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SNS/CNMS Project Environmental, Safety, and Health Plan

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SPALLATION NEUTRON SOURCE

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**SNS/CNMS PROJECT ENVIRONMENTAL, SAFETY,
AND HEALTH PLAN**

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1. SNS/CNMS SAFETY POLICY

The safety of all personnel is recognized as a primary concern to all participants at Oak Ridge National Laboratory (ORNL), Spallation Neutron Source (SNS), and Center for Nanophase Material Science (CNMS). Unsafe conditions and unsafe behavior can result in injuries and deaths as well as impact schedules, cause financial losses, and damage professional reputations. As such, it is our goal that all Project participants plan, manage, and execute their respective operations with the ultimate goal of conducting their operations injury-free on a daily basis.

It is the responsibility of each Subcontractor to adhere to the requirements of this plan. Each Subcontractor shall incorporate safety into the planning of each task, assure the safety of their personnel, provide all safety devices necessary for their employees, establish a safe and drug-free work environment, and confirm that their equipment meets the applicable safety standards. Each Subcontractor is responsible for any actions of their personnel that may endanger or otherwise expose other participants to potential hazards on the project site.

The Integrated Safety Management System (ISMS) shall be used to achieve these goals. The ISMS is a practical approach to the prevention of accidents with an emphasis on line management responsibility for safety. A central premise is that work planning starts with a focus on the nature of the job to be performed and assessment of the hazards involved in each step. Through the use of self-assessment and feedback from the line organizations, continuous improvement in each Subcontractor's safety process is expected.

Project participants are required to supervise and direct the work, using their best management skills and technical expertise. The Subcontractor will be solely responsible for all work means, methods, techniques, sequences and procedures. This includes all safety precautions and programs in connection with the work, as well as coordinating all portions of the work. Each lower-tier subcontractor is likewise required to be responsible for all safety precautions and programs in connection with the work under the Subcontractor's contractual agreement.

All personnel on the Project have stop work authority for any task that represents an eminent threat to safety. Only the Project Manager can authorize a restart of the identified task, with the concurrence of the Safety Coordinator.

Each Subcontractor will submit for review a written safety program in compliance with the Project safety requirements or adopt the SNS/CNMS Project ES&H Plan. The subcontractors' safety program will meet or exceed all applicable Project safety requirements.

Each Subcontractor shall submit a written project specific activity hazard analysis (AHA), to the Company for approval prior to site activities. The AHA shall identify all work tasks anticipated during the project phases, any potential hazards that could reasonably be expected during these work activities, and list actions or precautions that will be taken to minimize the risk of such hazards that could cause an accident, injury, illness, or environmental insult.

2. INTRODUCTION

ORNL, SNS, and CNMS have developed this plan for implementing the principles and functions of ISMS. The Project Manager and each Subcontractor's line management shall share the common goal to eliminate injuries to all employees and the down time associated with accidents. The requirements of the Occupational Safety and Health Administration (OSHA), ORNL, and this safety plan establish the requirements and minimum standards that the Safety and Health programs must meet or exceed.

2.1 GENERAL INFORMATION

The objective of this plan is to emphasize that the protection of people and property is of paramount importance to the success of this project. To accomplish this objective, the Project is committed to the principles and functions of ISMS described in U.S. Department of Energy (DOE) Policy 450.4, Integrated Safety Management System (ISMS) and discussed in detail in Section 3.

Accident prevention is a continuing process, not a fixed program. The Project recognizes that Subcontractors may have their own specific safety requirements. It is, therefore, each subcontractor's responsibility to identify to the Project how their programs will comply with the guidelines set forth in this plan before beginning work on the project site.

While it is the responsibility of each individual to work safely, it is ultimately each Subcontractor's management's responsibility to see that all safety and health policies and practices are followed and enforced. Active participation by each subcontractor's personnel in safety and health programs established for the Project is mandatory. Each Subcontractor's line management must demonstrate to their employees complete support and continuing involvement in all safety, and health policies and efforts.

Failure to fully carry out the responsibility to work safely and participate in the safety and health programs can result in removal of individuals from the Project at the direction of the Project Manager.

Safety is not to be compromised for production. Safety must be considered an integral part of the planning process. The Project's goal, along with the each subcontractor's goal, is to eliminate accidents. Each Subcontractor's line management is charged with the responsibility for developing, implementing, and enforcing the Safety and Health programs and policies established for the Project.

2.2 SUBCONTRACTOR'S SAFETY AND HEALTH PROGRAM

A written safety program that complies with the requirements of this Plan must be submitted within five calendar days after award for review and approval by the Project Manager. In lieu of submitting its own plan, the subcontractor can submit a letter stating that it will adopt/comply with the SNS/CNMS Project ES&H Plan.

Each Subcontractor will budget to establish and maintain a safety and health program that meets or exceeds the requirements contained in this Plan and the applicable sections of 29 Code of Federal Regulation (CFR) 1910 and 1926.

Each Subcontractor is solely responsible for carrying out their safety and health program. Therefore, the Project requires that each Subcontractor designate a competent on-site employee to carry out this responsibility. Along with the Subcontractor's line managers, this employee is directly responsible for ensuring that the Subcontractor's program and employee actions comply with the minimum safety standards required by this document.

3. INTEGRATED SAFETY MANAGEMENT SYSTEM

The Project has adopted the ISMS by contract as the overarching philosophy and approach to integrate systematically safety into work activities. The ISMS is the formal, organized process whereby the SNS Project plans, performs, assesses, and improves safe conduct of work. The ISMS for the SNS Project is based on the fundamental principles and core functions discussed in DOE Policy, P 450.4. Each subcontractor is committed to these fundamental principles and functions through contractual agreement. The use and implementation of this plan is verified through the self-assessment and independent assessment processes.

The Project and its subcontractors are committed to ensuring the health and safety of workers and the public and to protecting the environment. All work will be performed safely and will adhere to all applicable laws and requirements. Integral to this being accomplished is the workers' commitment to work safely and to work to the requirements.

3.1 PRINCIPLES OF INTEGRATED SAFETY MANAGEMENT SYSTEM

The fundamental principles described in DOE P 450.4, which are discussed below, are incorporated into the SNS Project's processes to help ensure that facilities are adequately preserved, that work is conducted safely, and that suitable accident preventive and mitigative measures exist.

3.1.1 Worker and Line Management Responsibility for Safety

Line management is accountable for empowering workers with the training and authority necessary to establish and maintain safe operating methods commensurate with their assigned duties. Management expectations are clearly communicated to all personnel, personnel are empowered, their feedback is solicited, the tools necessary to accomplish the work safely are provided, and personnel are held accountable for their actions. Each individual, in turn, is responsible for his or her actions.

Line managers are responsible for training, motivating, and enabling their workers to understand and comply with the Project's commitment to safety, and for ensuring that work is accomplished within the authorization basis. Line managers are also responsible, by personal example and by involving their workers, for providing a working environment in which everyone is dedicated to meeting the commitment to safety.

3.1.2 Clear Lines of Authority

The Project organizational structure focuses on management and worker involvement, and is centered on work planning and execution. Clear and unambiguous roles and lines of responsibility, authority, and accountability at all organizational levels must be established. Environmental, Safety, and Health (ES&H) responsibility will be integrated into the Project work activities, and interfaces for processes and organizations will be clearly established to provide for good understanding and communication.

3.1.3 Personnel Experience, Knowledge, and Skill

Each Subcontractor must commit to using a workforce on the Project that has the ability to do work safely and efficiently. Each individual associated with the Project shall possess the experience, knowledge, skills, and abilities necessary to discharge his or her responsibilities. Line managers must ensure that their workers are competent to safely accomplish the work through the hiring and training processes. Line management must ensure that training and qualification requirements are flowed down to their personnel, and are responsible for their performance.

3.1.4 Balanced Priorities

The Project ensures a "safety first" culture by effectively allocating, training, and monitoring resources to ensure that work is performed safely. A "safety first" attitude is a must for all personnel. Stop work authority is given to each employee to use when he or she believes an activity is unsafe. Restart approval is given at the appropriate management level. Specific job tasks are planned with appropriate worker involvement, and the work plan is required to be followed to ensure safe operation and environmental compliance.

3.1.5 Work and Associated Hazards

Before work is performed, the associated hazards are evaluated and an agreed-upon set controls is established, which, if properly implemented, provides adequate assurance that the public, the workers, and the environment are protected from adverse consequences.

3.1.6 Administrative and Engineering Controls

Administrative controls and engineering controls are essential elements of the ISMS. Wherever feasible, engineered controls are designed into the Project, and administrative controls are used to supplement engineered controls as appropriate. These controls are established through the work planning process.

3.1.7 Authorization Agreement

The conditions and requirements to be satisfied for operations to be initiated and conducted are clearly established and agreed upon by the Project Manager and subcontractor.

3.2 CORE FUNCTIONS OF INTEGRATED SAFETY MANAGEMENT SYSTEM

DOE P 450.4 describes the core functions of an ISMS. These five functions are not independent and not necessarily sequential. Rather, they are linked and interdependent such that outcomes during the accomplishment of one may affect others. In particular, identifying and implementing opportunities for improvement may arise at any stage of the work process. The five functions are Define the Scope of Work, Identify and Analyze Hazards, Develop and Implement Hazards Controls, Perform Work within Controls, and Provide Feedback and Continuous Improvement.

Each Subcontractors line management must commit to these core functions of integrated safety management in the manner described below.

3.2.1 Define the Scope of the Work

Defining the scope of work entails identifying and defining **all** the steps, each task and sub-task element, needed to complete a particular job safely. Defining the scope of work is a critical element of the safety management system, since it sets the stage for the scope and depth of hazard identification and analysis.

3.2.2 Identify and Analyze Hazards associated with the Work

Hazard identification includes defining those hazards to workers or property expected to be encountered during the course of performing a particular task and those that are introduced from concurrent work tasks. A Job Safety Analysis/Job Hazard Analysis (JSA/JHA) shall be performed for each task to address such hazards. There is also a potential that unexpected hazards may be encountered or the nature of the known hazards might change as work activities proceed. Should this occur the JSA/JHAs shall be amended to incorporate the new conditions.

3.2.3 Develop and Implement Hazard Controls

The development and implementation of hazard controls includes identifying controls to prevent and mitigate hazards, establishing the safety envelope (what conditions require what response) and performing periodic hazard assessments.

3.2.4 Confirm Readiness and Perform Work Within Controls

Confirmation of readiness is an effort to verify that safety controls have been implemented before starting work. Performing work within controls entails adherence to work controls in a manner such that activities remain within the safety envelope. Readiness assessments are conducted at multiple levels from each worker assessing his readiness to start a task to that necessary to demonstrate Project readiness to the DOE and regulators.

