calibration Plan*[40] establishes the process for the control and calibration of Critical M&TE for NIF in accordance with the ES&H Manual.[39]

The NIF Calibration Coordinator in consultation with the cognizant SM assigns the interval between calibrations for M&TE. The calibration interval can be adjusted by the coordinator depending on the historical performance and level of usage of specific M&TE, but all relevant devices are generally calibrated on an annual basis, in line with industry standards.

17.0 PLANNING, SCHEDULING, AND COST REPORTING

The goals of the NIF schedule management are to assist the NOM and in meeting schedule responsibilities to ensure that work is planned and executed such that it meets the experimental plans and directorate's requirements and stays within the scheduled delivery dates.

The process for scheduling uses a hierarchical approach. The *NIC Execution Plan*[1] is the basis for planning. The Management team establishes the strategic plan for accomplishing the scope consistent with the Level 0–3 milestones as defined in the NIC EP. The milestones represent deliverables to which work activities are linked. They represent the highest level of detail.

The next level of detail establishes the DOE reportable and earned value milestones. These milestones are selected for their significance in achieving the NIC schedule objectives.

17.1 Facility Laser Integrated Planning (FLIP)

Using the project and program milestones as a guide, the FLIP schedule is generated, taking into account the facility requirements and configurations required for shot campaigns. FLIP is chaired by the Physics and System Engineering Manager and the NOM. Shot campaign schedules are developed by the Integrated Experimental Teams (IETs) and integrated by the NIF Experimental Campaign Director.

As shot activities are developed and approved by FLIP, they are forwarded to the NOM for consolidation into plans developed by the SubFLIP planning committee and the Shot Planning and Approval Tool (SPLAT).

17.2 SubFLIP

SubFLIP is a committee that supports the NOM in the implementation of the FLIP guidance. The SubFLIP review committee consists of the NOM, NSM, SOM, FOM, WIM and the COMs. Each week, input from the COMs, Facility Operations and Maintenance SMs and the SOM is provided to the SubFLIP schedule. The SubFLIP committee reviews the combined schedules for the facility and develops a three-week look-ahead schedule. Developing this schedule requires assessment of conflicts between space constraints, facility configuration, maintenance activities, shot operations plans, and resources availability.

The weekly SubFLIP meeting is the forum where the impact of repair, rework, and maintenance activities; shot operations; and the real-time scheduling are evaluated for conflicts. The approved results of the SubFLIP are then posted on a server for easy access.

17.3 Cost Management Process

The NOM is responsible for monitoring money spent on a monthly basis, at minimum. To assist managers with this task, the Customer Service Request (CSR) form was developed. The CSR form is used to control costs before they occur. Completing the form is mandatory for any goods or services that will have costs in money or manpower, regardless of the amount. The CSR form is approved by the appropriate COM and then given a second level of approval by the NSM. Before a cost can be incurred, a resource manager reviews the requisition to ensure that the CSR was completed and signed off by the NSM and that there is money available to meet the cost. Resource managers also generate monthly reports from NPS for the Operations managers, which detail how much money was expected to be spent, how much was actually spent, and how much manpower was used, since manpower makes up a significant fraction of expenditures.

18.0 QUALITY ASSURANCE

The NIF Quality Manager facilitates the implementation of the *NIF & Photon Sciences Directorate Quality Assurance Plan*, DQAP (NIF-5021183)[41] by advising the NIF Project on quality matters regarding the management systems and facility conditions. This includes identifying areas needing improvement with regard to the design, maintenance, operation and general performance of the NIF, and any other quality initiatives as directed by the DPAD for NIF. The criteria of the DQAP will be applied to the NIF in a graded manner to achieve a balance between the rigor of applying QA measures and the scale, cost, and complexity of the work involved.

18.1 Audits and Surveillances

An audit is a review of the applicable NIF procedure against LLNL, LLNS, and DOE requirements as applicable. A surveillance is a review of the NIF procedure and then observation of actual work being conducted. The review should include verification that the procedure is being properly executed and should solicit feedback and improvement suggestions. In general, line management should perform these audits and reviews with their teams. In addition, the NIF Quality Assurance Group audit and surveillance program reports results to the NSM and NOM. The NSM, NOM and management team should review the Audit and Surveillance Reports and identify corrective actions as appropriate.

19.0 PERFORMANCE METRICS

NIF's operational goal for 192 beams is an availability of 90% with a reliability of 80% for shot operations. Metrics help assess performance and expected performance against that goal. As the shot operations and maintenance organizations mature, they will continue to develop appropriate performance metrics. The Reliability, availability, and maintainability (RAM) metrics program will be used to identify areas for performance improvement on a continuous basis.

20.0 REFERENCES

1. National Ignition Campaign Execution Plan, NIF-0111975.
2. NIF Shot Operations Plan, NIF-5018506.
3. NIF Maintenance Plan, NIF-5018526.
4. NIF Facility Safety Plan, NIF-5019665.
5. NIF & PS Principal Directorate Safety Manual NIF-5032483. Update with new ref
6. NIF Procedure 5.13, NIF Self-Assessment Program Safety Walkabout Process, NIF-5022196.
7. NIF Procedure 5.21, NIF & PS Directorate Off-Normal Event Initial Response and Notification Procedure, NIF-5023077.
8. NIF Procedure 5.11, NIF & PS Management Review, NIF-5026065.
9. Operational Safety Procedure 581.11, NIF Laser System Installation, Commissioning, and Operation, NIF- 5017298
10. NIF Procedure 5.8, NIF Work Permits, NIF-5018626.
11. NIF Operations Facility Duty Officer Response Procedure, NIF-5018691.
12. NIF Procedure 11.2, NIF Operations On-Call Field Supervisor Response, NIF-5018946
13. NIF Procedure 6.4, Control of CM Documents, NIF-5018532
14. NIF Procedure 3.2, Problem Reporting and Disposition of Nonconforming Material, NIF-5018653.
15. NIF Procedure 1.8, Action Management, NIF-5023066.

