OOI Safety Plan

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Consortium for Ocean Leadership
1201 New York Ave NW, 4th Floor, Washington DC 20005
www.OceanLeadership.org
in cooperation with the Implementing Organizations:
Oregon State University
Rutgers University
Scripps Institution of Oceanography
University of California, San Diego
University of Washington
Woods Hole Oceanographic Institution

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Contents:

1 Procedure

1.1 Purpose and Scope

This Plan provides the direction and requirements to promote safe work environments for Ocean Observatory Initiative (OOI) participants, protect OOI equipment, and identify potential equipment safety or environmental hazards. It also provides the process for notifying Ocean Leadership (OL) of accidents, injuries, problems, failures, and other incidents.

The objectives of this Plan, in concert with the individual Implementing Organizations (IOs) Plans, are to:

- Identify and communicate OOI common project specific processes that can be used to categorize potential hazards specific to OOI activities;
- Determine the acceptable level of risk through interface evaluations (design reviews, operations and maintenance procedures), hazard control, and reporting methods; and,
- Identify procedures that can be used to prevent or reduce the likelihood of accidents as well as steps to take if an accident occurs.

As appropriate, these Plans provide provisions for safety and interface activities involving, but not limited to, the design, construction, fabrication, integration, test, operation and maintenance of the OOI, as performed by the OOI Project team, which consists of project staff from the following organizations:

- Consortium of Ocean Leadership (Ocean Leadership)
- University of Washington (UW)
- University of California, San Diego (UCSD)
- Woods Hole Oceanographic Institution (WHOI), and its sub-awardee Scripps Institution of Oceanography (SIO)
- Oregon State University (OSU)
- Rutgers University

The OOI will apply this Plan (or the applicable IO EHS Plan) in its evaluation of project furnished equipment or required support equipment to the degree that this equipment affects the safety of personnel or critical hardware during manufacture, integration, test, or operation and maintenance activities.

Within the OOI, the IOs' Plans address all areas of fabrication, development, testing, handling, and operation and maintenance of the system, subsystems and equipment. Each institution's Plan is structured (as applicable) to manage the:

- Efficient integration of system safety concepts into the design and development of OOI products.
- Development and implementation of appropriate system, subsystem and operational hazard analyses.
- Development of any applicable safety design criteria, verification tests, inspections, and assessment reports.
- Prevention of accidents resulting in personal injury or death, catastrophic facility or equipment damage, or project delay by minimizing accident potential.

- Incorporation of government and industry health and safety requirements into specific safety criteria, engineering requirements, and formal procedures.
- Administration of reporting, cataloging, tracking and resolution of identified hazards.

1.1.1 Organizations and Responsibilities

The OOI Project is conducted in accordance with the Cooperative Agreement between the National Science Foundation (NSF) and Ocean Leadership with subawards to the IOs and their subawardees.

Ocean Leadership - Under the direction of the OL Project Manager, and with the assistance of the COTRs, the OOI Safety Manager, will support the IOs in their efforts to address safety in the design, manufacture, and transport of the hardware, software, and telecommunications systems they assemble and test. The Safety Manager will review and assist the IOs in using the common hazard assessment process to identify hazards associated with the OOI project.

Implementing Organizations (IO) - the IOs are responsible for completing safety/environmental reviews, hazard assessments and software assessments per the common OOI process. These assessments must be completed for items as specified by the Technical Specification at the time of the OOI Test Readiness Review (TRR). IOs should have working drafts of completed safety/ environmental reviews, hazard assessments, and software assessments, as applicable, by the Critical Design Review (CDR).

1.1.2 Reference Information

The following lists contain the documents that establish the standards and requirements used to for this EHS Plan and (as applicable) the individual IO EHS Plans.

Contracts/Sub-Awards

Federal and State Laws

- 29 CFR Occupational Safety and Health Administration (OSHA) General Industry Standards
- 40 CFR U.S. Environmental Protection Agency (EPA) Protection of the Environment

Standards, Requirements and Regulatory Drivers

- Life Safety Code Handbook
- UNOLS Research Vessel Safety Standards (RVSS) - http://www.unols.org/publications/manuals/saf_stand/contents.htm

OOI and IO Plans

- 1010-00000 OOI Operations and Maintenance Plan
- 1100-00000 System Engineering Management Plan (SEMP)
- 1001-00001 OOI Environmental Compliance & Permit Plan
- 2010-00008 CI Safety Plan
- 3101-00009 CGSN Safety Plan
- 4011-00001 RSN Safety Plan

Acronyms

CCB	Change Control Board
CGSN	Coastal/Global Scale Nodes
CI	Cyberinfrastructure
COTR	Contracting Officer Technical Representative
EPE	Education and Public Engagement
IO	Implementing Organization
NSF	National Science Foundation
OL	Ocean Leadership
OOI	Ocean Observatories Initiative
OSU	Oregon State University
PM	Project Manager
PPE	Personal Protective Equipment
RSN	Regional Scale Nodes
SIO	Scripps Institution of Oceanography
UCSD	University of California, San Diego
UNOLS	University-National Oceanographic Laboratory System
UW	University of Washington
WHOI	Woods Hole Oceanographic Institution

Definitions

Safety Program Plan - A description of the planned tasks and activities to be used by the contractor to implement the required system safety program. This description includes organizational responsibilities, resources, methods of accomplishment, milestones, depth of effort, and integration with other program engineering and management activities and related systems.

Hazard Probability - The aggregate probability of occurrence of the individual events that create a specific hazard.

Hazard Severity - An assessment of the consequences of the worst credible mishap that could be caused by a specific hazard.

Hazardous Material - Anything that due to its chemical, physical, or biological nature causes safety, public health, or environmental concerns that result in an elevated level of effort to manage.

Accident - An unplanned event or series of events resulting in death, injury, occupational illness, or damage to or loss of equipment or property, or damage to the environment.

Safety - Freedom from those conditions that can cause death, injury, occupational illness, or damage to or loss of equipment or property, or damage to the environment.

System - A composite, at any level of complexity, of personnel, procedures, materials, tools, equipment, facilities, and software. The elements of this composite entity are used together in the intended operational or support environment to perform a given task or achieve a specific purpose, support, or mission requirement.

System Safety - The application of engineering and management principles, criteria, and techniques to optimize all aspects of safety within the constraints of operational effectiveness, time and cost, through all phases of the system life cycle.

System Safety Engineering - An engineering discipline requiring specialized professional knowledge and skills in applying scientific and engineering principles, criteria, and techniques to identify and eliminate hazards, in order to reduce the associated hazard.

2 Personnel and Operational Safety

Appropriate members of the OOI Program Management Office and each IO have responsibility for the safe design, construction, operation and maintenance of the OOI system. Each individual involved in the OOI is personally responsible for his/her own health and safe workplace practices.