3.2.5 Provide Feedback on Adequacy of Controls

Feedback and continuous improvement are based on the premise that all work activities can be planned, performed, assessed, and improved. Continuous improvement entails proactive focusing on problem prevention and performance improvement to prevent unsafe practices from occurring. The capability to prevent minor problems from becoming major risks or events relies heavily on feedback from workers; observations from those not directly involved with the work, and adequate metrics to assess trends in performance.

3.3 ROLES AND RESPONSIBILITIES FOR INTEGRATED SAFETY MANAGEMENT SYSTEM IMPLEMENTATION

3.3.1 Senior Management

The Project Manager has the overall responsibility for assuring a safe workplace and for maintaining safe operations. The Project Manager approves all Project plans, ensures implementation by conveying to line management their responsibilities for integration of safety performance into all work activities, and confirms management responsibility for integration of safety performance into all work activities. The Project Manager also has responsibility for evaluating the progress and health of the ISMS and adjusting resources as necessary based on feedback of ISMS implementation. This promotes continuous improvement in safety performance, and communicates the importance to the Project success.

3.3.2 Line Organizations

Each Subcontractor's Field Managers and Supervisors constitute the focus of "line manager responsibility" for the protection of workers, the public, and the environment within the ISMS framework for all work conducted by their assigned employees, and visitors in their assigned operating facilities.

Line managers provide the primary operating interface for employees and visitors. Within the framework of the ISMS, they contribute to work planning, pre-job communication of hazards and controls, work monitoring, and evaluation of results.

Effective integration of support from ES&H professionals into line activities is essential to achieving excellence in ISMS. Line management is responsible for defining and providing an adequate level of subject matter expert support, either from its own staff, or from external sources, as appropriate for the particular line organization and ES&H discipline involved.

3.3.3 ES&H Organization

As noted above, effective integration of ES&H into line activities is needed for success of the ISMS. The Safety Coordinator is responsible for providing overall policy and guidance on ES&H issues, and for working with the line organizations to make available necessary and agreed-upon input from ES&H professionals and other support. ES&H personnel are responsible for ensuring the standards, requirements, and ES&H policies are effectively translated into suitable controls for work activities.

3.3.4 Workers

All employees and on-site subcontractors are responsible for becoming knowledgeable of and maintaining awareness of the hazards associated with their work, for contributing to the formulation of hazard controls, and for conducting their work safely in accordance with those controls. They are encouraged to identify ES&H issues in their workplace, to work with their management to provide input for improvements and to resolve concerns, and to exercise stop-work authority in cases of imminent danger to health and safety of workers or the public, or threat to the environment.

4. SUBCONTRACTOR RESPONSIBILITIES

4.1 EXPECTATIONS

The safety procedures established for the Project are based on anticipated work activities. Future work activities may require the development of additional safety procedures or clarification of existing policies and procedures.

It is the responsibility of each employee to work in a safe manner. However, it is ultimately the Subcontractor's line management's responsibility to see that all safety and health rules and practices are followed.

Safety is never to be sacrificed for production. The safety goal for this Project is to eliminate the actions that cause accidents or illness.

Each Subcontractor has the explicit responsibility to perform work in accordance with this plan. Subcontractors' line managers are accountable for fulfilling the responsibilities listed in this section, in addition to compliance with their own company requirements and attending meetings to discuss or resolve safety issues. A Subcontractor with 40 or more total employees on-site must have a dedicated safety representative assigned to the site full time to carry out the duties described below. A Subcontractor with fewer than 40 employees onsite must delegate these duties to an on-site supervisor (who will be referred to as a safety **designee**).

4.2 FIELD MANAGER OR SUPERVISORS

Each Subcontractor's Field Managers and Supervisors have the responsibility for overall training, control, and conduct of personnel on their crew. As first-line supervisors, their role in the safety and health program is crucial because they set standards by which their employees work.

The field supervisors' responsibilities include, but are not limited to:

- Conducting task-specific safety training,
- Conducting daily safety inspections,
- Conducting safety sampling,
- Conducting toolbox safety meetings
- Keep the Project Manager apprised of any safety-related problems that have or may develop.
- Conduct investigations of all accidents and incidents and submit reports to the Project Manager.
- Compile OSHA statistical information and report this information to the Project

4.3 DEFINITIONS

Dedicated Safety Representative. A full time dedicated safety representative is an individual (1) scheduled to be onsite during work hours and (2) assigned to exclusively carry out safety-related duties. Specifically, the dedicated safety representative shall not have other responsibilities that may take his or her attention from the expected safety duties.

The individual is required to have 2 years or more of safety experience and have completed the OSHA 30-hour Construction Safety and Health course.

Safety Designee. A safety designee is an individual who, in addition to other project-related duties, is responsible for performing safety-related duties.

As a minimum, this individual is required to have completed the OSHA 30-hour course.

4.4 ON-SITE SAFETY REPRESENTATIVE OR DESIGNEE

The qualifications of the dedicated safety representative or of the safety designee must be submitted for review and acceptance by the Project Manager, prior to the assignment of this person to the project site. Acceptance shall depend upon:

- prior applicable experience,
- prior history of on-site safety functions, and
- safety training .

Specific responsibilities of the safety designee or the dedicated safety representative include, but are not limited to, the following:

4.4.1 Employee Safety Orientation and Training

- Conduct orientation sessions for employees new to the project site, prior to their beginning work.
- Participate in weekly toolbox safety meetings and assist field supervisors, as requested, with meetings.
- Instruct supervisors on safety rules and regulations.
- Instruct employees in the proper use and care of personal protective equipment.
- Instruct employees concerning special procedures (e.g., lockout, excavation, confined space entry, etc.) as required by OSHA and this Plan.
- Conduct or arrange for appropriate training

4.4.2 Recordkeeping

- Complete OSHA, state, federal, company, and Project-specific reports.
- Complete accident investigation reports.
- Complete inspection reports.
- Maintain training documentation.

4.4.3 Safety Standards, Rules, and Regulations

- Authority to stop work.
- Authority to take immediate corrective action.
- Implement, maintain, and update, as required, conditions and project site-specific safety policies and procedures.
- Interpret and implement site-specific safety policies and procedures.
- Demonstrate, by example, proper safety behavior.

4.5 EMERGENCY SERVICES AND EQUIPMENT

If a serious or life-threatening injury occurs, ORNL will provide emergency ambulance and fire fighting services. Subcontractor employees must use an SNS facility phone to dial 911 or pull a fire alarm box to notify ORNL for emergency response. If using a privately owned cell phone, Subcontractor must call the Laboratory Shift Superintendent (LSS) at 574-6606.

In the event of a less-serious injury, subcontract employees will be sent to physicians/medical treatment facilities identified by the subcontractor. In addition to the injury recordkeeping required by OSHA, each subcontractor shall inform the SNS/CNMS ES&H Manager of any injury requiring First-Aid and all more serious occupational injuries and illnesses within one hour of the classification of the injury.

4.6 ORIENTATION

All personnel will be required to attend the Project orientation provided by the Project Manager before working at the Project site. This shall include each Subcontractor's Owners and Officers.

Each Subcontractor's Manager shall ensure that their employees are briefed on what they can expect and what is expected of them on this project site.

Newly employed, promoted, and/or transferred personnel shall be fully instructed in the safety practices required by their assignments. All employees must receive orientation prior to starting work. Visitors must also receive orientation prior to leaving the office areas or be escorted while on the site. The initial indoctrination is to be performed by the Subcontractor's safety designee or dedicated safety representative. The orientation is required before an employee can receive a Project ID and enter the project site.

In addition to the Subcontractor's safety and health policies, the orientation must include:

- employee safety requirements and policies specific to the Project;
- site-specific safety and health requirements ;
- permitting procedures (if applicable), including work permits, hot work permits, etc.;
- hazard communication on a multi-employer work site;
- emergency and medical procedures; and
- other topics as circumstances require.

All employees will complete an Orientation Acknowledgment form at the end of the orientation. A copy will be submitted to the Project in order for the employee to obtain an ID badge.

4.7 SITE ACCESS

Everyone on-site must have a valid driver's license and be able to speak English. Only those persons with a valid ORNL ID badge may enter the site, and only those workers enrolled in the Project may work on the site.

Badging procedures will be described to each contractor prior to initiation of work.

4.8 DISCIPLINARY POLICY

The purpose of this policy is to state the Project's position on administering equitable and consistent discipline of unsatisfactory conduct on the jobsite. This policy ensures fair treatment of all employees in making certain that disciplinary actions are prompt, uniform and impartial. The primary purpose of any

disciplinary plan is to correct the problem, prevent recurrence and prepare the employee for satisfactory service in the future.

We recognize that employees on the whole normally govern their activities while at work in the same high standards of conduct that they use for their personal affairs. But we recognize that errors in judgment may occur and when they do we wish to address them in a fair, impartial and consistent manner. By using progressive discipline, it is our hope that most employee problems can be corrected in the early stages, thus benefiting both the employee and the Project. Open and clear communications between the employee and the supervisor promotes understanding, and is the key to preclude the need for any disciplinary action.

Disciplinary action may call for any four of the following steps: Verbal warning, written warning, temporary suspension from the Project site, and denial of access to the Project site for a period of one year or more, depending on the severity of the problem and the number occurrences.

All disciplinary actions are based upon incident free time periods (rolling date). After an active employee has gone for a time period of one-year (365-days) without a reoccurrence of any progressive disciplinary action, all prior disciplinary action records will be removed from their personnel file. Records associated with terminations will not be purged from the files.

All disciplinary actions resulting in suspension or termination will automatically be reviewed by the appropriate Business Agent (if applicable), the subcontractor's representative, Project Manager, and the SNS/CNMS ES&H Manager.

Employees terminated for safety violations will not be eligible for re-employment on the Project for twelve (12) months. Employees terminated for a second time for a safety violation are ineligible for re-employment.

Appendix A provides the five (5) categories of offenses that require some form of disciplinary action in order to ensure corrective job performance, with only Class V offenses being characterized as the most serious and for which immediate termination will result.

4.9 EQUIPMENT AND MACHINERY

Subcontractor employees shall be trained in the operation, inspection, and maintenance of the equipment; and the safety features and procedures to be utilized during operation, inspection, and maintenance of the equipment. This training shall be based on the equipment operating manual and the hazard analysis for the activity.

Before any machinery or mechanized equipment is placed in use, it shall be inspected and tested by a competent person and certified to be in safe operating condition. Inspections and tests shall be in accordance with manufacturer's recommendations and shall be documented. Records of tests and inspections shall be maintained at the site by the subcontractor, and shall be made available upon request, and shall become part of the official project file.

All machinery and equipment shall be inspected daily (when in use) to ensure safe operating conditions. The Subcontractor shall designate competent persons to conduct the daily inspections and tests. Tests shall be made at the beginning of each shift during which the equipment is to be used to determine that the brakes and operating systems are in proper working condition and that all required safety devices are in place and functional.