16. NIF Procedure 5.5, NIF Access, NIF-5022192.
17. NIF Procedure 5.28, NIF Work Escort, NIF-5023863.
18. LLNL ES&H Manual Document 3.5, Conduct of Operations for LLNL Facilities.
19. DOE Order 5480.19, Conduct of Operations for DOE Facilities.
20. Conduct of Operations Applicability Matrix for the NIF, NIF-5021866.
21. NIF Procedure 5.7, NIF Site Tours, NIF-5029638.
22. NIF Directorate Training Plan, NIF-5018705.
23. NIF Qualification Card Procedure, NIF-5022072.
24. NIF Configuration Management Plan, NIF-5018949.
25. Tier 2 Safety Basis Document for the Building 581-582 Complex, NIF-5019666.
26. Site-Wide Environmental Impact Statement for the Continued Operation of the Lawrence Livermore National Laboratory and Supplemental Stockpile Stewardship and Management Programmatic Environmental Impact Statement, DOE/EIS-0348.
27. What to Do In An Emergency, NIF-0064673.
28. NIF Emergency Preparedness and Response Plan, NIF-5017354.
29. NIF Procedure 5.12, NIF Project Site Work Authorization: JHA/IWS Procedure, NIF-0050989
30. NIF Procedure 9.3, Safety and Performance Review Board, Management Prestart Reviews, and Working Group Reviews, NIF-5018667.
31. NIF Procedure 5.19, Work Authorization Review Procedure, NIF-5018658.
32. NIF Procedure 5.14, Preparation, Content, and Distribution of Operations and Maintenance Procedures, NIF-5018668.
33. NIF Procedure 8.3, Preparation and Standard Content for Commissioning Test Procedures, NIF-5018666.
34. NIF Clean Protocols, NIF-5022420.
35. NIF Procedure 5.15, NIF Project Site Lockout/Tagout Requirements, NIF-5018655.
36. NIF Procedure 5.25, Use of Key Trees to Control Main Laser Optical Hazards on NIF, NIF-5018474.
37. NIF Target and Target Fill Gas Management Process, NIF-5012336.
38. Safety Interlock Bypass Procedure, NIF-5012785.
39. NIF Programs Calibration Plan, NIF-0100032.
40. LLNL ES&H Manual, Document 41.4, LLNL Program for Calibration of Critical Measuring and Test Equipment.
41. NIF & Photon Sciences Directorate Quality Assurance Plan, NIF-5021183.
42. NIF Directorate ES&H Self-Assessment Plan, NIF-0112692.
43. NIF Procedure 5.16, Energy Source Ownership Process, NIF-5018656.

21.0 REVISION LOG

Revisions to this procedure must be evaluated with respect to the *Conduct of Operations Applicability Matrix* (NIF-5021866)[19]

Rev. No.	Effective Date	Pages Affected	Brief Description of Revision
AK	Aug 2011	Various	Replaced Sub-system Manager (SSM) with System Manager (SM)
AJ	Jan 2011	Various	Updated to include tritium and hazardous waste handling.
AH	May 2010	Various	Updated R&Rs, titles and document references.
AG	Aug 2009	Various	Added roles for Facility Duty Officer and Off-Hour Service Provider Coordination. Added Workers Designated as On-Call. Added NIF Operational memos.
AF	June 2009	Various	Updated organization chart.
AE	Jan 2009	Various	Updated based on the current org chart (moved Beam Transport into FOM, removed ICCS COM), minor changes to Delegation and Interface Tables, added reference to Action Management in Section 10.0, removed references to Readiness Assessments, incorporated the role of the NIF Security Manager, and added a list of items to be addressed when various managers change roles. Audit and Surveillance program and schedule are now the responsibility of the NIF QA Group
AD	Sep 2008	Various	Updated based on the current org chart (removed Support Operations, moved Logistics and Calibration to the new FOM organization), added SSM responsibilities for training, updated security and QA interfaces, removed references to TALIS, updated the scheduling process, added the SOM and FOM to the delegation tables, updated CCB5 and Working Group sections
AC	Aug 2008	Various	Fixed bad index page numbers
AB	July 2008	Various	Incorporates items identified through the MSA process.
AA	Feb. 2008	All	Original version.

APPENDIX A. ACRONYM LIST

ACS:	Access Control System
AI:	Authorizing Individual
ALARA:	as low as reasonably achievable
APM:	Associate Project Manager
BLIP:	Beamline Integrated Performance
BPU:	Beampath and Process Utility
CAM:	Control Account Manager
CCB:	Change Control Board
CF/BUS:	Conventional Facility/Beampath Utility Systems
CI:	Configuration Item
COM:	Commissioning, Operations, and Maintenance
CM:	Configuration Management
CMT:	Campaign Management Tool
CROM:	Control Room Operations Manager
CS:	Configured System
CSM:	Configured System Manager
CSMP:	Configurerd System Maintenance Plan
CSS:	Credited Safety Systems
DOE:	Department of Energy
DQAP	Directorate Quality Assurance Plan
DWTL:	Daily Work Team Leader
ECMS:	Enterprise Configuration Management System
EFC:	Experimental Facility Comittee
EIPs:	Energy Isolation Procedures
EMD:	Emergency Management Division
EP:	Environmental Protection
EPD:	Environmental Protection Division
ESH&Q:	Environmental Safety, Health, & Quality
FCO:	Field Control Officer
FLIP:	Facility Laser Integrated Planning
FOM:	Facility Operations and Maintenance Manager
FPOC:	Facility Point of Contact
FSP:	Facility Safety Plan
GUS:	Grand Unified Schedule
HED:	High Energy Density
HP:	Health Physicist
ICCS:	Integrated Computer Controls System
ICF:	Inertial Confinement Fusion
ICS:	Industrial Controls System
IQ:	Installation Qualification
ISM:	Integrated Safety Management
ITS:	Issue Tracking System
IT:	Information Technology
IWS:	Integration Work Sheet