All employees have the right to stop work and correct a safety issue. Each IO PM has assigned a person with safety responsibilities. IO employees and associated contractors should contact their IO Safety Representative for assistance with correcting any issues. The IO Safety Representative will, as necessary or required within their institution, solicit assistance from the IO's institutional safety organization to correct an issue. The IO Safety Representative will also communicate with the OOI Safety Manager regarding hazards identified, and the controls put in place to reduce the potential for injury and environmental impact.

Accidents will be documented and processed as directed by the IO's institutional policies. The IO Project Manager shall ensure that incidents are reported to the OL in accordance with the OOI Incident Reporting Procedure (Attachment A).

2.1 Organization and Responsibilities

Ocean Leadership - The Program Director/Principal Investigator is responsible for project safety and for certifying that the complete OOI System is safe for operation. The OOI Quality Manager, in the role as OOI Safety Manager, leads safety coordination across all IOs. The Safety manager informs the Program Director, Project Managers and COTRs on all major decisions; and, he is involved in all safety-related decision-making, as appropriate.

Under the direction of the OL OOI Project Manager, and with the assistance of the COTRs, the Safety Manager will support the IOs in their efforts to address safety in the design, manufacture, and transport of the hardware, software, and systems they assemble and test.

Implementing Organizations (IO) - The Principal Investigator and Project Manager at each IO are responsible for executing the construction of OOI systems and subsystems and for organizing and directing the project team. The Principal Investigators are responsible for project safety and are responsible for certifying that their portion of the OOI System is safe for operation. The Project Manager is responsible for assuring that their IO's project safety activities are properly organized and that the safety effort is effective. The IO Safety Representatives are responsible for leading safety activities, communicating EHS progress and issues to the IO Project Manager, and chairing IO health and safety meetings.

2.2 Process for OOI Program-Level EHS Management Decisions

The IO Safety representatives, working in conjunction with their Principal Investigators, Project Managers and institutional safety procedures, have the authority to act as appropriate to prevent or mitigate issues that could result in accidents, injuries, or property loss.

All individuals involved in the OOI program are responsible for identifying hazards and bringing them to the attention of their appropriate Safety Representative and Project Manager. This can be accomplished by using the OOI System Hazard Report form (Appendix A) or an equivalent form provided by the employee's home institution. At a minimum, the reporting individual should describe the hazard to his/her IO Safety representative, who can use the OOI System Hazard Report form or the IO institution's equivalent form to document the hazard and the actions taken to reduce the severity of the potential accident.

2.3 Safety Readiness Reviews

Safety readiness reviews are incorporated into the CDR and TRR processes. These reviews should evaluate re the level of safety controls for adequacy. The review should evaluate the level of safety support and determine if the safety program is properly oriented to assure that potential mishaps may be avoided by elimination or control of identified hazards. A secondary part of the review process is to determine if all hazards were identified, if hazard assessments were and are performed correctly with reasonable impacts projected, and if hazards are properly controlled. By performing this type of review, OOI leadership is assured that the project has made the best attempt at producing an operationally safe and maintainable system.

For existing OOI facilities, equipment (shore stations, buoys, power generators, etc.), and test plans will be accomplished prior to system testing of operational or test critical hardware.

Prior to OOI system deployment, the OOI Safety Manager and other personnel identified by OL and the IOs will perform safety inspections at IO facilities.

Prior to the start of OOI operations, there shall be a health and safety review of OOI operation facilities and/or operational safety programs and procedures. The final OOI system Commissioning process provides adequate assurance of compliance with Safety requirements.

2.3.1 Documentation

A Hazard Assessment is prepared for items specified as by the Technical Specification to obtain safety approval for operation of the OOI CI, Regional Scale, Coastal, and Global Scale Nodes. This includes operational arrays, moorings, buoys and subsystem sensors, safety matrices, hazards and their controls, handling/operational plan for the operational system handling and testing at the sites and all supporting information.

Operating Plans and/or Procedures include testing and operating plans and procedures to be used for the test/operation activity at IO institution facilities, and

for the operating sites/observatories assembly, test and alignment activities. These plans and procedures contain the necessary safety restrictions and directions to assure safety requirements are met. The approval of such plans and hazardous procedures will be by via the change control process. Plans related to the specified items will be reviewed submitted as an Entry Criteria for TRR. Included under this category are Site Initialization/Startup Procedures which identify hazardous operations during startup operations. Those items involving hazards shall be clearly marked in the initialization and startup sequence.

2.4 Health and Safety Training

2.4.1 Personnel Training and Certification

The OOI Safety Manager reviews areas requiring personnel training and certification relating to operations. The IO Safety Representatives review the same for their areas of responsibility and follow their institutional safety training programs.

2.4.2 Training and Certification

Each IO Safety Representative shall ensure that training and certifications are performed as necessary in accordance with the institutional requirements. These may include but are not limited to activities such as confined space access, ship operations, high-voltage electrical safety, lockout/tagout, hazard communication, equipment handling, storage, hardware removal/maintenance installation, equipment, and test operations. Training shall be done by organizations and personnel best qualified to do so, and/or by organizations having operational responsibility. Personnel training shall comply with OSHA and ANSI standards and monitored by the OOI EHS Manager.

2.4.3 Program Review

Each IO Safety Representative shall periodically survey the hazardous project elements under the IO's responsibility in accordance with institutional practices. Training and other safety records shall be maintained in accordance with the IO's facility safety procedures. Audits of internal records will be performed in accordance with the IO's procedures. Records will be available for review by the OOI Safety Manager upon request. The IO Safety Representatives work with their institutional EHS personnel for correction of hazards or other deficiencies.

The OOI Safety Manager also oversees activities associated with the Operational and Test Systems. The COTRs may require/request special safety audits of any area. Formal reviews serve as audits if sufficient details of the hazardous activities and the safety precautions to be used are a part of the review.

2.5 Internal and External Communications

The OOI Quality and Safety Manager will hold periodic meetings with the IO Safety Representatives to discuss safety issues, address corrective and preventive actions, and exchange information and opinions to help make the OL and IO safety systems more effective. Other attendees may be included as needed. All OOI employees are welcome to attend. Meeting minutes will be distributed and action items will be tracked. The IO

Safety Representatives review and provide input to draft safety documents before they go to CCB.

The expectation of the OOI project is for contractors to reduce their employees' accident and injury potential to as low as possible and to minimize the severity of the potential injury. The IOs will inform subcontractors of the hazards of their operations and expect the subcontractors to inform the IOs of their hazards. This documentation can be in the form of operations and maintenance manuals, vendor/contractor training along with initial design considerations reducing the injury potential and/or chemical and fuel spill potential.

2.6 Use of Non-UNOLS Vessels

In the event that non-UNOLS vessels are used for any deployment or recovery, the checklist found in Appendix B must be completed along with a walk though of the ship to ensure the vessel is able to accommodate the personnel and equipment deployment safely.

This process should take place as early as possible so that any necessary corrections can be completed in a timely manner. The correction of any deficiencies should be completed before entering into a charter agreement. The overall goal is to ensure a chartered vessel meets the same safety standards expected of a comparable size UNOLS vessel, and meets or follows Institution policies for chartering non-UNOLS vessel. Reference the Chapter 18 Chartering of Non-Institution Vessels of the UNOLS Research Vessel Safety Standards (RVSS) at http://www.unols.org/publications/manuals/saf_stand/contents.htm for more details.