Whenever any machinery or equipment is found to be unsafe, or whenever a deficiency which affects the safe operation of equipment is observed, the equipment shall be immediately taken out of service and its use prohibited until unsafe conditions have been corrected. A tag indicating that the equipment shall not be operated, and that the tag shall not be removed, shall be placed in a conspicuous location on the equipment.

Machinery and mechanized equipment shall be operated only by designated qualified personnel. Machinery and equipment shall not be operated in a manner that will endanger persons or property nor shall the safe operating speeds or loads be exceeded. Utilize equipment only for the purpose for which it was designed and in accordance with the manufacturer's instruction and recommendations. Modifications, extensions, replacement parts, or repairs of equipment shall maintain at least the same

factor of safety as the original equipment. Modifications shall be authorized in writing by the manufacturer.

4.10 EVACUATION OF THE WORK AREA

Subcontractor shall observe and participate in notices to evacuate the work area. The evacuation notices may be a drill or actual event. Evacuate to the assembly point identified in the orientation/JSA. Before evacuating the work area, shut down or make safe equipment or processes which could become a safety or fire hazard if left unattended.

4.11 ACCIDENT/INCIDENT INVESTIGATIONS AND REPORTING

All incidents, involving illness/injury, property damage, or neither (“near miss”), must be immediately reported to the Project Manager. This is to include repairable damage to equipment or materials and all but minor first aid cases. Such incidents must be investigated by the Subcontractor’s safety representative or designee and documented on a Project Incident Investigation Report (Appendix B). The report must be completed and submitted to the Project Manager within 24 hours of the incident. The Project reserves the right to conduct an independent investigation of any incident.

An incident investigation committee will investigate all major incidents. This includes, but not limited to, any incident resulting in a medical case, lost-time injury, fatality, damage to property or equipment or a “near-miss” that could have resulted in such an incident. The committee will review the incident scene, interview all involved or witnessing parties, review all facts pertaining to the accident, and file a report of the findings and conclusions as well as recommended measures to prevent re-occurrence to the Project Manager. The committee will be comprised of, but not limited to:

- the person(s) involved in the incident,
- the first-line supervisor of the person(s) involved in the incident,
- the superintendent of the employing Subcontractor,
- the safety representative or designee of the employing Subcontractor,
- the safety representative or designee of the Subcontractor, and
- the Project Safety Coordinator, or designee.

4.12 PERSONAL PROTECTIVE EQUIPMENT

The Subcontractor is responsible for providing the appropriate personal protective equipment (PPE) in all operations/tasks where there is an exposure to hazardous conditions or where there is the need for using such equipment to reduce the hazards to the employees.

PPE and safety equipment shall be tested, inspected, and maintained in serviceable and sanitary condition as recommended by the manufacturer. Users of PPE and Safety equipment shall be trained in the use, limitations, inspection, testing, and maintenance of the equipment.

Basic Eye Protection—Employees must wear ANSI Z87 approved safety glasses with sideshields 100% of the time when exposed to hazards from flying particles, molten metal, liquid chemicals, acids, or caustic liquids, chemical gases or vapors, or potentially injurious light radiation.

Contact Lenses—Wearers of contact lenses must also wear appropriate eye and face protection devices in a hazardous environment. It should be recognized that dusty and/or chemical environments

might represent an additional hazard to contact lens wearers. Hazardous environments include, but are not limited to, those in which a respirator may be required or where welding is being performed.

Face Shield and Goggles— When Subcontractor’s employees are exposed to splashes, mists, etc., either goggles or face shield must be worn, depending on the situation. With a face shield, basic eye protection must also be worn.

Welding Shield—When welding, both basic eye protection and hard hats must be worn with a welding shield. This is to protect employees from popping hot slag when the shield is raised and from overhead work exposures. If welding goggles are worn basic eye protection is not required while welding.

Head Protection—All persons working in or visiting hard hat areas shall be provided with and required to wear protective headgear. Hard hat areas are those with potential of head injury: all construction- designated areas are considered hard hat areas.

Hearing Protection—The safety representative or designee will monitor work areas to identify and post high noise areas and provide appropriate hearing protection.

Foot Protection—Subcontractor personnel must wear leather ANSI Z41 protective work shoes or boots. No one is permitted to wear sneakers, tennis shoes or athletic shoes of any type, sandals, high heels, or thongs on the project site.

Clothing—Employees are to report to work properly attired. The Project’s requirements include:

- Clothing in good repair. (Frayed or tattered clothing can be hazardous to employees and will not be permitted);
- No tank tops or sleeveless shirts. (Shirts must have at least 2” sleeves and tails be tucked in at all times);
- Long pants only. (No short pants, cutoffs, sweat pants, etc.);
- If working around moving machinery, no neckties, gauntlet type gloves and/or baggy, loose or ragged clothing;
- No loose, dangling jewelry. (Jewelry such as rings, watchbands, necklaces, earrings and the like can cause or contribute to accidents);
- Shoulder length or longer hair must be tied back and put under the hard hat or worn in a hair net. (This will keep it from impeding vision, becoming entangled in machinery, or preventing the use of personal protective equipment).

4.13 ON-SITE SAFETY INSPECTIONS

Subcontractor’s supervisors are to conduct and document a weekly review of the work area.

4.14 WEEKLY TOOLBOX MEETINGS

Subcontractor’s supervisors are to conduct weekly toolbox safety meetings. Records of the meetings retained on-site by the subcontractor.

4.15 PROTECTION OF WORK AREAS

Subcontractor must ensure that the work areas and storage areas are conspicuously flagged and barricaded, as needed, prior to initiation of work.

Subcontractor must furnish, post, erect, and install safety devices, equipment, signs, barricades, flagging, and any other item necessary to give adequate warning and caution of hazards, and to provide instructions and directions to workers and the public.

4.16 WORKING AND STORAGE AREAS

Housekeeping is a general indicator of a Subcontractor's performance on-site, including safety performance. Each Subcontractor has the responsibility to maintain their area of operations, and those of their lower-tier subcontractors, in an orderly condition free of materials that could create slip/trip or fire hazards. In addition, the Subcontractor's Supervisors shall ensure a daily walkdown of their work area is conducted, that any deficiencies are immediately corrected, and the condition of the site is reported to the Subcontractor's Field Manager.

All materials and equipment in storage, laydown, staging, or work areas must be properly secured so that they are stable and secure against sliding or collapse. All materials storage and loading/unloading areas must be established a safe distance from walkways, aisles, and traffic areas to avoid personnel injury should materials slide or collapse.

4.17 HAZARDOUS MATERIALS AND HAZARDOUS WASTE

- All Subcontractors will provide to the Project Manager a list of hazardous materials that will be used on the project site.
- U.S. Environmental Protection Agency (EPA) ID number shall be obtained for the hazardous wastes produced by the Subcontractors.
- All hazardous wastes produced by the Subcontractor must be packaged, transported, and disposed of by a licensed entity. Such loads shall be manifested and a copy of the manifest sent to the Project Manager. All hazardous materials must be properly labeled and stored until removed from the project site (by a licensed hazardous waste hauler).
- Hazardous materials or hazardous wastes stored in 30-gallon or 55-gallon drums are to be placed on spill containment pads.
- Report all accidental releases of a hazardous material or hazardous waste promptly to the Project Manager. If the release is of a reportable quantity, the Project Manager will notify the appropriate regulatory agency.
- The responsible Subcontractor will do proper cleanup of accidental releases of hazardous materials waste. Cleanup is to be done by properly trained personnel. Hazardous waste from the cleanup must be hauled away by a licensed hauler. The Project Manager must be given a copy of the hauler's manifest.
- Depending on the hazardous materials spilled, the Project Manager may require the responsible Subcontractor to hire a certified laboratory to take an appropriate number of soil samples to test at their laboratory. A copy of the results is to be given to the Project Manager.
- Subcontractor must inspect their hazardous material and waste storage areas at least weekly to ensure they are properly maintained.
- The Subcontractor will randomly audit the labeling and storage of hazardous material and waste and the disposal of hazardous waste to verify that all subcontractors, at any tier, are fulfilling their roles as responsible parties.

5. HAZARDOUS WORK REQUIREMENTS

5.1 JOB HAZARD ANALYSIS

A Job Safety Analysis/Job hazard Analysis (JSA/JHA) shall be conducted on any and all tasks. The JSA/JHA shall identify the task and the steps necessary to complete the task, the hazards associated with each step of the task, and the means to protect the workers performing the task from those hazards.

Supervisors and employees are responsible for performing a hazard analysis of their work activities and identifying those activities that require a written hazard analysis. The supervisor is also responsible for:

- Ensuring that hazard analyses are developed and reviewed by the employee before work begins.
- Ensuring that employees are trained in the process of developing a hazard analysis.
- Seeking advice of the safety officer or designee as appropriate

Should conditions change or unexpected hazards arise the hazard analysis shall be amended to account for the new conditions and the workers rebriefed on the changes. The participation of workers who may be assigned to perform the tasks is strongly encouraged.

An example of a typical JSA/JHA is illustrated on the following table. Also, hazard analysis worksheet/guidelines are presented in Appendix C.

Table 1. JSA Example		
Principal steps	Hazards	Controls
Vehicle Operations	Accidents	All operators must have valid licenses and certifications.
Excavation of 7 foot trench using backhoe or similar equipment	General physical hazards (manual lifting, slips, fall, contact with moving equipment, work near trench margin)	Take “2” to review tasks, hazards, and controls. Hard-hat, safety glasses, work boots, work clothes require. Establish a safety zone radius the length of the fully extended excavator arm. Only authorized and necessary personnel in the safety zone. Functional back-up alarm on excavator. Work gloves required for material handling. No one-person lifting over 55 pounds, proper lifting technique.
	Trenching physical hazards	Identify soil type. No trench entry permitted by personnel without proper shoring, guarding, or slope construction. Soils stored 14 feet from trench edge.
Excavation of 7 foot trench using backhoe or similar equipment (continued)	Fire	Flammables stored in safety cans with flame arresters. Fire extinguisher \geq 20AB 25 to 50 feet from outside flammables storage. Ignition sources prohibited in fuel storage or handling areas. Fuel storage areas must be marked with “No Smoking or Open Flame” signs. Bonding (metal to metal contact) during pouring. Gasoline powered equipment will be shut down during filling.
	Electrical shock	Maintain clearance from overhead and buried electrical utilities. Verify that no utilities have been installed in the immediate vicinity of the trenching. Notify CM of location and depth to dig.
	Exposure to chemicals	None anticipated. Wash face and hands prior to taking anything by mouth.
	Biological hazards	Notify On-site Medical Provider of any severe allergies to insect stings. PPE (boots, work clothes, taped pant legs). Insect repellent, as necessary.