JHA: Job Hazards Analysis
LLNL: Lawrence Livermore National Laboratory
LO: Lead Operator
LoCoS: Location Component and States (tracking system)
LOTO: Lockout Tagout
LRU: Line-Replaceable Unit
LTAB: Laser and Target Area Building
LTRAIN: Livermore Training Records and Information Network
M&TE: Measuring & Test Equipment
MIM: Maintenance Integration Manager
MO: Maintenance Operations Manager
MPR: Management Prestart Review
MQ: Maintenance Qualification
N&PS: NIF and Photon Science
NIC: National Ignition Campaign
NIF: National Ignition Facility
NIF PAD: NIF & Photon Science Principal Associate Director
NNSA: National Nuclear Security Administration
NOG: NIF Operations Gram
NOM: NIF Operations Manager
NPS: NIF Planning System
NSM: NIF Site Manager
OAB: Optics Assembly Building
O&M: Operations and Maintenance
OQ: Operational Qualification
OSB: Operations Support Building
OSP: Operational Safety Plan
PA: Public Address (system)
PAD: Principal Associate Director
PAM: Preamplifier Module
PAMMA Preamplifier Module Maintenance Area
PCS: Power Conditioning System
PCU: Power Conditioning Unit
PEP: Project Execution Plan
PPE: Personal Protective Equipment
QA: quality assurance
QC: quality control
RA: Readiness Assessment
RAM: Reliability, Availability, Maintainability
REMS: Rules of Engagement/Machine Safety
RI: Responsible Individual
RMO: Refurbishment & Maintenance Operations
RMS: Requirements Management System
RSO: Radiation Safety Officer
SBAC: Safety Basis Administrative Controls
SD: Shot Director
SIP: shelter in place
SIS: Safety Interlock System

SM:	System Manager
SMaRT:	System Maintenance & Reliability Tracking (system)
SOM:	Shot Operations Manager
SP:	Safety Plan
SPA:	Safe Plan of Action
SPI:	Significant Programmatic Impact
SPLAT:	Shot Planning and Approval Tool
SRS:	Sealed Radioactive Source
SY/TA:	Switchyard/Target Area
T&H:	Transport and Handling
WAP:	Work Authorization Point
WCO:	Work Control Officer
WIM:	Work Integration Manager
WPA:	Work Permit Approver/Approval
WPRI:	Work Permit Responsible Individual
WS:	Worker Safety

APPENDIX B. DETAILED MANAGEMENT DESCRIPTIONS

Table of Contents

B.1 NIF Operations

B.1.1 NIF Operations Manager (NOM)

The NOM is responsible for the safe and cost-effective planning and execution of NIF laser operations and maintenance, including line management responsibility for the facility and technical equipment, operations and sustaining engineering staff and associated operational processes, policies, and procedures. The NOM is responsible for ensuring that activities are maintained in accordance with all applicable ESH&Q, directorate and ISM requirements. The NOM's areas of responsibility include:

- Safety of workers, facility, and environment—policy, procedures, oversight, and line responsibility.
- Ensuring that all workers are adequately trained for the activities they perform
- Quality of the work performed—direct, surveillance, and policies.
- Cost and schedule of the work performed; budgeting, planning, status, corrective actions.
- Ensuring mission needs are met while balancing safety, quality, cost, and scheduling.
- Operating and maintaining the NIF.
- Ensuring the security program is implemented in support of mission needs.
- Participating in strategic planning—FLIP.
- Senior management interface—interfacing with Directorate on issues relating to NIF Operations.
- Experimentalist support—supporting users in successful execution of their experiments in the facility.
- Institutional interface—Emergency Management Division (EMD), PE, Public Affairs, etc.
- Ensuring compliance with DOE, LLNL, and directorate policies.
- Ensuring development, implementation, and compliance with a management system for Operations, such as FSP, Conduct of Operations, etc.
- Establishing CCBs and Working Groups, as appropriate, to support the execution of the operations and maintenance.
- Appointing AIs/RIs and others key personnel within the facility
- Establishing policies for the Operations organization and approving implementing plans and procedures.
- Establishing and approving work authorization and work control processes for the NIF.
- Ensuring proper configuration management is provided as described in the NIF Configuration Management Plan and associated procedures.
- Communicating facility-related ES&H requirements to building visitors.
- Developing and maintaining long-range staffing and shift plans to achieve and maintain safe operations while minimizing overtime.

- Ensuring all equipment deficiencies are documented and resolved.
- Ensuring the configuration of the laser is managed, including approval of all safety interlock bypasses.

Duties include:

- Participating in CCB3 for NIC.
- Chairing the NIF Site ALAR committee
- Commissioning SubFLIP team charter—establishing facility configurations, work priorities, etc.
- Commissioning incident investigations/management reviews as needed, ensuring appropriate corrective actions are taken, and making recommendation to NIF DPAD on the need for a DOE Occurrence Report. The NOM shall make recommendations as to when it is safe to resume operations.
- Ensuring control of facility and operating keys.
- Acting as AI for all shots and final shot setup approval for execution.