2.7 Navigational Safety

In accordance with the *Site-specific Environmental Assessment for the NSF-Funded Ocean Observatories Initiative* (SSEA; NSF, 2011), *Finding of No Significant Impact/Decision Document* (FONSI; NSF,2011), and *Supplemental Environmental Report* (SER; NSF, 2013) (available at http://www.nsf.gov/geo/oce/envcomp/index.jsp), the OOI has conducted discussions with the U.S. Coast Guard (USCG) and fishing communities to establish non-regulatory "areas to be avoided" around the RSN infrastructures and CSN infrastructure sites. The diameters of these proposed avoidance areas or zones relate to water depths with larger zones in deeper water.

Discussions with the Oregon Fishermen's Cable Committee (OFCC) have established the extent of avoidance zones around the RSN Primary infrastructure, which by proximity includes the Secondary Nodes, cable exposures, and the Endurance Oregon off-shore and shelf sites.

The Pioneer Array is re-locatable and the size and locations of the Pioneer Array areas to avoid are subject to change, depending upon its location (and depth) in subsequent years.

The RSN and CSN Endurance cabled sites are clearly marked on charts distributed by the Oregon Fishermen's Cable Committee (OFCC) and distributed to members, and locations of RSN and CSN sites have been communicated to the National Oceanographic and Atmospheric Administration (NOAA) to facilitate appearance on electronic navigation charts.

Both the RSN and CSN sites are published in Notice to Mariners (NM) and Local Notice to Mariners (LNM), and communicated to marine user communities. There will be active radar transponders on some surface buoys as well as required U.S. Coast Guard markings.

Ocean Leadership submits USCG Private Aids to Navigation (PATON) applications for the Endurance Washington Line, Endurance Oregon Line In-shore moorings, and Pioneer moorings in advance of deployment. Existing PATONs shall be updated as operational mooring turns are completed. Ocean Leadership works with the USCG to develop guidance (to appear in NM, LNM, or NOAA chart annotations) regarding the suggested voluntary "areas to avoid" for Pioneer Array moorings to reduce the risk of gear entanglement.

The Notice to Mariners (NM) and Local Notice to Mariners (LNM) details shall be provided to NOAA so that the Pioneer and Endurance array mooring locations can be updated on the NOAA electronic charts.

The OL is working to establish a system for responding to fishermen who become entangled on Primary or Secondary Infrastructure components. This system will provide guidance and organizational responsibilities for answering such calls, and what the responses should be.

The University of Washington (UW) is the maintenance authority for the RSN Primary and Secondary Infrastructure and as such, may be designated as the primary responder.

3 System Safety and Hazard Assessment

3.1 Introduction

This Section provides the process to identify, assess, and eliminate or control hazards during the design and manufacturing process. Additionally, it provides the OOI with an active approach for assuring the safe design, development, construction, and operation of the OOI.

3.1.1 Purpose

This Plan provides a project-wide common process for determining the potential hazards associated with the OOI Project, document the hazard and the courses of action for reducing these hazards to an acceptable level.

3.1.2 Scope

This Plan, in conjunction with the IO Plans, directs and guides the evaluation of equipment and systems of the OOI project. This Plan focuses specifically on product safety and the hazard evaluations used to determine an acceptable degree of hazard reduction. As appropriate, these Plans provide provisions for safety and interface activities involving, but not limited to, the design, construction, fabrication, integration, test, operations and maintenance of the OOI, as performed by the OOI Project Team, which consists of project staff from the following organizations:

- Consortium of Ocean Leadership (Ocean Leadership)
- University of Washington (UW)
- University of California, San Diego (UCSD)
- Woods Hole Oceanographic Institution (WHOI), its sub-awardee Scripps Institution of Oceanography at UCSD (SIO)
- Oregon State University (OSU)
- Rutgers University

Within the OOI, the IOs' Safety programs address as applicable, all areas of fabrication, development, testing, handling, and operation and maintenance of the system, subsystems and equipment.

3.2 OOI System Safety Management Plan

3.2.1 System Design Safety Requirements

In addition to the general requirements of the previous and following sections, OL and the IOs of the OOI Project must comply (as appropriate) with safety requirements established by their respective institutions, the safety requirements of their subawardee institutions, and the UNOLS Research Vessel Safety Standards (dated March 2009, and found at: http://www.unols.org/publications/manuals/saf_stand/contents.htm). The OOI Project must consider:

- Material design safety factors
- Safety mechanization of design (i.e., electrical power isolation, emergency disconnects, etc.)

- Safe use of acoustic devices
- Determining when, where and how pressurized vessels, vacuum systems, cryogenics and other hazards can be safely handled
- Shipping of hazardous items
- Electrostatic safety requirements
- Confined spaces/limited access
- Use of cranes/hoists and forklifts
- High voltage power
- Other appropriate safety concerns, as identified

3.2.2 Safety Design Guidelines

Safety design requirements are defined in OOI applicable standards, specifications, regulations, design handbooks, safety design checklists (Safety/Environmental Review), and other sources of design guidance. General system safety design guidelines are:

a) Eliminate identified hazards or reduce associated hazards through design, including material selection or substitution. When potentially hazardous materials must be used, select those least hazardous throughout the life cycle of the system that meets product performance requirements.

b) Isolate hazardous substances, components, and operations from other activities, areas, personnel, and incompatible materials.

c) Locate equipment so that access during operations, servicing, maintenance, repair, minimizes personnel exposure to hazards (e.g., hazardous chemicals, electrocution, or sharp points).

d) Minimize hazards resulting from excessive environmental conditions (e.g., temperature, pressure and noise).

e) Design to minimize hazards created by human error in the operation and support of the system.

f) Consider alternate approaches to minimize hazards that cannot be eliminated. Such approaches include interlocks, redundancy, fail safe design, fire suppression and procedures.

g) Protect the power sources, controls and critical components of redundant subsystems by physical separation or shielding.

h) When alternate design approaches cannot eliminate the hazard, provide safety and warning devices and caution notes in assembly, operations, maintenance, and repair instructions, and distinctive markings on hazardous components and materials, equipment, and facilities to ensure personnel and equipment protection. These shall be standardized in accordance with institution standards or commonly accepted industry requirement. The OOI EHS Manager, OOI O&M Manager and OOI Senior Project Manager shall be provided copies of all warnings, cautions and distinctive markings proposed, for review and comment.

i) Minimize the severity of personnel injury or damage to equipment in the event of a mishap.

j) Design software controlled or monitored functions to minimize initiation of hazardous events or mishaps.

Review design criteria for inadequate or overly restrictive requirements regarding safety. Recommend new design criteria supported by study, analyses, or test data.