5.2 COMPRESSED GAS CYLINDERS

General Requirements

- Ensure that these containers are not defective or leaking any product.
- Prescribed stamped markings on the container shall be located on the shoulder of the cylinder.
- The labels applied by the gas manufacturer or authorized supplier/vendor to identify the container contents shall not be defaced or removed.
- Containers may be painted by the gas suppliers to permit the suppliers to help recognize their contents and to segregate them more readily in their handling operations. However, the primary identifier is the container label. Color shall not be used to exclusively identify container content.

- Containers not bearing a legibly written, stamped, or stenciled identification of the contents shall not be used.
- Compressed gas cylinders shall not be used as rollers, supports, or for any purpose other than to contain and use the content as received.
- The container valve shall be kept closed at all times (charged or empty), except when the container is in use.

Transporting Cylinders

- Compressed gas containers shall not be rolled in the horizontal position or dragged. A suitable hand truck, forklift, or similar material handling device should be used with the container properly secured to the device.
- Containers shall not be lifted by using the container cap or magnets. In cases where hand trucks are designed to lift containers using the cap, the containers shall not be lifted higher than 6 inches or for longer than it takes to properly position the container on the hand truck.
- Ropes, chains, or slings shall not be used to suspend containers unless provisions have been made on the container for appropriate lifting attachments, such as lugs. Where appropriate lifting attachments have not been provided on the container, suitable cradles or platforms to hold the containers shall be used for lifting with the containers being adequately secured.

Storage

- Containers are not to be stored near readily ignitable substances, such as gasoline, oil, or scrap material.
- All compressed gas cylinders shall be stored and used valve end up. The cylinders shall be secured to prevent instability.
- Valve protection caps should always be in place and hand tight, except when cylinders are in use or connected for use.

5.3 CONFINED SPACE

A Confined Space means a space that:

- is large enough and so configured that an employee can bodily enter and perform assigned work; and
- has limited or restricted means for entry or exit for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry); and
- is not designed for continuous employee occupancy.

A Permit-Required Confined Space is a confined space that has one or more of the following characteristics:

- contains or has the potential to contain a hazardous atmosphere;
- contains a material that has the potential of engulfing an entrant;
- has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or
- contains any other recognized serious safety or health hazard.

For entry into non-permit spaces a job safety analysis, work guideline, or a standard operating procedure is required. Entry into a permit-required space requires a confined space permit (see Appendix D).

Operations involving a confined space entry require an evaluation of work by the Subcontractor and the Project Manager's S&H Representative to classify the space as Permit-Required or Non-permit.

Retrieval equipment shall be provided to facilitate non-entry rescue for all Permit-required spaces unless evaluation of the Permit-required confined space determines that the use of retrieval equipment creates greater health and safety hazards. In this case, rescue services shall be notified that entry into the confined space will be necessary to perform rescue operations.

5.4 ELECTRICAL SAFETY

- Conduct electrical installation and maintenance operations in accordance with requirements in 29 CFR 1926 Subpart K, applicable requirements in 29 CFR 1910 Subpart S, and the National Electrical Code.
- Ensure electrical work is performed by qualified persons.
- Provide a ground fault circuit interrupter for cord sets, receptacles, and electrical tools including plug and cord connections to generators and equipment for employee use.
- All unfinished circuits are to be tested for energy, capped with wire nuts, and pushed into the box by an electrician. All employees are to be instructed that any wires not capped are assumed to be live, and are to be reported to an electrician.
- Provide three-wire extension cords, continuous length without splices, and designed for hard or extra-hard use. Protect electrical extension cords from pinch points, sharp edges, pedestrian or vehicle traffic, or other potentially damaging configurations. Do not fasten extension cords with staples, hang with nails, or suspend on wires. Arrange extension cords in a manner that avoids creating tripping hazards.
- Notify the Project Manager prior to any work being done near overhead lines. Overhead lines shall be de-energized and grounded or other protective measures (guarding, isolating, insulating, etc.) shall be provided, before work is performed in the vicinity of overhead lines. This will be accomplished by ORNL Electrical Power Operations Group

Any vehicle operated in proximity to overhead lines shall maintain the following minimum distance:

- Ten feet (305 cm) for voltage of 50 kV or below;
- Ten feet (305 cm) plus 4 inches (10 cm) per 10 kV for voltage greater than 50 kV
- Four feet (122 cm) for vehicles in transit, with its structure lowered for voltages 50 kV or below, with clearance increased 4 inches (10 cm) for every 10 kV over that voltage.

Live parts to which an employee might be exposed shall be put into an electrically safe work condition before an employee works on or near them, unless the deenergizing introduces additional or increased hazards or is infeasible due to equipment design or operational limitations. Energized parts that operate at less than 50 volts to ground and containing less than 10 Joules of stored electrical energy are not required to be deenergized if there will be no increased exposure to electrical burns or to explosion due to electric arcs.

The hazard analysis is utilized to ensure workers understand their role in the work to be performed, as well as what others involved in that project or task will be doing. Supervisory approval for "working on

or near” or “working hot” shall be given in the Permit (Appendixes E and F). **“Working on or near” or “working hot” requires approval by the Subcontractor Supervisor, SNS CNMS Project Manager, SNS/CNMS Electrical Safety Officer, and SNS/CNMS Level II Manager. Subcontractor shall follow the guidelines presented in Appendixes G, H, I, J, K, L, and M for determining approach boundaries and PPE. These Appendixes were derived from NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces.**

5.5 ELEVATED WORK/FALL PROTECTION

Each Subcontractor must provide appropriate 100 % fall protection for its employees working six feet or more above the work surface. This includes steel erection. The Subcontractor’s Field Manager must fully evaluate the work conditions and environmental factors (including seasonal weather changes) before selecting the appropriate fall protection system (active, passive or a combination of measures, as appropriate). Such evaluation is to be included in the hazard analysis for the task.

Employees shall be trained in the selection and safe use of fall protection systems before the equipment is used. This can be accomplished in a safety meeting or pre-job briefing.

Types of Fall Protection Systems

- Personal fall arrest system (PFAS): a means used to arrest an employee in a fall from a work level. It consists of an anchorage, connectors, and a body harness and will include a lanyard, deceleration device, lifeline, or a combination of these. Anchorage shall be capable of sustaining static loads, applied in the directions permitted by the PFAS, of at least 5,000 lbs per user attached.
- Restraint: The full body harness is used as a component of a restraint system to prevent the user from reaching a fall hazard. Anchorage must support a minimum of 3,000 lbs. per person attached.
- Work Positioning: The full body harness is used as a component of a work positioning system to support the user at a work position. Anchorage must support at least 3,000 lbs per person attached.
- Warning line system is a barrier erected to warn employees that they are approaching an unprotected edge. It also designates an area in which work may not take place without the use of a guardrail, personal fall arrest system, or a safety net to protect employees.
- Guardrail system is a barrier erected to prevent employees from falling to lower levels.
- *Controlled access zone* is an area in which certain work (e.g., overhead brick laying) may not take place without the use of guardrail, personal fall arrest or safety net systems and access to the zone is controlled.
- *Safety monitoring system* is a system in which a competent person is responsible for recognizing and warning employees of fall hazards.
- *Safety net system* can be used when workplaces are more than 25 feet above the ground, water surface or other surfaces where the use of ladders, scaffolds, catch platforms, temporary floors, safety lines, or a safety harness is impractical.

5.6 EXCAVATION/PENETRATION

The Excavation/Penetration permit process is utilized to provide for the safety of personnel and protection of existing utilities and facilities during work activities requiring excavations and/or penetrations into structures.

Prior to excavation/penetration, the estimated location of utility installations (e.g., sewer, telephone, water, fuel, electric lines) underground and in walls, floors, etc. shall be determined and protected from

damage or displacement. The Project Manager shall be contacted to locate the installations. Before excavation/ penetration, the Project Manager Field Representative will provide the Seller with an Excavation/Penetration Permit (Appendix N). The permit shall be posted at the work site.

For penetrating activities (including installation of fasteners less than 2") where the subsurface elements are unknown, the following requirements will be performed:

- assuring GFCI protection on electrically-operated equipment/tools;
- connecting non-double insulated electrically operated equipment/tools with an insulated #8 AWG or larger copper conductor;
- connecting non-electrically operated coring/cutting machines to ground with an insulated #8 AWG or larger copper conductor;
- requiring appropriately rated electrically insulated gloves;
- investigate/survey for identification of subsurface elements.

Excavation/penetration work activities excluded from the permit process are as follows:

Excavation Activities

- Maintenance replacements of the same location, depth, and size as the items being replaced (i.e., sign posts, bollards, poles, asphalt milling, etc.)
- Soil borrow areas pre-designated by Project Manager
- Earth/rock excavations 12 inches or less in depth with surface area not in excess of 25 square feet, using hand-held tools excluding jackhammers.

5.7 FLAMMABLE AND COMBUSTIBLE LIQUIDS

- Only approved containers and portable tanks shall be used for storage and handling of flammable and combustible liquids. Approved safety cans or Department of Transportation approved containers shall be used for the handling and use of flammable liquids in quantities of 5 gallons or less(this does not apply to those liquids which are extremely hard to pour, which may be handled in original containers). For quantities of 1 gallon or less, the original container may be used, for storage, use and handling of flammable liquids.
- Containers of flammable and combustible liquids shall be tightly capped when not in actual use.
- Flammable liquids may be used only where there are no open flames or other sources of ignition within 50 feet of the operation, unless conditions warrant greater clearance.
- All sources of ignition shall be prohibited in areas where flammable and combustible liquids are stored, handled, and processed. Suitable No Smoking or Open Flame signs shall be posted in all such areas.
- Areas where flammable or combustible liquids are transferred at one time, in quantities greater than five gallons from one tank or container, shall be separated from other operations by 25 feet distance or by construction having a fire rating of at least one hour.
- A fire extinguisher, rated not less than 10B, shall be provided within 50 feet of wherever more than five gallons of flammable or combustible liquids are being used on the job site. This does not apply to the integral fuel tanks of motor vehicles.

- The Project/ORNL will provide fire fighting services. Subcontractor employees must use a facility phone to dial 911 or pull a fire alarm box to notify ORNL for emergency response. If using a privately owned cell phone, Subcontractor must call the Laboratory Shift Superintendent (LSS) at 574-6606.

5.8 HAND AND POWER TOOLS

- Hand and power tools shall be used, inspected, and maintained in accordance with the manufacturer's instructions and shall be used only for the purpose for which designed.
- Power tools designed to accommodate guards shall be equipped with such guards when in use. Reciprocating, rotating, and moving parts of equipment shall be guarded if exposed to contact by employees or otherwise create a hazard.
- Tools and equipment showing evidence of safety hazards shall not be brought on site. Should hazards become evident after work is initiated, remove the tool from use, clearly indicate the tool is not to be used, and take the tool from the site at the end of the work shift.