B.1.2 Systems Analysis

Systems Analysis is provided by the Laser Performance and Modeling group, who formally reports to the Inertial Confinement Fusion (ICF) and High Energy Density (HED) Sciences Program Director. They support the NIF Operations Manager in the evaluation and trending of laser performance, RAM and cleanliness data. The systems analysis group supports Shot Operations in the set-up and review of campaigns and shots, and supports other COMs as needed with analysis and expert groups.

B.1.3 Engineering Technician Superintendent

The Operations Engineering Technician Superintendant is responsible for taking an overall view of technician roles and responsibilities in Operations and ensuring that the proper resources are allocated to each part of the Organization to ensure success. This includes working with the various operational groups to establish proper work models, processes and procedures to optimize the performance of individual technicians and groups of technicians. Some of the specific responsibilities include:

- Assignment and re-assignment of engineering technicians to meet Program and Operational needs
- Establishing a consolidated process for interviewing and hiring new engineering technicians to support all groups
- Reviewing all classification changes to ensure consistency across the Operation
- Conducting regular work team interviews to ensure that Operations processes and procedures are evenly understood and implemented across the organization.
- Participating in disciplinary problems to ensure that consistent standards are applied across the organization.

B.2 Site Management Organization

B.2.1 NIF Site Manager (NSM)

The NIF Site Manager is responsible for coordinating and integrating NIF activities and reports to the NOM. The NSM's responsibilities include:

- Oversight of the implementation the conduct of operations on the NIF Site
- Oversight of security for the NIF Site.
- Oversight of Quality Assurance for the NIF Site.
- Oversight of training and establishing and ensuring implementation of the training plan for all personnel at the NIF.
- Oversight of ES&H, waste management and Safety Program for the NIF Site.
- Providing direction and oversight for emergency management, including Self Help procedures.
- Oversight of the administration of the Work Authorization Process.
- Oversight of the activities of the Work Control Center.
- Ensure that processes for controlling work activities are implemented and coordinated through the use of Work Permits, shot schedule, maintenance work, and daily coordination meetings, including changes in facility or utility conditions and facility LOTO configurations.
- Oversight of the NIF LOTO process, including procedure changes, process compliance, and direct LOTO support, such as locks, tags, and LOTO logs
- Oversight of Configuration Management program and document control for the NIF Site.
- Ensure construction activities implement Site safety requirements and conduct work in accordance with Site expectations.
- Oversight of site tours program.
- Oversight of Clean Construction Protocol.
- Managing NIF access control and training, including TESA lock management, approval of unescorted access, and access processes and procedures.
- Ensuring standards and consistency of all NIF operating and maintenance procedures.
- Oversight of business administration
- Oversight of space management on the Site.
- Manage the action tracking and resolution for NIF Operations through the use of ITS, LoCoS, SMaRT, etc.
- Maintaining an Audit and Surveillance program to ensure goals are achieved and standards are maintained.

Duties include:

- Overseeing the status of NIF environmental permits (maintained by the NOM APM).

- Chairing the Field Safety working group and managing the safety walkabout process.
- Chairing the NIF Site Integration CCB5 and being responsible for managing changes to policies and site wide procedures.
- Managing the action tracking and resolution for NIF Operations through the use of ITS, LoCoS, SMaRT, etc.
- Interfacing with IT to ensure consistency and appropriateness of software tools such as LoCoS, SMaRT, Glovia, ITS, etc.
- Implementing the training plan for all personnel at the NIF.
- Acts as Facility Manager for the NIF, interfacing with the Institution and the NIF & Photon Science ADFM as necessary.

B.2.2 NIF Operations Administrator

The NIF Operations Administrator is responsible for the overall administrative support of the NIF Operations organization. Responsibilities include ensuring that the organization has appropriate administrative assistants, the hiring process is managed, space allocations/moves are accomplished, a computer equipment program exists, and travel/conference plans are consistent with the budget. The Administrator interfaces with the directorate administrators to perform this function.

Duties include:

- Hiring, training, and managing administrative assistants across the organization.
- Managing the computer and office equipment while ensuring a cost-effective approach.
- Managing the travel/conference program.
- Managing moves, office space allocations, and other overhead functions.
- Managing hiring activities, such as ensuring postings, interviews, and hire packages are handled professionally and expeditiously.
- Developing and implementing business processes necessary to support documentation, CSR processing, monthly reporting, etc.
- Managing the employee termination check-out list process, including ensuring completion of all necessary paperwork and return of government property.
- Supporting the NOM and NSM in special assignments as requested.

B.2.3 Configuration Manager

See *National Ignition Facility Project and Facility Configuration Management Plan* (NIF-5018949)[24] for the Configuration Manager's responsibilities.

B.2.4 Configured System Managers (CSMs)

CSMs are responsible for:

- Ensuring that their assigned systems perform their design function, or if the system is not functioning fully to specification, ensuring appropriate impairment controls are identified and implemented.

- Ensuring, through the SMs (who have direct cognizance for the CIs of which the CS is comprised), that their systems receive the maintenance and calibration necessary to operate to design specifications.
- Acquiring requisite knowledge of the safety or other credited functionality and other system baseline requirements and failure modes of their system as necessary to perform the above functions.

It is important to recognize that, unlike SMs, CSMs own no "hardware." They are responsible for the functionality of their CS and ensuring its continued performance to design requirements, but they fulfill this responsibility through their oversight of the CIs as maintained by the SMs.