3.2.3 Safety Precedence

The order of precedence for satisfying safety requirements and resolving identified hazards shall be as follows:

Design for minimum hazard. From the start of the project, design the project elements to eliminate hazards. If an identified hazard cannot be eliminated, reduce the associated hazard to an acceptable level, as defined by the Senior Project Manager in consultation with the EHS Manager, through design selection.

Incorporate safety devices. If identified hazards cannot be eliminated or their associated hazard adequately reduced through design selection, that hazard shall be reduced to a level acceptable to the Senior Project Manager through the use of fixed, automatic, or other protective safety design features or devices. Provisions shall be made for periodic functional checks of safety devices when applicable.

Provide warning devices. When neither design nor safety devices can effectively eliminate identified hazards or adequately reduce associated hazard, devices shall be used to detect the condition and to produce an adequate warning signal to alert personnel of the hazard. Warning signals and their application shall be designed to minimize the probability of incorrect personnel reaction to the signals and shall be standardized within like types of systems.

Develop procedures and training. Implementation of procedures and training shall be used where it is impractical to eliminate hazards through design selection or adequately reduce the associated hazard with safety and warning devices. Without a specific waiver from the Senior Project Manager, no warning, caution, or other form of written advisory shall be used as the sole hazard reduction method for catastrophic or critical hazards. Precautionary notations shall be standardized as specified by the Senior Project Manager. Tasks and activities judged to be safety critical by the Senior Project Manager may require certification of personnel proficiency.

Note that the basic methods for controlling hazards are:

- Engineering controls, where feasible
- Administrative controls
- Personal protective equipment (PPE)

Effective engineering controls are always preferred, as they can eliminate or substantially mitigate the hazard. Some hazards cannot be eliminated and PPE is required (e.g., welding helmet, hard-hat, safety shoes). Hazard control methods are selected during the hazard analysis process. In some cases, all three of these controls may need to be implemented simultaneously.

3.3 Hazard Assessment during Design/Manufacturing

3.3.1 Purpose

To identify, plan/design the mitigation of, manage and document safety and environmental hazards associated with the design, construction, fabrication, integration, test, and operation and maintenance of the OOI Tracked Design Items.

This also fulfills the requirements of hazard identification (safety and environmental) of clause 4.3 and 4.3.1 of ISO 14001 and the OHSAS 18001 Management Systems.

Hazardous materials shall be controlled, handled, and disposed of in accordance with the IO's institutional policies and procedures.

3.3.2 Definitions

Firmware – Software that resides in a nonvolatile medium that is read-only in nature, which cannot be dynamically modified by the computer during processing (write protected during operation).

Software – Combination of associated computer instructions and computer data that enable a computer to perform computational or control functions. Embedded software is software developed to control a hardware device.

3.3.3 Procedure/Responsibilities

Entry Criteria:

The Hazard Assessment process begins with completion of the Safety/Environmental Checklist, which is started as a working draft at the CDR with final assessments completed and reviewed and accepted at the OOI TRR. All decisions on hazard reduction by are documented by the TRR process.

Inputs:

Inputs for the hazard assessment process include TDI item drawings, operations and maintenance manuals and employee experience.

Safety/Environmental Checklist:

Obtain and complete a blank spreadsheet (Attachment E - Safety/Environmental Checklist). When completing the checklist, all items must be addressed. Items that are not applicable to the system should be marked "NA". The IO performing the assessment should initiate checklist use during the conception phase of the project and continue using the checklist throughout the project. A working draft of the checklist shall be completed by the IO prior to the Critical Design Review (CDR). All items must be checked and documented prior the OOI Test Readiness Review (TRR). All open items must be closed with the TRR.

Hazard Assessment Catalog:

This Catalog (Attachment C) is used to assess and document the safety and environmental hazards identified during the assembly, disassembly, operations and maintenance of all equipment. This assessment process should be started during the conception phase of the project and used throughout the project. A working draft must be completed by the CDR. All items must be checked and documented prior to the OOI TRR. This assessment is used to answer the "All hazards entered in the Hazard Assessment Catalog" question on the Safety/Environmental Checklist. The initial development of the likely hazards that are associated with a product or service is a matter of technical knowledge of the product, assembly, disassembly, operation and maintenance, and system safety methodology. After hazards have been identified, the next step is to apply the methodology shown in Tables 4.4.1 through 4.4.3 to assess the hazard by identifying its category and probability. Table 4.4.3 illustrates the hazard assessment matrix using the elements of probability and severity to establish levels of management acceptability of employee injury potential.

Hazards assessed with unacceptable hazard levels require mitigation measures to reduce the hazard to an acceptable level. Management decisions are required on the post-mitigation residual hazard levels to determine acceptability of the mediations (elimination, control, and procedural avoidance documentation). The resolution of identified hazards shall be based on assessment of the hazard potential involved. Hazards shall be characterized within hazard severity categories and hazard probability levels. Hazard severity categories are defined along a range from Negligible (4) to Catastrophic (1) to provide a qualitative measure for Hazard Severity.

Table 4.4.1: Hazard Severity Categories

Description	Category	Definition
Catastrophic	1	Death or permanent total disability, system loss, major property damage or severe environmental damage.
Critical	2	Severe injury, severe occupational illness, major system or environmental damage.
Marginal	3	Minor injury, lost workday accident, minor occupational illness, or minor system or environmental damage.
Negligible	4	Less than minor injury, First aid or minor supportive medical treatment type of occupational illness, or less than minor system or environmental damage.

The probability of a hazard during the planned life expectancy of the system or activity. A qualitative hazard probability may be derived from research, analysis, and evaluation of historical safety data from similar systems. An example of a qualitative hazard ranking is shown in Table 4.4.2.

Table 4.4.2 Hazard Probability Levels

Description	Level	Definition
Frequent	A	Likely to occur frequently or continuously experienced
Probable	B	Will occur several times in the life of an item.

Occasional	C	Likely to occur sometime in the life of an item
Remote	D	Unlikely but possible to occur in the life of an item
Improbable	E	So unlikely, it can be assumed occurrence may not be encountered

Potential hazards identified through the hazard analyses are subject to the hazard assessment procedure to establish priorities for corrective action. To aid in this assessment, each hazard is assigned a hazard severity category (Table 4.4.1) and a qualitative probability of occurrence (Table 4.4.2). The combination of hazard severity and probability is displayed in the hazard assessment matrix (Table 4.4.3). The hazard assessment code criteria (as shown under Table 4.4.3) provide the level of hazard acceptability by listing the management level of review required to accept the hazard.

Table 4.4.3 Hazard Assessment Matrix

Hazard Category Frequency	(1) Catastrophic	(2) Critical	(3) Marginal	(4) Negligible
(A) Frequent	1A	2A	3A	4A
(B) Probable	1B	2B	3B	4B
(C) Occasional	1C	2C	3C	4C
(D) Remote	1D	2D	3D	4D
(E) Improbable	1E	2E	3E	4E

Hazard Index	**Code Criteria**
1A, 1B, 1C, 2A, 2B, 3A	Unacceptable (unless adequate hazard controls are applied)
1D, 2C, 2D, 3B, 3C	Undesirable (SR Decision required)
1E, 2E, 3D, 3E, 4A, 4B	Acceptable with review by OL Project Manager (or delegate)
4C, 4D, 4E	Acceptable without review

The hazard assessment catalog will document the hazards during the assembly, disassembly, operations and maintenance of the equipment or system. Obtain and complete a blank hazard assessment spreadsheet (Attachment C).