5.9 HAZARD COMMUNICATION

- Subcontractor must demonstrate compliance with a hazard communication program including employee information and training, provisions for labeling, and availability of MSDSs.
- Subcontractor shall maintain MSDSs for hazardous chemicals brought onsite and shall supply information regarding hazardous chemicals to the Project representative prior to initiation of activities that may potentially expose Project personnel to a hazard at the job location.
- The Project Manager shall provide the Subcontractor MSDSs and any information about any chemical hazards to which the Subcontractor employees may be exposed from Project operations.
- Subcontractor shall remove all unused chemicals or materials brought to the site at the completion of the job.

5.10 HEAT AND COLD STRESS

Personnel exposed to temperature extremes shall be protected in accordance with the American Conference of Governmental Industrial Hygienists (ACGIH) guidelines by implementing appropriate engineering controls, work-rest regimens, and/or personal protective equipment.

5.11 HOISTING AND RIGGING

Perform hoisting and rigging activities in accordance with the 29 CFR 1910 Subpart N, 29 CFR 1926 Subparts H and N, and ANSI B30 and B56 Series. Provide for review by Project S&H representative, documents of certification that Subcontractor's hoisting and rigging equipment meets the requirements in these documents. If an inspection certificate expires while the equipment is on site, re-inspect the equipment and update the inspection certificate before continuing work activities.

Equipment operators/riggers, including alternates, shall be qualified to perform their assigned functions. Qualifications shall include physical, knowledge, and skills proficiency based on job function.

All operations that require hoisting and rigging shall have a JSA/JHA and /or an appropriate safety checklist completed prior to beginning work to ensure safety and compliance.

Classify each lift as ordinary or critical.

5.11.1 Critical Lift

A lift will be considered critical when any one of the following conditions exists:

- The load item is unique and, if damaged, would be: (1) irreplaceable; or (2) not repairable and is vital to a system, facility, or project operation;
- The cost to replace or repair the load item or the delay in operations of having the load item damage would have a negative impact on facility, organizational, or DOE budgets to the extent that it would affect program commitments.
- When a lift involves more than one crane or other motorized lifting device lifting a common load
- The lift exceeds 75% capacity of crane
- The load requires exceptional care in handling because of size, weight, close-tolerance installation, high susceptibility to damage, or other unusual factors
- All lifts over 50 tons
- Collision, upset, or dropping could result in significant release of hazardous material or other undesirable conditions

There are other conditions which **might** constitute a critical lift and should be evaluated by the Subcontractor. Such conditions include:

- Lifts that are made where the load could fall on pipelines or vessels containing flammable gases or liquids
- Lifts in tight spaces
- Lifts involving nonrigid objects like tank shells
- Lifts with lifting points below the center of gravity of the load

The Critical Lift Plan/Permit (Appendix O) must be developed by the subcontractor in conjunction with its safety and health plan and obtain reviews/approval from the following personnel:

- Subcontractor Lift Supervisor
- Subcontractor Safety and Health Representative/Designee
- Operators performing the lift
- Project Engineer
- Project Manager
- Project Safety and Health
- SNS/CNMS Level II Manager

Required attachments to the Critical lift plan include:

- Crane operator certification must be issued through a Certified Competent Person and must be up-to-date. All operator certifications must be attached to the plan or be on file.

- Type, size, capacity, engineered designs, and manufacturer of shackles, hooks, jacks, rollers, come-alongs, spreader bars and slings
- Type, size, capacity rating, manufacturer, capacity certificates, and inspection reports for all cranes and other lifting equipment
- Lift geometry and free body diagrams to illustrate the individual tensions of each sling involved in the lift, and any shift of weight when the load is lifted
- A complete rigging diagram must be attached to the critical lift plan. The rigging diagram must include the entire rigging process and the following minimum information when it applies:
 - Type and capacity of lifting equipment
 - Crane boom length, radius, and location of outriggers
 - A plot of the path of travel including all vertical and horizontal clearances from such items as adjacent equipment, power lines, and other encumbrances or hazards
 - Location, size and capabilities of lifting lugs, slings, and other rigging accessories as well as the method of attachment
 - Position of load in relation to the boom to show hook clearance and distance between the boom and the load
 - Description, size, capacity, and location of miscellaneous equipment such as dollies, jacks, hand wrenches, rollers, etc.
 - Location of mats and cribbing used before, during, and after the lift
 - Location and orientation of equipment
 - Location of underground lines (utility lines, electrical duct banks, cables, etc.), abandoned vessels and tanks, and foundations

Critical lift permits must be submitted to the Project Manager/Engineer nominally two (2) working days prior to making the lift.

5.11.2 Ordinary Lift

Any lift which does not meet the definition of a critical lift is considered an ordinary lift. The hazard analysis will suffice as the lift plan for ordinary lifts. The hazard analysis must contain the following information:

- Description of lift to include weight, dimensions, center of gravity, and objects to be lifted
- Hoisting and rigging equipment with capacities
- Rigging sketches/drawings

Ordinary lift plans/hazard analysis must be reviewed and approved by the subcontractor's field supervisor and safety and health representative, and SNS/CNMS safety and Health Representative.

5.11.3 Safe Rigging Practices

- Determine the weight of the load before designing the method that will be used to lift it. Consider whether vessels will contain fluid, sludge, internal equipment, etc. These items can add significantly to the nominal weight and can create dynamic motion.
- If possible, distribute the load evenly on all legs of a sling.
- When using multiple leg slings, keep in mind that the load is not always divided equally.
- The 4-leg slings shall be rated as 2-leg slings, since it cannot always be determined that all legs will be loaded equally. Other multiple leg slings should be given due consideration for possible uneven loading.
- Check choker rotation to eliminate jerking or slipping while upending or laying down.
- When fastening chain hoists, or snatch blocks to permanent structures, verify that the structure is strong enough to support the load.
- Always refer to the manufacturer's specification chart for safe working loads of shackles.
- Never replace the shackle pin with a bolt; only the proper fitted pin shall be used.
- The crane rated loads do not account for the weight of rigging accessories, like blocks, auxiliary boom head, hooks, slings, spreader bars, jibs, material handling equipment, and other elements of lifting tackle. Their combined weight must be added to the total weight.
- The maximum safe working load of cranes is determined from static loads. The capacity charts do not take into account impact loads due to the dynamic motions of the load or crane.
- Are softeners required to reduce cutting to the slings?
- Conduct a detailed investigation to identify all possible interference in the vicinity of the work including overhead, at grade or underground.
- Prior to lift, develop a method of unhooking and hooking up the load.
- Always assure that rigging is placed to assure proper orientation of piece in final position.
- Surveying equipment may be needed to insure that loads remain within vertical and horizontal limits and to assure stability during the lifting operation.

5.11.4 Safety Precautions for Lifting in Tight Spaces

- Plot in detail the location of the crane and/or other equipment with respect to the work, including location of outriggers.
- Establish limits of allowable motion for the boom in both the vertical and horizontal directions for each crane location in order not to damage existing facilities.
- Devise and provide means to protect existing operating facilities. Mechanically protect small protrusions on operating equipment, such as valves, instrumentation, brackets, etc., which could be damaged if contact is made with the load.
- Consider shutting down and depressurizing operating equipment which could be jeopardized by the lift.

5.11.5 Method of Attachment and Handling

- If attachment points or lifting lugs are provided on the piece, verify that they are intended for handling operations to prevent damage.
- What are the manufacturer's care and control restrictions of the object to be lifted during handling the entire piece and not a component.
- Are there any requirements for shipping skids or other handling devices and their availability.
- Review the sequence of proper assembly or disassembly when the structure consists of components.

5.11.6 Lifting Lug Requirements

- Lifting lugs must be engineered to withstand the load plus an additional 125 % of the load as a safety factor.
- All engineering of the lugs must be done by a certified engineer.
- Welds on both old and new lifting lugs must be magnetic-particle tested to ensure soundness.

5.11.7 Matting Requirements

- Matting must be made of through bolted hard wood, or heavy duty 12" X 12" crane timbers.
- Matting must be thoroughly inspected before use.

5.11.8 Ground Stability

- Ascertain the load carrying capacity of the soil and beware of recently excavated and backfilled areas or areas with weak soils having limited bearing capacity. Examine the rigging diagram to verify that cranes, dollies, and trailers are adequately supported and that the diagram includes cribbing or mats under the crane and outriggers where required.
- Check the entire path of movement during the lift for all holes, rocks, and soft ground.
- Check all load restrictions on floors, structures and access roads.

5.11.9 Tag Lines

- Always use a tag line even for smaller lifts unless the tag line increases the hazard. It is much easier to maintain control of the lift than to regain control when it is swinging or spinning.
- There shall be no knots in the trailing end of tag lines.

5.12 LOCKOUT/TAGOUT

LOTO procedures must be strictly followed when it is necessary to work on any equipment that may release any form of hazardous energy including, but not limited to, electrical, rotational, mechanical, chemical, hydraulic, or pneumatic energy, while the equipment is shut down.

LOTO is required whenever servicing, maintenance, or modification is being performed on equipment in which the unexpected energization or startup of the equipment, or the release of stored energy, could cause injury to people or damage to equipment. All sources of hazardous energy must be shut off and secured. LOTO must be performed by each person who works on the equipment.

The Project Manager will perform a lockout/tagout of applicable Project controlled systems and equipment. Subcontractor must provide at least two (2) working days advance notice to the Project field representative of systems requiring lockout/tagout.

Following the initial isolation and lockout/tagout by the Project, a representative of the Subcontractor shall review and approve the protection provided. Subcontractor employees shall verify isolation, and overlock isolation points (or a lockbox) with their personal locks. These locks shall be identified with the Subcontractor employee's name and a unique employee identification number (a tag can be used to provide identifying information). A detailed tag must be used in conjunction with the lock if the lockout period extends beyond the work shift. Necessary information will include who locked and tagged out the energy source, brief description of task, and the date tag was applied.

Upon completion of work, Subcontractor employees shall remove all personal locks and notify the Project field representative. The removal of the Project lock(s) shall not precede the removal of the Subcontractor's lock(s).