CSM duties include:

- Identifying documents that define the design basis for systems important to facility safety and operations (e.g., engineering calculations, drawings, vendor specifications), and ensuring the SMs maintain these along with documentation of installation and subsequent maintenance and testing in a format that permits conformity of the CSs to the design requirements to be demonstrated.
- Ensuring Configuration Management of their systems, including:
  - Developing and maintaining CI lists for their configured systems.
  - Ensuring safety basis change control reviews affecting their systems are properly executed, as applicable, and that no unintended deviation from the safety basis occurs.
  - Approving all Engineering Change Requests affecting the CSM's system (upon obtaining concurrence from the Safety Analyst for Credited Safety Systems).
- Reviewing and concurring on all work permits affecting CIs within their CSs and ensuring that any tests required to re-certify the function of the CSs are specified.
- Reviewing and concurring on all operating, maintenance, or test procedures designated as CIs within their CSs.
- Recommending additional training and qualification requirements for personnel in a position to impact the performance or reliability of their CSs.
- Developing and implementing a surveillance program to ensure that their CS configurations and states are maintained in the field, including periodic independent verification checks for position-specific CIs (per *NIF Shot Operations Plan*[2] and *NIF Maintenance Plan*[3]).

B.2.5 Tour Manager

The Tour Manager is responsible for:

- Coordinating NIF tours, including high level and protocol tours, working with the NIF Directorate office.
- Coordinating large volumes of visitors, tour routes, guides, and administration.

Duties include:

- Maintaining tour route maps.
- Coordinating with the NIF Directorate Tour administrator for scheduling NIF tours.

- Securing tour guides for each NIF tour.
- Greeting visitors in NEL Lobby for tours, handing out PPE/CCP, and signing the safety video log.
- Preparing PPE/CCP and dosimetry (if required) for visitors and cleaning up after tours (hard hats, glasses, , and safety shoes).
- Recruiting NIF tour guides.
- Maintaining tracking for NIF tour guide training classes.
- Issuing Tour Guide cards.
- Ensuring tour guides current on training related to tour responsibilities.
- Sending out tour guide communication updates.
- Updating NIF tours information on the web site.
- Updating NIF tour request form

B.2.6 Work Integration Manager

Work Integration Manager responsibilities include:

- Managing the activities of the Work Control Center.
- The NIF LOTO process, including procedure changes, process compliance, and direct LOTO support, such as locks, tags, and LOTO logs.
- Controlling and coordinating activities through the use of Work Permits, shot schedule, maintenance work, and daily coordination meetings, including changes in facility or utility conditions and facility LOTO configurations.
- Maintaining the SubFLIP schedule

B.2.8 Clean Protocol Manager

Clean Protocol Manager responsibilities:

- Testing and monitoring the cleanliness of the NIF cleanrooms, clean areas, and mechanical systems (surface, airborne, non-volatile residues and Airborne Molecular Count).
- Writing or revising cleanliness protocol procedures as needed.
- Interacting with the NIF Cleanliness and Materials Group and attending the weekly meeting.
- Assisting NIF operations and engineering groups with cleanliness control issues and solutions.
- Monitoring the cleanroom custodial group for proper protocols and assisting in training as needed.
- Training construction and operations personnel in NIF cleanliness protocol.
- Conducting regular cleanliness walkabouts for all cleanroom facilities and areas.
- Approving clean work zone plans.

- Managing a continuous process improvement program.

B.2.9 NIF Training Manager

The NIF Training Manager's responsibilities are contained in the NIF Training Plan.[18]

B.2.10 Radiation Safety Officer (RSO)

The Radiation Safety Officer is responsible for coordinating radiological safety within the NIF. The RSO is the primary interface with the Team 2 Health Physicist in identifying and implementing required radiological controls. The RSO is responsible for preparing and implementing radiological processes and procedures, for training and qualification of radiological workers, and for concurring on work procedures involving radiological work. RSO duties include managing the radiological controls team and the assigned health physics survey and analysis equipment. The RSO coordinates the NIF ALARA (as low as reasonably achievable) program, serving the function of the ALARA Engineer as specified in ES&H Document 20.4 if no ALARA engineer is assigned The RSO uses the Team 2 Health Physicist and BUTrY working group and ALARA committee as resources in accomplishing this function. In addition, the RSO manages the radioactive materials inventory, including serving as the Sealed Radioactive Source (SRS) custodian for the facility.

B.2.11 Deputy Radiation Safety Officer

Responsible for technical supervision of assigned Radiological Control Technicians and maintenance of the health physics lab and associated equipment. Assists the RSO in his duties, including radiological worker training, review and approval of radiation work permits and management of radioactive materials and radiological monitoring systems.

B.2.12 NIF ES&H Manager/Safety Officer

The NIF ES&H Manager/Safety Officer assures compliance with the NIF Site Safety Program. This manager works with line management and leads the NIF ES&H Team, in support of line management's commitment to safety. This includes providing guidance on the interpretation and implementation of safety rules, codes, and standards. The NIF ES&H Manager assists line management in developing, implementing, and assessing ISM work control processes. The NIF ES&H Manger is responsible for:

- Providing oversight to NIF work activities to assure compliance with LLNL and applicable federal, state, and local ES&H rules and regulations.
- Coordinating with the N&PS Directorate ESH&Q, and N&PS Directorate Laser and Electrical Safety Officers to develop and maintain core safety practices for working at the NIF.
- Working with the NIF Programs ESH&Q, and FPOC and assists in the resolution of any issues related to ESH&Q.
- Ensuring operations documentation is within scope of the ES&H Manual, Tier 2 Safety Basis Document,[25] and applicable IWS/SPs.
- Ensuring adequate ESH&Q support is provided to the site, based on operational conditions.