Step #	Description	Role(s) Responsible
1	Enter the TRR review name in the TRR Name column.	Assessor
2	Enter the activity (assembly, disassembly, operations, maintenance, etc.) in the Activity column.	Assessor
3	Enter "S" for safety or "E" for environmental hazard	Assessor
4	Enter the specific component in the Config. Inst. column.	Assessor
5	Enter the hazard (e.g. slick surface, pinch points, fall from height, electrocution, diesel fuel spill, methanol, used oil)	Assessor

Step #	Description	Role(s) Responsible
6	Enter the consequences (e.g. muscle strain, slip and fall, death, diesel fuel spill, throwing metal away into the dumpster instead of recycling, loss of used batteries at sea)	Assessor
7	Enter the Hazard Severity Category, the Hazard Level and the total score. Reference tables 4.4.1 and 4.4.2 to determine Hazard Severity and Hazard Level and input values. In the total score box enter the total score and color code (reference table 4.4.3, Hazard Assessment Matrix) to help highlight the areas to be addressed (e.g. 3A is red).	Assessor
8	Enter the controls in place (e.g. knife switch for lockout/tagout, chemical gloves for handling/transferring methanol, training, recycling programs, energy conservation programs)	Assessor
9	Enter the preventive measures to be used (e.g. fall protection, forklift training, engineering controls, fuel emergency shut-off).	Assessor
10	Enter the safety verification methods (e.g. engineering controls present, training (vendor or institutional), lockout/tagout equipment). The safety verification must always take place to ensure the controls and preventive measures are working as designed.	Assessor
11	Finally, input the verification status and how the controls were checked (e.g. physical inspection, equipment design).	Assessor

The IO assessor may send the completed sheet to the OOI Quality and Safety Manager for initial review. The Hazard Assessment Catalog spreadsheet must be completed and provided at the OOI TRR. In addition to the TRR submittal, the Quality and Safety Manager posts the Hazard Assessment documents on Alfresco.

Assessment values may need to be reviewed by the OL PM and/or SE for a final determination as to acceptable hazard reduction. Scores rated as “orange” or “red” based on the Hazard Assessment Matrix must be reviewed.

3.3.4 Software Assessment Process

The initial assessment for software, and consequently software controlled or software intensive systems cannot rely solely on the hazard severity and probability. Determination of the probability of failure of a single software function is difficult at best and cannot be based on historical data. Software is generally application specific and reliability parameters associated with it cannot be estimated in the same manner as hardware. The software assessment process starts with the design concept, the operational concept and the major components used in the system. The process begins with a listing of all major system hardware elements or components. The process considers the potential hazard severity and the degree of control that software exercises over the hardware. The degree of control is defined using the software control categories:

Table 4.5.1 Software Control Categories

I	Software exercises autonomous control over potentially hazardous hardware systems, subsystems, or components without the possibility of intervention to preclude the occurrence of a mishap. Failure of the software or a failure to prevent an event leads directly to a mishap occurrence.
II	Software exercises control over potentially hazardous hardware systems, subsystems, or components allowing time for intervention by independent safety systems to mitigate the hazard. However, these systems by themselves are not considered adequate. Software item displays information requiring immediate operator action to mitigate a hazard. Software failures will allow or fail to prevent the mishap occurrence.
III	Software issues commands over potentially hazardous hardware systems, subsystems, or components requiring human action to complete the control function. There are several, redundant, independent safety measures for each hazardous event. Software generates information of a safety critical nature used to make safety critical decisions. There are several, redundant, independent safety measures for each hazardous event.
IV	Software does not directly control safety critical hardware systems, subsystems, or components and does not provide safety critical information. However, software controls hardware/components that could indirectly affect safety critical hardware, propagating to a potential hazardous event. For example, fault recovery s/w might be triggered by failure of a non-safety critical component, resulting in temporary shutdown and reset of a control system, which does control hazardous functions.

Software Hazard Severity Categories

The software hazard severity categories are the same ones used for the Hazard Assessment Process:

Description	Category	Definition
Catastrophic	1	Death or permanent total disability, system loss, major property damage or severe environmental damage.
Critical	2	Severe injury, severe occupational illness, major system or environmental damage.
Marginal	3	Minor injury, lost workday accident, minor occupational illness, or minor system or environmental damage.
Negligible	4	Less than minor injury, First aid or minor supportive medical treatment type of occupational illness, or less than minor system or environmental damage.

Software Hazard Matrix:

The Software Hazard Matrix (Table 4.5.3) is similar to the Hazard Assessment Matrix. The matrix is established using the hazard categories for the rows and the Software Control Categories for the columns. The matrix is completed by assigning Software

Hazard Index numbers to each element, just as Hazard Index numbers are assigned in the Hazard Assessment Matrix. A Software Hazard Index (SHI) of "1" from the matrix implies that the hazard may be unacceptable. A SHI of "2" to "4" is undesirable or requires acceptance by the IO and OL Project Managers. Unlike the hardware related SHI, a low index number does not mean that a design is unacceptable. Rather, it indicates that greater resources need to be applied to the analysis and testing of the software and its interaction with the system. Obtain a blank assessment spreadsheet (Attachment E). The IO assessor may send the completed sheet to the OOI Quality and Safety Manager for initial review. The spread sheet must be completed and provided at the OOI TRR. In addition to the TRR submittal, the Quality and Safety Manager posts the Hazard Assessment documents on Alfresco.

After initial review with the OOI Quality and Safety Manager, the IO will send the final version to the OOI Quality and Safety Manager, appropriate COTR, and OL PM.

Table 4.5.3 Software Hazard Matrix

Software Control Category	I	II	III	IV
Hazard Category				
1 - Catastrophic	1	1	3	5
2 - Critical	1	2	4	5
3 - Marginal	2	3	5	5
4 - Negligible	3	4	5	5

Hazard Index	**Suggested Criteria**
1	High - significant analysis and testing resources, may be unacceptable.
2	Medium - requirements and design analysis and in-depth testing required, require OOT approval.
3 - 4	Moderate – high-level analysis and testing acceptable with Senior PM approval (or delegate).
5	Low – acceptable.