Hazardous energy sources introduced by the Subcontractor must be controlled through the use of Subcontractor's hazardous energy control procedure. The procedure/JSA must include/address the following:

- **Assess energy type and magnitude:**
The authorized employee must assess the type, magnitude, and hazards of the energy to be controlled.
- **Determine methods of control:**
The authorized employee must determine the appropriate methods of controlling the hazardous energy; e.g., disconnect switch or valve. **Note: push buttons, selector switches, interlock circuits, and other control type devices are not energy-isolating devices.**
- **Notify all affected personnel:**
The authorized employee must notify all affected employees of the impending shutdown, the reasons for it, and anticipated duration of shutdown.
- **Shutdown:**
The authorized employee must verify that it is safe to shut down the equipment.
- **Perform normal equipment shutdown:**
The authorized employee must turn off or shut down the equipment using established methods for that equipment.
- **Isolate and lock out energy sources:**
The authorized employee must operate the energy-isolating device and affix his/her LOTO lock to this device. The lock must be affixed so as to hold the energy-isolating device in an off or safe position that physically prohibits normal operation of the energy-isolating device. Where more than one authorized employee is involved in the job and a Group LOTO procedure is not used each authorized employee must affix his/her personal lock using a multiple lock hasp.
- **Enter required information on tag:**
The tag is used to provide identifying information. The authorized employee must complete all appropriate information on the tag. If the placement of the tag would compromise safety by obscuring indicator lights or controls, the tag may be located as close as is safely possible to the device, in a position that will be immediately obvious to anyone attempting to operate the device. Where more than one authorized employee is involved in the job, and a Group LOTO procedure is not used each authorized employee must affix his/her own personal tag on a multiple lock hasp.
- **Releasing stored energy:**
The authorized employee must completely release or otherwise control any stored energy. In the case of stored mechanical energy, vent valves, spring releases, blocking devices, or equipment

repositioning (as appropriate) must be utilized. In the case of stored electrical energy, approved grounding wands or discharge devices must be used.

If there is a possibility of reaccumulation of stored energy to a hazardous level, verification of isolation must be continued until the servicing, maintenance, or modification is completed or until the possibility of such accumulations no longer exists. The equipment must be in a Zero-Energy State.

- Verification of LOTO Application procedure:

Attempt to restart the equipment. The authorized employee must physically attempt to operate the energy-isolating device and attempt to restart the equipment using the normal equipment controls (e.g., start buttons or computer software controls).

If the equipment is electrical, the authorized employee must additionally test potential electrical energy sources using appropriate instruments or testers. The authorized employee shall use test equipment to verify that the circuit elements and equipment parts are de-energized, and shall also determine if any energized condition exists as a result of inadvertently induced voltage or unrelated voltage back-feed even though specific parts of the circuit have been de-energized and presumed to be safe. If the authorized employee is not qualified to test the energy being isolated, he/she must ensure that a qualified person tests the energy. If the circuit to be tested is over 600 volts, nominal, the test equipment must be checked for proper operation before and immediately after this test. Note: All test equipment must be checked for proper operation regardless of the voltage. Circuits over 600 volts may require special test equipment.

Although electrical LOTO verification/Testing is only properly performed on de-energized equipment, there can be occasional surprises (e.g. multiple feeds or sources, or stored electrical energy) and such verification may indeed be on or near unexpectedly energized (live) electrical parts. The qualified worker must approach the hazard with the assumption that the system is energized until it is verified to be de-energized, and as such must follow the guidelines presented in Appendixes G, H, I, J, K, L, and M for determining approach boundaries and PPE. These Appendixes were derived from NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces. The “working on or near” or “working hot” Permit (Appendix F) is not required for LOTO verification/testing.

- Release from LOTO:

Before LOTO devices are removed and energy is restored to the equipment, the authorized employee must:

- Verify that it is safe to reenergize. The authorized employee must verify that the work for which the LOTO was applied has been completed and that it is safe to reenergize equipment. The authorized employee must check the work area to ensure that all tools and personnel are at a safe distance from the equipment.
- Remove all isolating and grounding devices. The authorized employee must check the equipment to ensure that any removed guards are reinstalled.
- Remove lock and tag, reset the energy-isolating device, and return the machinery to service. The authorized employee must notify all affected employees that the equipment is back in service.

5.13 RESPIRATORY PROTECTION

The Subcontractor will determine which respirator type or class will offer adequate protection based on:

- the respiratory hazard(s) to which the worker may be exposed;

- the workplace and user factors that have the potential to affect respirator performance and reliability;
- his or her informed professional judgment;
- the scientific literature.

The Subcontractor shall provide respirators in accordance with the following:

- If subcontractor employees are required to wear negative or positive pressure, tight-fitting respirators, they shall have been medically evaluated
- Ensure respirator wearers have completed the respirator quantitative fit testing and respirator training.
- Provide respirators and cartridge type specified to protect worker from exposure to identified or suspected hazards as specified in the hazard analysis.
- Provide breathing air, if required. Submit data to Project Field Representative demonstrating the compressed breathing air quality supplied to the air respiratory protections systems meet the ANSI/CGA G7.1, Commodity Specification for Air, requirements.
- Provide optical corrections for appropriate respirators.
- All respirators shall be NIOSH- certified.

5.14 SANITATION

An adequate supply of drinking water shall be provided by the Seller. Portable drinking water dispensers shall be designed, constructed, and serviced to ensure sanitary conditions, shall be capable of being closed, and shall have a tap. Containers shall be clearly marked as to their contents and shall not be used for other purposes. Water shall not be dipped from containers. The common drinking cup is prohibited.

When sanitary sewers are not available, chemical toilets and hand washing facilities shall be provided and maintained by the Project.

5.15 SCAFFOLDING

All scaffolds and platforms must meet the following requirements:

5.15.1 General Requirements

OSHA requires that scaffolds are to be erected, moved, altered, and dismantled only under the supervision and direction of a qualified Competent Person experienced in scaffold erection and maintenance. The scaffolding Competent Person shall not have other responsibilities that could take his or her attention from the scaffolding work.

Each working level or platform of scaffolds must be completely decked and have handrails, midrails, and toeboards installed. If for some reason, a platform or working level cannot be equipped with standard handrails or completely decked, safety harnesses must be worn and properly tied off in compliance with the established fall protection requirements.

Chain guardrails on scaffolding are not allowed.

Scaffolds that will be higher than 30 ft and a working load exceeding 50 lb ft² requires a licensed professional engineer to complete sealed and signed design drawings, including load calculations. Examples are scaffolds erected for plasterers, masons, or any other trades who routinely store material on the platform.

Supported scaffolds with a height to base width (including outrigger supports, if used) ratio of more than four to one (4:1) shall be restrained from tipping by guying, tying, bracing, or equivalent means.

Contact the Project Manager if any special scaffolding issues arise.

Scaffolds must be inspected prior to each shift and tagged for the workers. Tagging must designate the requirements of the user and the conditions of the scaffold.

5.15.2 Rolling Scaffolds

No one is to ride on a rolling scaffold while it is being moved.

All materials and tools must be secured prior to moving a rolling scaffold.

No rolling scaffolds will be utilized to support other scaffolds.

5.15.3 Scaffold Planking

Paint or stamp scaffold planks within 12" of each end or edge to denote use for scaffold decking only.

Use only 2" × 10" or 2" × 12" scaffold grade material for scaffold planking.

5.15.4 Scaffold Tagging

The scaffold tagging procedures are as follows:

- The crew that erects the scaffold must complete and attach the appropriate scaffold tag.
- The scaffold tag must be placed at eye level on or near the access ladder so it is easy to locate and plainly visible.
- A Competent Person needs to ensure that the scaffold is erected properly and the tag attached is proper and completely filled out.
- If the scaffold needs to be altered in any way, the person who signed the tag must be contacted to authorize the change and re-tag if necessary.
- An untagged scaffold must not be used.
- A Competent Person must inspect it prior to each shift.
- Tagging System procedure:
 - A green tag is completed and attached by the erecting crew to scaffolds that have complete handrails, midrails, toeboards, and decking.
 - A yellow tag is completed and attached to scaffolds that cannot be erected with all the components complete. The yellow tag allows the erecting crew to note what portion of the scaffold is incomplete and cautions the user. A yellow tag also informs the user fall protection is required.
 - A red tag means the scaffold is being dismantled, not yet completely erected or for some reason not safe and shall not be used.
- Under rare circumstances non-traditional scaffolding techniques may be required prior to installation. Appendix I shall be completed and submitted to the Project Manager for approval.

5.16 WELDING, CUTTING, AND HOT WORK

The Subcontractor shall have a permit system addressing S&H and fire prevention for the following applications when work is conducted in a non designated area; welding and allied processes, grinding, heat treating, thawing pipes with a torch or flame, torch-applied roofing, powder driven fasteners, hot

riveting, and similar applications producing a spark or flame. Designated areas are permanent locations designed or approved for hot work operations to be performed regularly. Appendix J is an example of a hot work permit.

All hot work operations shall be coordinated with the Facility Manager/ Project Manager, or designee.

The supervisor of the work to be performed shall inspect the area to ensure that preparations are complete, safe conditions exist, and ensure that all listed precautions on the permit have been considered and checked as met or not applicable.

Welders and burners shall wear protective clothing which meet requirements of ANSI Z49.1. The selected clothing shall be specified in the hazard analysis for hotwork activities. Protective clothing requirements shall be determined and noted on each hotwork permit issued during this project. Fire watchers who may be exposed to the same hotwork hazards as the welders and burners shall also wear the selected protective clothing.

A fire watch must be designated if any of the following conditions exist:

- A significant amount of combustible material is closer than 35 ft to the point of operations;
- A significant amount of combustible material is more than 35 ft away, but could be easily ignited by sparks;
- Hot work is conducted in areas where the employee must wear multiple layers of clothing and respiratory protection.

The fire watch shall be instructed to:

- Remain present in direct line of sight to the work area and perform no other activities other than fire watch duties;
- Be alert for any condition that could lead to a fire;
- Guard passers-by from welding hazards;
- Interrupt the work when a hazardous condition develops and deal with the situation appropriately;
- Ensure that appropriate fire extinguishing equipment is readily available and know how the equipment is to be used;
- Remain on the scene for at least thirty minutes after completion of hot work to detect and report a fire resulting from stored heat.

6. ENVIRONMENTAL PROTECTION AND WASTE MANAGEMENT

This section provides environmental protection and waste management requirements for on-site activities.

6.1 STORM WATER POLLUTION PREVENTION AND CONTROL

- Prior to mobilization to the site, perform an inspection of equipment containing liquid systems including, but not limited to, bulldozers, backhoes, bobcats, drill rigs, trucks, hoists, and cranes, to ensure no leaks exist. Verify hoses, tubing, and hydraulic lines are in good operating condition. Make all necessary repairs before delivery of equipment or vehicles to the site.