Duties include:

- Supporting NIF Site participation in the *NIF Directorate Self-Assessment Plan*[42] and *NIF Directorate ISM Plan,*[5] including safety issue trend analysis.
- Coordinating the development and approval of all FSP/JHA/IWS/SPs for the NIF.

B.2.13 Energy Owners

See Procedure 5.16, Energy Source Ownership Process[43] for Energy Owner description.

B.2.14 Work Control Officer

See Procedure 5.8, NIF Site Work Permits[10] for WCO description.

B.2.15 Work Permit Responsible Individual

See Procedure 5.8, NIF Site Work Permits[10] for WPRI description.

B.2.16 Daily Work Team Leader

See Procedure 5.8, NIF Site Work Permits[10] for DWTL description.

B.2.17 Waste Manager

The Waste Manager actively monitors and manages NIF waste streams to ensure consistent compliance with institutional ESH&Q requirements. This includes hazardous, radiological and mixed waste streams. The Waste Manager works with the institution's Radiological and Hazardous Waste Management (RHWM) group to remove hazardous waste from the NIF Site.

B.3 Shot Operations

B.3.1 Shot Operations Manager (SOM)

The SOM is responsible for managing the execution of NIF experimental and commissioning shots. The SOM reports to the NOM. Responsibilities include:

- Ensuring that trained and qualified staff is available and scheduled to support planned shot operations; this includes coordination with other organizations that provide staff for shot operations.
- Ensuring that required documentation to support shots is provided and managed, including shot checklists, shot safety checklists, and operating procedures/checklists required to support shot operations.
- Maintaining the control room infrastructure and managing access, through the Control Room Operations Manager. Managing the shot operations master personnel schedule and contact list.
- Supervises the training program and approves the qualification of all control room operators. Approves all shot and non-shot operations shift and vacation schedules.
- Managing the assigned shot operations staff, including Laser System operators, pulsed power operators, target diagnostic operations personnel, and LOs.

Duties include:

- Concurring with the turnover of new hardware/systems to shot operations, ensuring that all required documentation and operator training are completed prior to operations.

- Ensuring compliance with all safety protocols for shot operations as specified in the governing SPs, including beampath integrity checks and area sweeps.
- Concurring with any changes to functioning of the SIS and ACS systems.
- Coordinating the efforts of Shot Operations personnel to support non-shot system operations, such as commissioning and maintenance tasks.
- Maintaining the short-term shot schedule, based on approved shot campaigns and current facility status under the direction of the NOM.
- Approving or concurring on all safety documents related to shot operations, including sweep, shot safety, and beampath integrity checklists.

B.3.2 Control Room Operations Manager (CROM)

The Control Room Operations Manager (CROM) is responsible for coordinating and integrating personnel in the Control Room. The CROM's duties include:

- Maintaining shift and vacation schedules.
- Hiring and maintaining control room operations technical staff.
- Establishing and coordinating technical training of shot operations staff in coordination with SMs.
- Tracking the qualification of shot operations personnel and ensuring that qualified operators are assigned to shot operations.
- Approving the control room access list.
- Ensuring a current phone list is maintained in the Control Room.
- Establishing and implementing control room protocol requirements.
- Retaining completed shift turnover checklists.
- Maintaining Control Room infrastructure, such as consoles, projectors, and communication systems.
- Maintaining the Required Reading program.

B.4 Commissioning, Operations, and Maintenance

The COM managers each have a similar set of responsibilities and duties, but a different scope. Common responsibilities for the COMs include:

- Managing their systems, from commissioning through the NIF life cycle.
- Ensuring their systems are ready on a day-to-day basis to meet mission objectives and that they meet their performance and RAM requirements.
- Ensuring that the official copy of all procedures is kept in ECMS, minimizing the use of "working" copies, and issuing "special instructions" as necessary.

Common duties include developing and implementing the operations procedures, checklists, maintenance and spares programs, qualification cards, and supporting sustaining engineering of their systems.

Each COM Manager has System Managers that report to him/her for assigned hardware.

B.4.1 System Managers (SMs)

SMs are responsible for all aspects of their sub-systems and are owners of their sub-systems. Specific responsibilities include:

- Understanding the requirements, failure modes and as-built configurations of their sub-systems and ensuring the performance of the sub-systems within these bounds.
- Understand system requirements and required critical functions of their system, and how the system performs these functions.
- Assuring safety, operability, and RAM of installed sub-systems.
- Maintaining physical configuration management of their sub-systems.
- Maintaining a continuous improvement and cost efficiency perspective of their sub-systems.
- Supporting the CSMs as needed for the CSMs to perform their functions.
- Performing acceptance functions for a new or newly assigned sub-system from the Construction or other organizations.
- Reporting regularly to management on sub-system readiness, performance, issues, and risk.
- Working with other SMs to maintain system interfaces and resolve interface issues.
- Providing educational materials for alternates, operators, and technicians in the operation and maintenance of the sub-systems, as needed.
- Providing the training content for operators and technicians (in conjunction with the NIF Training and Development Group) and designating system-specific training requirements.
- Managing all aspects of change to the sub-systems due to new requirements.

SM duties include:

- Developing and maintaining a maintenance plan.
- Executing the maintenance plan with documented procedures in SMaRT.
- Ensuring the root cause of any non-conformance/non-performance is determined and the appropriate corrective action/improvement is implemented.
- Developing long-range sub-system replacement and enhancement plans.
- Commissioning/recommissioning new and modified systems as they are turned over from construction.
- Participating in CCBs/Material Review Boards.
- Improving equipment maintenance through the application of reliability-centered maintenance approaches.