Step #	Description	Role(s) Responsible
1	Enter the TRR review name in the TRR Name column.	Assessor
2	Enter the specific component in the Config. Inst. column.	Assessor
3	Enter the function/purpose or the software	Assessor
4	Enter "S" for software and "F" for firmware. Note – write none into blank if no software or firmware is used	Assessor

Step #	Description	Role(s) Responsible
5	Enter the software module data – this column identifies the software module(s) associated with the item.	
6	Enter the Software Hazard Category, the Software Control Category and the total score. Reference tables 4.6.1 and 4.6.2 to determine Software Hazard and Software Control and input values. In the total score box enter the total score and color code (reference table 4.6.3, Software Hazard Matrix) to help highlight the areas to be addressed (e.g. 1 is red).	Assessor
7	Enter "SR" for safety related and "SC" for safety critical. Note – write none into blank is the software is not safety related or safety critical.	Assessor
8	Enter the software related hazards (e.g., electrocution, shock, damaged instruments, etc.)	Assessor
9	Enter the recommendations to reduce the software hazard potential	Assessor
10	Insert all SR decisions for level 2 and Senior PM decisions for level 3 and 4 decisions	Assessor

Assessment values may need to be reviewed by the Senior PM and the SR and a final determination made as to acceptable hazard reduction. The SR is the method available for health and safety decisions for the OOI project and will meet as needed. The SR must review scores rated as "orange" or "red" based on the Hazard Assessment Matrix. The CCB process will be used to document the decisions of the SR and the Safety Review Template (1006-100XX) completed and posted to Alfresco.

Outputs:

The output will be the initial safety/environmental checklist & hazard assessment catalog that will be used to help determine the level of hazard control associated with the TDI item.

An updated or completed Safety/Environmental Checklist and the updated/completed hazard and/or Software Safety assessments.

Exit Criteria:

The exit criteria is a reviewed safety/environmental checklist, hazard assessment (by the OOT) along with completed and implemented recommendations.

4 Appendix A: OOI Incident Reporting Procedure

1. Incident Notification

1.1 Purpose

1. This procedure provides direction for OOI Implementing Organizations (IOs) to report incidents to Ocean Leadership (OL) involving safety, equipment problems, data loss, and environmental issues.

2. This procedure does not exempt or supersede the use of IO internal procedures, IO Marine Operations, UNOLS incident reporting, or procedures or processes for reporting and tracking safety, equipment, or environmental incidents or problems.

3. Incident information will be compiled and evaluated for trends and quality, safety and environmental compliance improvements.

Information on commercially purchased items will be used to improve supplier quality.

Engineering investigations, failure analyses, and other reports will be documented using the OOI Incident Report to ensure consistency and completeness, and to track status.

The database will be available to the on the OOI website.

1.2 Scope

1. The types of incidents to be reported in accordance with this procedure include:
   a) Accidents, near-misses, and personnel injuries;
   b) Failure, damage, or loss involving OOI equipment, facilities, and systems;
   c) Incidents which cause loss of data availability; and
   d) Environmental spills, releases, or exposures.

1.3 Reporting Requirements

1. Report incidents by email within 24 hours after the incident is discovered. Send follow-on information as it becomes available.

Incidents which require the IO send email notification to the OL are described in Sections 4 thru 6 of this procedure. If there is a question as to whether an incident meets the reporting criteria, it should be reported.

2. Typical information to be provided in notifications and reports includes the following, as applicable:

Brief description of the incident, time, location, cause, etc.;
Follow-up action taken/planned to return to operation;
Corrective Action to prevent recurrence of the problem;
Est. cost of failed/damaged/lost item, and disposition of failed item;
Est. cost to recover from incident, not including cost of item involved.

1.4 OL Reporting Contacts

1. IOs shall send reports by email to the (OL) OOI Project Manager, and the OL Quality, Safety and Environmental Manager at:

mkelly@oceanleadership.org and landerson@oceanleadership.org

1.5 Equipment, System, or Data Incidents

1.4.1 Scope

1. This section applies to the failure, damage, or loss of OOI equipment, systems, or facilities. This includes the loss of data or data availability.

1.4.2 Reporting Thresholds

1. Problems or failures that could cause a potential hazard to navigation, such as a loss of power or lighting, loss of mooring anchorage, etc.

NOTE:
The IO shall also immediately report these incidents to their cognizant Coast Guard agency or representative. Make this notification as soon as possible after discovering a problem that could be a potential hazard. The IO is to document the time, date and personnel contacted.

2. Potentially lost or missing items (e.g.: item is not on location, or missed a check-in).

3. Problems and failures of commercially supplied items (e.g.: purchased instruments, profilers, gliders, significant electrical and mechanical components, acoustic releases, cables & connectors, and similar purchased items). This includes deployed/in service items and items under IO control pre- and post-deployment.

4. Problems, failures, losses, damages, etc. to any OOI equipment if the cost to recover from the incident is more than $5,000 and/or it affects scheduled OOI operations. This includes deployed/in service items and items under IO control pre- and post-deployment.

5. Problems or failures that cause a loss of data or data availability of more than 24 hours. Data loss/availability includes both the data from an operating item and data which will not be available because planned deployment or operation cannot be performed.

1.4.3 Reporting Requirement

1. In all incidents, provide the item description, manufacture & model, OOI P/N & S/N, etc. as applicable.
2. Provide follow-on information as it becomes available.
3. If an incident meets more than one reporting threshold, note that in the report(s) sent to OL.

1.6 Injuries, Accidents, and Near-misses

1.5.1 Scope

1. This section applies to personnel injuries, accidents, and hazardous or near-miss incidents.

Note:
It is expected that the IOs maintain internal safety programs which comply with OSHA and applicable state requirements and that all safety incidents are also reported and processed in accordance with the IO's institutional safety program and policies.

1.5.2 Reporting Thresholds

1. Report accidents, injuries, and hazardous or near-miss incidents involving the public (i.e.: non-OOI project personnel).

2. Report injuries involving IO personnel, vessel crew, or other OOI project personnel which are, or are likely to be, classed as a "Recordable Injury" as defined by OSHA.
If a "Non-recordable Injury" later becomes classed as a "Recordable Injury", report it at that time.

3. Report accidents and hazardous or near-miss incidents involving IO personnel, vessel crew, or other OOI project personnel which had the obvious potential to result in a "Recordable Injury" as defined by OSHA (e.g.: falls, electrical discharges, load drops, overboard incidents, etc.).

1.5.3 Reporting Requirements

1. If applicable, include the IO's internal case tracking/ID. number.
2. Provide follow-on information as it becomes available.
3. For ship board incidents, the IO shall provide a copy of the UNOLS incident investigation and report when it is released.

1.7 Environmental Incidents

1.6.1 Scope

1. This section applies to incidents involving the spill or release of hazardous material to the environment, and/or exposure to or contamination of personnel by a hazardous material.

1.6.2 Reporting Thresholds

1. Report incidents that involve exposure or contamination involving the public (i.e.: non-OOI project personnel), or a spill or release in any public area.

2. Report incidents occurring inside an IO's facility that:
(a) Require treatment/decontamination of any personnel; or
(b) Require notification of any outside agencies or responders.

3. Report incidents occurring outside an IO's facility (such as dockside, shipboard, or at sea) that:
(a) Release hazardous material to the environment;
(b) Require a hazmat response by the IO or vessel crew; or
(c) Require notification of any outside agencies or responders.

1.6.3 Reporting Requirements

1. If the incident involves the public or public areas, it should be reported to OL immediately.
2. Provide follow-on information as it becomes available.