- Perform daily inspections to ensure continued good operating condition of equipment and promptly repair all deficiencies.
- Store all materials indoors or otherwise protected from weather.
- For outdoor painting operations, minimize overspray, and use tarps/vacuums/enclosures to contain sandblasting waste and paint chips from paint removal operations.
- Petroleum products stored in quantities greater than 500 gallons shall be appropriately labeled and have secondary containment capable of preventing any release to a drainage system or the environment.
- Do not allow liquids, including but not limited to, gasoline, diesel fuel, lubricating oil, or antifreeze to enter the storm sewer systems, waterways, drainage ditches, or the ground.
- Use due caution when operating oil-bearing equipment near aquatic resources . Where necessary, implement appropriate control measures, including but not limited to the use of physical barriers (plastic or tarps, berms, etc.) and or absorbent materials to prevent leaks or spills from entering waterways.
- Maintain a 25-foot minimum buffer zone from streams, be aware of storm drain inlets, and cover or contain debris stored outside.
- Flushing empty concrete trucks or dumping excess concrete is prohibited. Transport excess concrete back to the batch plant. The truck chute may be washed at the work site. Flush the truck chute at designated on site location. The SNS/CNMS Project Manager will designate the location. Solidified cement waste from truck chute cleaning is solid waste and shall be cleaned up and transported to the Landfill.
- Conduct all pipeline sterilization, flushing, hydro-testing, etc. in a manner protective of the environment. The SNS/CNMS Project Manager will designate the approved discharge location(s).
- Water used to sterilize or flush pipelines cannot be released directly to the environment due to possible high concentration of chlorine. The SNS/CNMS Project Manager will determine the appropriate storage/treatment and will designate the approved discharge location.
- Unless otherwise directed by the SNS/CNMS Project Manager, all chlorinated or treated water shall be discharged through a treatment/detention basin and monitored for chlorine levels, other contaminants when applicable, and standard water quality indicators. The treatment/detention basin may consist of a field-constructed structure or portable tank.
- Storm water accumulated in excavated areas, chlorinated rinse water, and chlorinated water used to sterilize/flush pipelines shall not be directly discharged, or otherwise allowed to enter the storm systems, waterways, or drainage ditches without written approval from the SNS/CNMS Project Manager.

6.2 EROSION PREVENTION AND SEDIMENT CONTROL

- Manage excavated soil and spoil material in a manner protective of the environment. Cover stockpiled material to prevent erosion and/or install appropriate sediment controls. Use due caution during excavation or any other soil management in the vicinity of sanitary or storm systems, waterways, or drainage ditches.
- All erosion prevention measures and sediment controls (silt fence, straw bales, catch basins, etc.) shall be in place and approved by the SNS/CNMS Project Manager prior to beginning excavations, road

building, etc. Sediment barriers such as silt fence and straw bales shall be entrenched and of sturdy construction.

- Perform inspection of erosion and sediment controls on a weekly schedule, prior to expected storm events and after each heavy rainfall event. Document each inspection.
- Where appropriate, provide temporary or permanent modifications to surface terrain gradient (soil or crushed stone berms, sediment retention basins, etc.) in order to minimize the flow of storm water into or out of excavated or otherwise disturbed areas.
- All erosion and sediment control measures shall be maintained throughout the course of the project and removed at completion of project and appropriate measures taken to return the area to its previous state. Maintenance shall include but not be limited to removal of accumulated sediment, repairs and or replacement of storm damaged or otherwise deteriorated structures.
- All disturbed areas shall be stabilized as soon as practicable by appropriate means, including but not limited to the use of mulch or other temporary cover, seeding with vegetative ground cover, etc.

6.3 SPILL PREVENTION AND CONTROL

- Report all spills promptly to the Project Manager. If the release is of a reportable quantity, the Project Manager will notify the appropriate regulatory agency.
- The responsible Subcontractor will perform proper cleanup of accidental releases of materials. Cleanup is to be done by properly trained personnel. Hazardous waste from the cleanup must be packaged, transported, and disposed of by a licensed entity. The Project Manager must be given a copy of the hauler's manifest.
- Depending on the materials spilled, the Project Manager may require the responsible Subcontractor to hire a certified laboratory to take an appropriate number of soil samples to test at their laboratory. A copy of the results is to be given to the Project Manager.
- For inside work, provide a spill kit, prevent spills to floor drains and do not discharge waste into any ORNL systems without approval.
- For outside work, provide a spill kit, inspect equipment for leaks, and repair leaking equipment in a timely manner.

6.4 WASTE MANAGEMENT

- Subcontractor will provide containers and/or transport vehicles for excess property for salvage, universal waste, sanitary/industrial waste, and construction/demolition debris.
- Waste Minimization principals shall be incorporated in all activities to ensure the greatest environmental benefits and minimize future liability for the waste that is generated.
- All work will be performed in a manner that maximizes salvage and recycling and waste disposal to landfills shall be minimized.
- Characterization methods and procedures will be employed by all parties to the contract to ensure that the characteristics of the waste are known and adequately recorded during all stages of the waste management process.
- Subcontractor will be responsible for properly handling and disposing of all wastes generated.

APPENDIX A: DISCIPLINARY ACTIONS BY OFFENSE CLASS AND OCCURRENCE

OFFENSE	FIRST	SECOND	THIRD
<p>Class I</p> <ul style="list-style-type: none"> • Creating or contributing to unsanitary conditions due to poor housekeeping • Posting or removing notices on bulletin boards without permission • Eating in unauthorized areas • Failure to report the use of prescription drugs • Unauthorized soliciting of contributions on SNS Project • Smoking in unauthorized areas (Note: This may be upgraded to a Class V offense if in a hazardous area) <p>For Fourth Offense, next step in Progressive Disciplinary Policy is 30-day suspension, followed by Access Denial for the Fifth Offense within a 365-day time period.</p>	Verbal reprimand	Written reprimand	3-day suspension
<p>Class II</p> <ul style="list-style-type: none"> • Unauthorized use of equipment, tools, or machinery • Failure to observe traffic and parking rules on SNS project • Horseplay <p>For Fourth Offense within a 365-day time period, next step is Access Denial.</p>	Written reprimand	3-day suspension	30-day suspension
<p>Class III</p> <ul style="list-style-type: none"> • Gambling on SNS site • Disregard for safety rules (other than those mentioned elsewhere) • Failure to report an injury or accident 	3-day suspension	30-day suspension	Access denied to site
<p>Class IV</p> <ul style="list-style-type: none"> • Threatening or intimidating other employees or supervisors • Intentionally punching another employee's timecard, dropping brass, or using another ID badge 	30-day suspension	Access denied to site	
<p>Class V</p> <ul style="list-style-type: none"> • Any violation of safety procedures that contribute to the potential for loss of life or limb (see Note 1 for examples) • Possession of weapons or firearms on company property, including site parking areas • Possession of drugs, alcohol, and related paraphernalia on company property, including site parking areas • Any other violations of the Drug Free Work Place policy • Theft of property from company, client or other employees • Assault on a supervisor or other employee 	Access denied to site		
<p>Note 1: Examples of Safety Violations</p> <ul style="list-style-type: none"> • Failure to comply with Company 100% fall protection policy • Violation of confined space entry procedures • Violation of First Break procedure 			

NOTE: This policy is designed to set minimum standards and is not meant to supercede a subcontractor's policy or policies which may be more stringent.

SNS/CNMS Progressive Discipline Policy

Acknowledgement:

I have read and understand the Project policy on discipline. I further understand that not following the company or client's rules and regulations will result in disciplinary action up to and including denial of Project site access.

Print Name

Signature

Date

Witness

Date

APPENDIX B: INCIDENT INVESTIGATION REPORT(example)

Page 1 of 2

PART 1

Date of Incident:	Time of Incident:	Date of Investigation:
Company:		Contract Number:
Location of Incident:		
Describe what the employee was doing at the time of the incident:		
Did injury result? Yes / No ____. If No proceed to Part 3	If yes SSN(s) Proceed to Part 2	<input type="checkbox"/> Employee Name(s) <input type="checkbox"/> <input type="checkbox"/>

PART 2

Body part(s) affected:		
Disposition: Employee Sent to	<input type="checkbox"/> Doctor <input type="checkbox"/> Emergency Room <input type="checkbox"/> Personal Physician <input type="checkbox"/> On-Site Medical Station <input type="checkbox"/> Other	<input type="checkbox"/> Employee refused treatment Result impression <input type="checkbox"/> 1 st Aid Only <input type="checkbox"/> Medical Recordable <input type="checkbox"/> Lost Time or Restricted Duty
Type of Injury:		
Employee Supervisor:		
Witnesses:		
Circle the Number Identifying Contributing Factors:		
<ol style="list-style-type: none"> 1. Absent/Improper Guarding 2. Defective Equipment 3. Weather/Temperature 4. Inappropriate PPE 5. Inadequate Housekeeping 6. Slippery/Uneven Walking Surface 7. Improper Layout of Work Area 8. Inadequate Ventilation 9. Inadequate Lighting or Noise Control 10. Improper Storage or Placement of Materials 11. Insect/Animals in Work Area 12. No At Risk Condition Identified 13. Other 	<ol style="list-style-type: none"> 14. Operating Without Authority 15. Improper Use of Equipment 16. Inadequate Procedures 17. Use of Defective Equipment/Tools 18. PPE Not Used 19. Inadequate Training 20. Improper Position or Posture 21. Horseplay 22. Altercation 23. No At Risk Act Identified 24. Other _____ _____ 	

PART 3

How Did The Incident Occur?		
What Object or Substance was Involved?		
Any Previous or Similar Incidents?	Project Specific:	Company Wide:
What Factors Contributed to the Incident		

Was an SPA/JSA developed for the task being performed? Yes/No ____, If yes, attach a copy.

What **corrective actions** are being taken to prevent recurrence? Also list the person responsible for implementing and the target completion date for each item.

Supervisor/Investigation Team Members: _____
Name(s)
Signature(s)/Date

Reviewed by: _____
Contractor Safety Representative/Date
Program Safety Manager/Date

APPENDIX B: INCIDENT INVESTIGATION REPORT

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WITNESS STATEMENT

Name: _____ Title: _____

Social Security Number: _____ Date: _____ Time: _____

Temporary Address: _____ Phone No. _____

Permanent Address: _____ Phone No. _____

Location at Time of Incident: _____

Describe, to the best of your knowledge, what happened just before, during, and just after the incident:

Signature

Attach to Incident Report

APPENDIX C: JOB SAFETY ANALYSIS WORKSHEET (JSA)(example)

Page 1 of 2

Title of Job/Operation _____ **Date** _____

Analysis Performed By: _____

Prime Contractor or Subcontractor _____

Reviewed By: _____

Sequence of Basic Job Steps	Potential Accidents or Hazards	Recommended Safe Job Procedures

Potential Hazards:

- | | | |
|-----|-------------------------|-----|
| 1. | Struck By | SB |
| 2. | Struck Against | SA |
| 3. | Contacted By | CB |
| 4. | Contact With | CW |
| 5. | Caught On | CO |
| 6. | Caught In | CI |
| 7. | Caught Between | CBT |
| 8. | Fall-Same Level | FS |
| 9. | Fall to Different Level | FDL |
| 10. | Overexertion | OE |
| 11. | Exposure | E |

APPENDIX C: JOB SAFETY ANALYSIS WORKSHEET (JSA)

Page 2 of 2

JOB SAFETY ANALYSIS (JSA)

STEP 1.