- Maintaining sub-system documentation, including specifications, sub-system descriptions, configuration drawings, operating procedures (normal/off-normal), maintenance procedures, and training.
- Monitoring indicators of performance through appropriate metrics.
- Developing and maintaining a list of equipment and piping requiring labeling in accordance with the maintenance plan and documented in system-level maintenance plan.
- Overseeing engineering, production, installation (except where this responsibility is transferred to other organizations), commissioning (Installation Qualification [IQ]), Operational Qualification [OQ], Performance Qualification [PQ], Maintenance Qualification [MQ]), and follow through on any issues associated with the subsequent operation of the equipment.
- Conducting independent verification checks for positions noted in the CI Lists and Significant Programmatic Impact List (Section 11—Independent Verification) at least annually and after the equipment or sub-system has been returned to service following maintenance, put in a bypass mode, or tested for proper functioning.
- Developing procedures for operating, maintaining, and testing the sub-system and developing appropriate Qualification Cards.
- Specifying the applicable retests following maintenance to the sub-system and ensuring successful execution of the retest.
- Conducting follow through of punch lists, receipt of documentation/certification and as-builts for a new or newly accepted sub-system.
- Supporting Shot Operations, SMs will:
  - Serve as staff advisors to SD on an as-needed basis.
  - Provide guidance and recommendations to SD concerning operation of their sub-systems, particularly when off-normal conditions are encountered. They shall not direct specific actions to operators without the concurrence of SD
- Supporting the CSMs, SMs will:
  - Understand CIs within their sub-systems and how they relate to the CSMs.
  - Inform CSMs of change in status of CIs.
  - Obtain concurrence on changes/modifications to CIs.
  - Implement impairment controls to CIs as directed by the CSM.
- When turning over responsibilities to a new SM, both SMs will review all open ITS, LoCoS and SMaRT actions and ensure the items are assigned to the new SM.

B.4.2 Department Planner

- Interface with SMaRT for maintenance requirements & schedule
- Chair weekly planning meetings
- Work with SMs to prepare maintenance window packages and present to SubFLIP for scheduling

B.4.3 Work Center Supervisors

- Assist in weekly planning

- Work with planners to resource level weekly plan
- Lay out manpower to support daily work plan
- Review work permits for scope, hazards and controls (serve as WPRI)

B.4.4 Field Supervisor

The Field Supervisor supervises technicians assigned to their area.

Duties include:

- Work with Work Center Supervisor to develop daily work plans
- Conduct the shift turn over meeting (prepare report and distribute)
- Make daily technician job assignments
- Assist in the preparation, release & closeout of work permits
- Conduct pre-job walks
- Understand LOTO and controls associated with permits
- Conduct LOTO verifications & SPA process spot checks
- Provide technical support to teams as needed
- Coordinate support with other areas and de-conflict work activities
- Ensure work team jobs are progressing as planned
- Provide job performance/safety feedback to technicians and management

B.4.5 Laser Commissioning, Operations, and Maintenance Manager (Laser COM Manager)

The Laser COM Manager is responsible for the main laser systems from commissioning and throughout the NIF lifecycle. Specifically, the manager ensures that the laser systems are ready to meet mission objectives and that they meet their performance and RAM requirements. The Laser COM Manager's duties include developing and implementing the operations procedures, checklists, maintenance and spares programs, qualification cards, and supporting sustaining engineering of the systems.

B.4.6 LCOM Senior Scientist

The Laser COM Senior Scientist is responsible for maintaining in-depth technical knowledge relevant to the laser systems on NIF. This should include, but not be limited to, laser beam generation, beam modulation (temporal, spatial, phase), amplification, materials damage, alignment, wavefront control, and diagnostics. The Senior Scientist's duties involve using that knowledge to support operational issues, campaigns, safe system operation, maintenance and upgrades. Additional duties include leading small or medium-sized teams in support of NIF Operations and Maintenance and special assignments involving anomalous operation issues or system upgrades in support of new or specialized missions.

B.4.7 Target Area Commissioning, Operations, and Maintenance Manager

The Target Area COM Manager is responsible for the target chamber and attached systems (excluding Final Optics Systems) from commissioning and throughout the NIF lifecycle. Specifically, the manager ensures that the target area systems are ready to meet mission objectives

and that they meet their performance and RAM requirements. The Target Area Operations and Integration COM Manager's duties include developing and implementing the operations procedures, checklists, maintenance and spares programs, qualification cards, and supporting sustaining engineering of the systems. In addition, the Target Area Operations and Integration COM Manager ensures that all newly installed equipment designs are supportable and that the process for turnover to operations from supplying organizations is properly executed.

B.4.8 Target Area Senior Scientist

The Target Area Senior Scientist is responsible generating and approving requirements related to systems, software, and procedures required for alignment of targets, beams, and diagnostics in the target chamber. In addition, the scientist defines necessary tests and maintenance to ensure that requirements are met and reviews associated data.

B.4.9 Safety Systems and Industrial Controls Manager

The Safety Systems and Industrial Controls Manager is the Controls Engineering liaison with the institution and other NIF organizations in the areas involving personnel safety. In this capacity, the Safety Systems Manager is responsible for leading the activities to complete control system equipment design, procurement, installation, and activation consistent with established processes and procedures.

Duties include:

- Reviewing system designs and processes to ensure compliance with established safety plans and procedures.
- Serving as the primary interface with the Hazards Control organization for the design and production of the Safety Systems.
- Assembling and leading the team that produces and activates the safety systems.
- Ensuring the team's adherence to project policies and practices.
- Reporting production status to project management.
- Coordinating safety system support for all required Management Prestart Reviews.
- Chairing the SIS CCB5.
- Functioning as the system manager for the SIS CIs.