5 Appendix B: Inspection of Non-UNOLS Vessels

Inspection Checklist for Chartering Non-UNOLS Vessels

Vessel Name:	
Owner:	
Address and Contact Information:	
Operator:	
Address and Contact Information:	
Licenses held:	
Vessel Type and General Description:	
Length Overall:	
Displacement, Draft, and Tonnage [GT/GRT/NT]:	
Radio Call Sign	
Number of Passengers/Scientists that can be carried:	
Charterer – PI and Institution	
Dates of planned charter:	
Area of operations:	
Type of operations or activities planned:	
Number in planned science party:	

Life Saving Equipment:

_____PFDs

_____Immersion Suits

_____Inflatable Life Rafts

_____Life Ring Buoys

_____Rescue Boats

_____Water Lights/Strobes

Exterior Decks and Equipment:

____ Anchors and Associated Equipment

____ Watertight Doors and Hatch Comings

_____Freeing Ports

_____Deck Vents

_____Cargo and Weight Handling Equipment (Safe Work Load posted & tested, 46CFR189.35 requirements, Appendix A requirements if appropriate).

_____Deck Surfaces Non-Skid

_____Life Lines and Safety Chains

Fire Fighting Equipment:

_____Fixed and Portable Fire Extinguishers Inspection Dates Current? _____

_____Smoke and Fire Detectors

_____Fire Stations and Hoses

_____Self Contained Breathing Apparatus

_____Fire and Damage Control Locker

_____Emergency Stations Bill

Engineering:

_____Gas Engines. Check flame arrestor, vents, gas hoses, no sparking devices in bilges.

_____Diesel Engines - Oil and exhaust leaks, starting system, maintenance, hours since last overhaul.

_____Inspect overall cleanliness and condition of power sources.

_____Check emergency lights.

_____Check bilge and ballast systems and pumps.

_____Check fueling system and pumps.

_____Check refrigeration systems.

_____Check fire pump.

_____Check engine room fire suppression capability.

_____Check all manifolds for saltwater, fuel, etc.

_____Check condition of switchboards, wiring and auxiliary generators.

Structural:

_____Tank Inspections/Record of Inspections

Miscellaneous:

_____First Aid Kits and Medical Supplies

_____Damage Control Equipment

_____Emergency Steering

_____General Appearance and Cleanliness

_____Oil Pollution Placard and other required notices are posted.

_____Sanitary System Operations

_____Assess vessel's overall stability

_____Assess vessel's overall ability to perform charter mission. Include laboratory and deck space, berthing and feeding capability, scientific equipment and winches, etc.

6 Appendix C: Hazard Assessment Checklist

						1A, 1B, 1C, 2A, 2B, 3A			Unacceptable (unless adequate controls are applied)				
						1D, 2C, 2D, 3B, 3C			Undeseriable (OOT Decision required)				
						1E, 2E, 3D, 4E, 4A, 4B			Acceptable with review by PM				
						4C, 4D, 4E			Acceptable without review				
TRR Name	Activity	Safety or Env.	Config. Inst.	Hazard	Consequences			Total Score	Controls in Place	Preventive Measures	Safety Verification	Verification Status	OOT/PM Comments
Design Review Name	Activity (i.e., assembly, disassembly, operations, maintenance, etc.)	Safety (S) or Env. (E)	Specific component	Interaction, the way in which an activity, product or service can have on an employees safety and health	Potential types of injuries/env. damage if the hazard is not controlled	Hazard Severity Category	Hazard Level	Total Score	List all controls in place that eliminate or reduce the hazards potential impact	List all preventive measures to eliminate or reduce the hazards potential impact	Safety Verfification Methods	Verification Status (checked to ensure controls & methods) Enter date when completed	Insert all OOT Comments on hazard reduction via OOT decision (required for all 1A, 1B, 1C, 2A, 2B, 3A, 1D, 2C, 2D, 3B, 3C). Insert all PM Comments for hazard reduction (required for 1E, 2E, 3D, 3E, 4A, 4B)

7 Appendix D: Software Assessment Checklist

1	Unacceptable (unless adequate controls are applied)
2	Undeseriable (OOT Decision required)
3	Acceptable with review by Senior PM
4	Acceptable without review

TRR Name	Activity	Config. Inst.	Software Hazard	Consequences			Total Score	Controls in Place	Preventive Measures	Software Verification	Verification Status	OOT/PM Comments
Design Review Name	Activity (i.e., operations, maintenance)	Specific component	Safety interaction, the way in which an activity or product can have on an employees safety and health or damaged equipment	Potential types of injuries to humans or equipment damaged if the software hazard is not controlled	Software Hazard Category	Software Control Category	Total Score	List all controls in place that eliminate or reduce the hazards potential impact	List all preventive measures to eliminate or reduce the hazards potential impact	Software Verfification Methods	Verification Status (checked to ensure controls & methods) Enter date when completed	Insert all OOT Comments on hazard reduction via OOT decision (required for all 2 scores). Insert all Senior PM Comments for hazard reduction (required for all 3 scores)

8 Appendix E: Environmental Review Checklist

Purpose
To ensure that all equipment installations (mobile and fixed), support system installations, modified facilities, and relocated equipment projects are designed and implemented in a manner consistent with applicable codes, regulations and sound engineering practices. Also to ensure equipment is installed or relocated in a manner, which will allow minimal safety and environmental hazards to operational and maintenance activities. All items must be addressed. Items that are not applicable to the system should be marked "NA". **This checklist should be used during the conception phase of the project and throughout the project. A working draft must be completed by the OOI Critical Design Review (CDR). All items must be checked and documented prior the OOI Test Readiness Review (TRR) for items listed on the Tracked Design Item Table (1100-00003).** All punchlist items will be tracked via JIRA and discussed at the weekly EHS Implementation Team "Safety Meeting".

Review Date:	Design Review Name:
OL Environmental, Health and Safety Contact:	Equipment Name:
Equipment Location:	IO Safety Rep. or Point of Contact (POC):
Organization:	System Engineer:

All personnel hazards entered in the Safety/Environmental Assessment Catalog: *(Yes) (No)*

Equipment Weight: _____Lbs. _____Kgs.
List equipment dimensions:

_____

Labeled for mechanical assistance: *(Yes) (No)*
Crane liftable: *(Yes) (No)*
Forklift: *(Yes) (No)*
Load Balanced: *(Yes) (No)*
How is equipment moved from shop to ship: _____

_____

Does equipment pose a rolling or crushing hazard: _____
How secured against movement: (on ship and in transit): _____

_____

Walking/Working Surfaces:
Slippery surfaces? *(Yes)* *(No)* Anti-skid tape applied?: _____

Any areas labeled “No Step”: _____
Ladder climbing to heights over 6 ft.? (if yes, outline fall protection methods)
_____

Lithium Batteries

Battery Type & Primary/Secondary	How used?	Storage in Flammable Storage Cabinet (Yes/No) or in-use

Lithium-Ion Batteries

Battery Type & Primary/Secondary	How used?	How Stored or in-use

Electrical Activation

Panel/Feeder/Solar/Wind/Fuel Cell	Circuit	Voltage	Phase	Current	Energy Isolation Devise (i.e., lockable knife switch)

Chemicals/Fuels to be used (mandatory at CDR)

Chemical/Fuel	Flammable/Hazardous	Quantity & How Stored	PPE available

Equipment Interlocks & Emergency Machine Off (EMO) (E-STOP)

Location	Upon activation

Radar and Acoustic Equipment

Equipment	Operating wavelength and power	Safe for humans/wildlife	Any shielding required

Pressurized Vessels, Vacuum System and Cryogenics

System	Pressurized or Vacuum	Contents	Crushing/Bursting Verification (analysis/test)	Maximum Pressure	Safely relieve pressure?