B.5 Facility Operations and Maintenance

The Facility Operations and Maintenance organization operates and maintains the NIF conventional facility and other commissioned systems that support laser system operations, as well as providing maintenance management and logistics support functions.

B.5.1 Facility Operations and Maintenance Manager (FOM)

The FOM is responsible for operation and maintenance of the NIF conventional facility and other commissioned systems that support laser system operations, and for providing on-site logistical support for NIF operations. The FOM may also act as the AI on IWSs. The FOM:

- Ensures that work is performed safely and provides for a safe working environment.

- Ensures the safe and reliable operation and maintenance of installed systems and equipment.
- Develops and implements a strategic plan for upgrades, capital projects, and other improvements to the listed systems.
- Leads regular reviews of operating and maintenance plans for the affected systems.
- Assesses and makes recommendations for continued safety, technical performance, reliability, and maintainability of operating systems.
- Ensures programmatic needs are supported by NIF facilities.
- Integrates maintenance activities with operational schedules.
- Ensures facility activities stay within the safety basis of the facility.
- Interfaces with Plant Engineering for Operations & Maintenance (O&M) services within the site.
- Manages the interface of Plant Engineering workers and subcontractors within NIF facilities.
- Communicates operational changes to affected organizations.
- Develops and implements equipment sustaining and improvement strategies, processes, budgets, metrics, schedules, staffing plans, training and qualification programs, and reporting for subsystems under FOM cognizance.
- Coordinates and administers calibration, common use tools, and logistics.
- Manages the NIF Maintenance Plan, ensuring consistency in maintenance process, software tools, and metrics.
- Handles maintenance planning and scheduling.
- Manages the COM of BUS/Conventional Facility and the conventional facilities maintenance operations and custodial teams.
- Coordinates and administers site logistics support, including warehousing and distribution of spare parts and consumables.

B.5.2 Maintenance Integration Manager (MIM)

- The Maintenance Integration Manager is responsible for implementing requirements of the NIF Maintenance Plan and administering the processes by which maintenance is identified, planned, scheduled, performed, and documented, in support of the system maintenance requirements of the NIF System Managers. Developing and implementing metrics that support continuous performance and productivity improvement.

B.5.3 Conventional Facility and Utilities Manager

The Conventional Facility and Utilities Manager is responsible for operation and maintenance of the 44 conventional and utility systems. The CF/U Manager's duties include the following:

- Managing assigned systems, through assigned SMs, from commissioning through the NIF life cycle.

- Ensuring their systems are ready to meet mission objectives and that they meet their performance and RAM requirements.
- Providing direction, training, and oversight to the conventional facility and utilities SMs in the performance of their responsibilities, as described above and in the NIF Maintenance Plan.

B.5.4 Beam Transport System Manager and Utilities

The Beam Transport Systems COM Manager provides the safety, engineering, and technical leadership for the construction, commissioning, maintenance, and operations of the 1-omega and 3-omega large aperture beampath and associated LRUs, including the LRU assembly stations and Transport and Handling equipment. Duties include leading and supporting installation, testing, precision alignment, trouble-shooting, repairs, and commissioning for a variety of mechanical and electrical systems. The manager uses CM tools and schedules to track activities through a maintenance management system.

B.5.5 Site Logistics Manager

Duties include:

- Managing the operational spares inventory.
- Managing the tool crib, which contains specialty tools and consumable personal protective equipment, such as safety glasses and gloves.
- Budgeting for NIF uniforms and clean construction protocol consumables. Managing space utilization at NIF, including:
  - Assigning storage and staging areas for work.
  - Working with production engineers to organize space and facilities.
  - Setting up signs, barricades, and tags on areas assigned for work, and updating site maps to reflect the assignment.
- Managing hazardous waste by monitoring known NIF satellite accumulation areas in compliance with the ES&H Manual.

B.5.6 Maintenance Operations Manager (MO)

The MO Manager is responsible for performing maintenance and refurbishment operations in support of programmatic needs. Duties include:

- Manages the Planning and Scheduling Group.
- Maintaining and refurbishing facility, laser, and target systems.
- Ensuring staff with appropriate qualifications is available to support programmatic needs.
- Coordinating with SMs for the effective performance of preventive or reactive maintenance, as requested via the Work Order process.
- Documenting work using SMaRT work orders, as appropriate.
- Ensuring that all maintenance work performed under his cognizance falls under the OSP 581.11[9] scope, hazards, and controls.
- Conducting regular safety walks of maintenance work fronts and periodic spot checks of LOTO or other special permits.

- Managing personnel training and qualification to ensure compliance.
- Ensuring that all maintenance and operations are performed in accordance with procedures.

B.5.7 Beampath & Process Utilities (BPU) Field Supervisor

The BPU Field Supervisor reports to the Maintenance Operations Manager and is responsible for the safe and efficient completion of all BPU maintenance on his or her assigned shift. This includes the following duties:

- Meeting with the Maintenance Operations manager, as required, to plan proper work loading.
- Understanding hazards and reviewing work sites prior to work start.
- Assisting in the preparation of work permits, including scope and controls.
- Ensuring work permits are released one day prior to work start.
- Regularly reviewing technician training for compliance.
- Regularly monitoring work teams for safety and performance.
- Documenting and reporting daily work progress

B.5.8 NIF Operations Facility Duty Officer

The primary role of the Duty Officer is to address issues requiring managerial decisions in support of the NIF Operations when other management or WCO or SD is not on duty (e.g., holidays). The role of the Facility Duty Officer is assigned by the NOM. The procedure describing the functions and duties of the Facility Duty Officer is NIF-5018691[29]