Safety

Description	OL EHS	System Engineer	IO Safety Rep.	N/A
1. Chemical/Fuel Material Safety Data Sheet (MSDS) sheet available on site? **(mandatory at CDR)**				
2. Proper Personal Protective Equipment (PPE) available?				
3. Equipment contains Permit Required Confined Spaces?				
4. Lockable (open and closed) hatch(s)				
5. Confined Space - ventilation for explosive/hazardous gases				
6. Is there a lockable main power disconnect, and is it readily accessible and capable of disconnecting all electrical power sources to the equipment?				
7. Has the power network from distribution or branch panel to equipment main disconnect been verified for correct connections and labeling?				

Description	OL EHS	System Engineer	IO Safety Rep.	N/A
8. Are all junction boxes properly labeled, all covers secured, and conduits properly identified?				
9. Is the main power disconnect correctly labeled with the equipment identification, location and identification of supply sub-panel, supply circuit # or designator, and voltage?				
10. Is the supply electrical sub-panel circuit breaker & panel schedule labeled correctly with the equipment identification that it supplies?				
11. Is good wire management exhibited?				
12. Have all safety interlocks (electrical, mechanical, temperature, automation, liquid leak, etc.) been tested and confirmed operational?				
13. Are means provided for isolation (Lockout/Tagout (LO/TO)) of all hazardous energy sources (mechanical, electrical, hydraulic, chemical, etc.)?				
14. Is electrical wiring/equipment protected from possible liquid leak sources?				
15. Is a ground fault circuit interrupt (GFCI) system installed and operating per design, where applicable?				
16. Is the Emergency Machine Off (EMO) (E-Stop) functional (shuts off all electrical power to the system) and does the system require a manual restart upon EMO reset? Note: EMO testing must occur immediately upon system energization.				
17. Are all sharp edges, pinch-points, thermal & mechanical hazards adequately guarded & labeled?				
18.				
19. List any other safety hazards below:				

Description	OL EHS	System Engineer	IO Safety Rep.	N/A
20.				
21.				
22.				
23.				

Environmental

Description	OL EHS	System Engineer	IO Safety Rep.	N/A
1. Fuel/Chemical spill cleanup equipment available?				
2. Employees trained to clean up fuel/chemical spills?				
3. Does the equipment or any components have to be disposed of as hazardous waste? Why?				
4. Does the equipment or any components have to be disposed of as universal waste? Why?				
5. Does the equipment exhaust airborne pollutants?				
6. Does the equipment discharge any cooling water or other liquid wastes?				
7. Is any used oil associated with this equipment? And is it recyclable?				
8. Can pollution prevention principles be applied and the equipment or associated packaging reduced, reused or recycled?				
9.				
10. List any other environmental hazard below:				
11.				
12.				

Fixed Site

Emergency Evacuation Maps Updated? *(Yes)* *(No)*
Any fire suppression systems (CO_2, FM200, etc.) *(Yes)* *(No)*
-Any time delay between lights/horns and suppression activation? *(Yes)* *(No)*
-Who maintains system: _____
-Operations and maint. Manuals stored at: _____
_____
How is fire suppression system tied into FD Notification? _____
_____
Battery backup? *(Yes)* *(No)* List voltage, if yes:
-Who maintains battery: _____
Backup generator? *(Yes)* *(No)* *If yes,* list make, model, oper., capacity: _____
_____
_____
-Automatic Generator testing frequency: *(Weekly)* *(Monthly)* *(Quarterly)*
-Fuel source (diesel, natural gas, etc.): _____
_____
-Fuel storage tank capacity: _____(*Aboveground tank)* *(Underground tank)*
-Permit numbers for backup generator: _____
-Permit expires on: _____

Description	OL EHS	System Engineer	IO Safety Rep.	N/A
1. Personal Protective Equipment (PPE) is available? List PPE needed				
2. Are all receptacles marked with their voltage, amperage and phase?				
3. Are switches, indicators, panel instruments, and control devices adequately labeled to prevent confusion that could lead to a hazard?				
4. Have all equipment related mechanical, electrical, chemical, and health hazards been suitably addressed through warning labels?				

Description	OL EHS	System Engineer	IO Safety Rep.	N/A
5. Is the supply electrical sub-panel circuit breaker & panel schedule labeled correctly with the equipment identification that it supplies?				
6. Are guards, covers, and barriers marked to indicate the hazard that may be present upon removal of such devices?				
7. Are labels located such that they are not removed when the barrier or access door is removed?				
8. Noise level under 85 dBa (8 hours-time weighted avg. (TWA))?				
9. Are procedures in place to react immediately to any leaks/spills?				
10. Are personnel trained in the proper procedures to deal with leaks/spills?				
11. Are materials in place to deal with leaks/spills such as spill containment, absorbent pads, drip pans, proper containers for oily rags, etc? Are procedures in place for the proper disposal of any hazardous waste?				
12. Equipment is secured against movement in event of an earthquake per local building codes (minimum)				
13. Good housekeeping principles?				
14. Fuel/chemical/gas separation?				
15. Fire fuel sources at a minimum?				
16.				
17. List any other hazard(s) below:				
18.				
19.				

Sign-off Punch-list

All punchlist items will be tracked via JIRA and discussed at the weekly EHS Implementation Team “Safety Meeting”. The System engineer has responsibility for completing these punchlist items. The System engineer may delegate these tasks but still retains ultimate responsibility.

Issue	Responsibility	Completion Date
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

9 Appendix F: Incident Notification Reporting

OOI Incident Notification Report #___

- This form provides a listing of the information is generally needed to enter an Incident Notification Report into the OOINet online system, or onto a hardcopy form.
- If the online system is not available, the incident can be entered on this form and emailed directly to the OL QA Manager. Enter the information and email table to: landerson@oceanleadership.org and mkelly@oceanleadership.org

Ver. 1-01

1. Date identified	
2. Brief summary	
3. Detailed incident description	
4. Item(s) involved	
OEM & model	
OOI P/N & S/N	
5. Location	**---drop-down list---**
6. Platform	**---drop-down list---**
7. Action taken	
8. Follow up action(s)	
9. Reported by & date	
10. Status	

***Reference list of instruments:** **---drop-down list---**