Identify jobs posing the greatest accident risk.

STEP 2.

Prioritize selected jobs into four (4) main areas.

1. Jobs with high accident frequency
2. Jobs with lower frequency but higher severity
3. Jobs with serious injury potential
4. New jobs with no accident history

STEP 3.

Conduct job analysis

1. Use either the direct observation method or the discussion method.
2. For best results observe and discuss job using an experienced employee in that job.

STEP 4.

You need an understanding of the types of accidents possible in your workplace and you must review the records of the past accidents.

There are six (6) categories of accidents:

1. Struck (By or against)
2. Contact (abrasion, electric shock, etc.)
3. Caught (in, on, between, under)
4. Fall (from elevation or same level)
5. Over exertion (stress or strain)
6. Exposure (exposed to gases, fumes, mists, etc.)

STEP 5.

Develop recommended safe work procedures. Use complete JSA to conduct initial training of new employees, or to review safe procedures with existing employees. JSA are also useful for accident investigation as a resource.

Permit-Required Confined Space Authorization – Part II

NOTE:

10. Pre-entry Briefing (ensure that ALL attendants, entrants and Sample Techs. are briefed)							
Worker Feedback:							
Briefing Conducted by (signature):					Badge:	Date: / /	Time
11. Authorization Approvals							
	Signature		Badge		Date		
Entry Supervisor:							
Other:							
12. Confined Space Entry Log (to be completed by Attendant)							
Date	Entrant (Print Name)	Entrant Badge	Time In	Attendant Initial	Time Out	Attendant Initial	
Permit Terminated by Entry Supervisor (signature):					Badge:	Date: / /	Time:
13. Post Permit Required Confined Space Entry Debriefing/Evaluation							
Entrant/attendant feedback on unanticipated hazard(s) encountered during the entry and control measure(s) implemented (if none, state so):							
Describe any difficulties or implementation barriers that took place (if none, state so):							
Continuous improvement recommendations (if none, state so):							
Debriefing Conducted by (signature):					Badge:	Date: / /	Time

NOTE:

APPENDIX E: ELECTRICAL JOB BRIEFING AND PLANNING CHECKLIST(example)

(This Appendix is derived from NFPA 70E.)

Appendix illustrates considerations for an Electrical Job Briefing Checklist.

Identify

- The hazards
- The voltage levels involved
- Any “foreign” (secondary source) voltage source
- Any unusual work conditions
- Number of people needed to do the job
- The shock protection boundaries
- The available incident energy
- Potential for arc flash (Conduct a flash-hazard analysis)
- Flash protection boundary

Ask

- Can the equipment be energized?
- Are backfeeds of the circuits to be worked on possible?
- Is a “standby person” required?

Check

- Job plans
- Single-line diagrams and vendor prints
- Status board
- Information on plant and vendor resources up to date
- Safety procedures
- Vendor information
- Individuals are familiar with the facility

Know

- What the job is
- Who else needs to know – Communicate!
- Who’s in charge

Think

- About the unexpected event...What if?
- Lock – Tag – Test – Try
- Test for voltage – FIRST
- Use the right tools and equipment, including PPE
- Install and remove grounds
- Install barriers and barricades
- What else?

Prepare for an emergency

- Is the standby person CPR trained?
- Is the required emergency equipment available? Where is it?
- Where is the nearest telephone?
- Is confined space rescue available?
- Are radio communications available?
- What is the exact work location?
- How is the equipment shut off in an emergency?
- Are the emergency telephone numbers known?
- Where is the fire alarm?
- Where is the fire extinguisher?

APPENDIX F: ENERGIZED ELECTRICAL WORK PERMIT
(This appendix derived from NFPA 70E)

ENERGIZED ELECTRICAL WORK PERMIT

PART I: TO BE COMPLETED BY THE REQUESTER

Job/Work Order Number _____

(1) Description of circuit/equipment/job location: _____

(2) Description of work to be done: _____

(3) Results of the Shock Hazard Analysis: _____

Requester/Title _____ Date _____

PART II: TO BE COMPLETED BY THE ELECTRICALLY QUALIFIED PERSONS *DOING* THE WORK:

Check when complete

(1) Detailed job description procedure to be used in performing the above detailed work: _____

(2) Description of the Safe Work Practices to be employed: _____

(3) Results of the Shock Hazard Analysis: _____

(4) Determination of Shock Protection Boundaries: _____

(5) Results of the Flash Hazard Analysis: _____

(6) Determination of the Flash Protection Boundary: _____

(7) Necessary personal protective equipment to safely perform the assigned task: _____

(8) Mean employed to restrict the access of unqualified persons from the work area: _____

(9) Evidence of completion of a Job Briefing including discussion of any job-related hazards: _____

(10) Do you agree the above described work can be done safely? Yes No (If *no*, return to requester)

-
-
-
-
-
-
-
-
-
-

Electrically Qualified Person(s) _____ Date _____

Electrically Qualified Person(s) _____ Date _____

PART III: APPROVAL(S) TO PERFORM THE WORK WHILE ELECTRICALLY ENERGIZED:

Subcontractor Supervisor _____ SNS/CNMS Electrical Safety Officer _____

Project Manager _____ SNS/CNMS Level II Manager _____

APPENDIX G: APPROACH BOUNDARIES TO LIVE PARTS FOR SHOCK PROTECTION

(Derived from NFPA 70E)

Nominal System Voltage Range, Phase to phase	Limited Approach Boundary ¹			Restricted Approach Boundary ² Includes Inadvertent Movement	Prohibited Approach
	----- Exposed Movable Conductor Adder	Exposed Fixed Circuit Part Boundary ³			
0 to 50	Not Specified	Not specified	Not Specified	Not specified	
51 to 300	10 ft 0 in	3 ft 6 in	Avoid Contact	Avoid Contact	
301 to 750	10 ft 0 in	3 ft 6 in	1 ft 0 in	0 ft 1 in	
751 to 15kV	10 ft 0 in	5 ft 0 in	2 ft 2 in	0 ft 7 in	
15.1kV to 36kV	10 ft 0 in	6 ft 0 in	2 ft 7 in	0 ft 10 in	
36.1kV to 46kV	10 ft 0 in	8 ft 0 in	2 ft 9 in	1 ft 5 in	
46.1kV to 72.5kV	10 ft 0 in	8 ft 0 in	3 ft 3 in	2 ft 1 in	
72.6kV to 121kV	10 ft 8 in	8 ft 0 in	3 ft 2 in	2 ft 8 in	
138kV to 145kV	11 ft 0 in	10 ft 0 in	3 ft 7 in	3 ft 1 in	
161kV to 169kV	11 ft 8 in	11 ft 8 in	4 ft 0 in	3 ft 6 in	
230kV to 242kV	13 ft 0 in	13 ft 0 in	5 ft 3 in	4 ft 9 in	
345kV to 362kV	15 ft 4 in	15 ft 4 in	8 ft 6 in	8 ft 0 in	
500kV to 550kV	19 ft 0 in	19 ft 0 in	11 ft 3 in	10 ft 9 in	
765kV to 800kV	23 ft 9 in	23 ft 9 in	14 ft 11 in	14 ft 5 in	

¹ Limited Approach Boundary - A shock protection boundary to be crossed by only qualified persons (at a distance from a live part) which is not to be crossed by unqualified persons unless escorted by a qualified person.

² Restricted Approach Boundary - A shock protection boundary to be crossed by only qualified persons (at a distance from a live part) which, due to its proximity to a shock hazard, requires the use of shock protection techniques and equipment when crossed.

³ Prohibited Approach Boundary - A shock protection boundary to be crossed by only qualified persons (at a distance from a live part) which, when crossed by a body part or object, requires the same protection as if direct contact is made with a live part.

APPENDIX H: WORK TASKS AND RELATED HAZARD CATEGORY

(Derived from NFPA 70E)

Task (Assumes Equipment is Energized, and Work Is Done Within the Flash Protection Boundary)	Hazard/Risk Category	V-rated Gloves	V-rated Tools
Equipment rated below 240 volts; i.e., 120/208 panels with <125KVA transformer in its immediate power supply– Note 7	0	-	-
Panelboards rated 240 V and below – Notes 1 and 3	0	-	-
Circuit breaker (CB) or fused switch operation with covers on	0	N	N
CB or fused switch operation with covers off	0	N	N
Work on energized parts, including voltage testing	1	Y	Y
Remove/install CBs or fused switches	1	Y	Y
Removal of bolted covers (to expose bare, energized parts)	1	N	N
Opening hinged covers (to expose bare, energized parts)	0	N	N
-	-	-	-
Panelboards or Switchboards rated >240 V and up to 600 V (with molded case or insulated case circuit breakers) – Notes 1 and 3	0	N	N
CB or fused switch operation with covers on	1	N	N
CB or fused switch operation with covers off	2*	Y	Y
Work on energized parts, including voltage testing	-	-	-
600 V Class Motor Control Centers (MCCs) – Notes 2 (except as indicated) and 3	0	N	N
CB or fused switch or starter operation with enclosure doors closed	0	N	N
Reading a panel meter while operating a meter switch	1	N	N
CB or fused switch or starter operation with enclosure doors open	2*	Y	Y
Work on energized parts, including voltage testing	0	Y	Y
Work on control circuits with energized parts 120 V or below, exposed	2*	Y	Y
Work on control circuits with energized parts >120 V exposed	3	Y	N
Insertion or removal of individual starter “buckets” from MCC – Note 4	2*	Y	N
Application of safety grounds, after voltage test	2*	N	N
Removal of bolted covers (to expose bare, energized parts) – Note 4	1	N	N
-	-	-	-
Opening hinged covers (to expose bare, energized parts)	-	-	-
600 V Class Switchgear (with power circuit breakers or	0	N	N

APPENDIX H: WORK TASKS AND RELATED HAZARD CATEGORY

(Derived from NFPA 70E)

Task (Assumes Equipment is Energized, and Work Is Done Within the Flash Protection Boundary)	Hazard/Risk Category	V-rated Gloves	V-rated Tools
fused switches) – Notes 5 and 6			
CB or fused switch operation with enclosure doors closed	1	N	N
CB or fused switch operation with enclosure doors open	2*	Y	Y
Work on energized parts, including voltage Testing	0	Y	Y
Work on control circuits with energized parts 120V or below, exposed	2*	Y	Y
Work on control circuits with energized parts >120V exposed	3	N	N
Insertion or removal (racking) of CBs from cubicles, doors open	2	N	N
Insertion or removal (racking) of CBs from cubicles, doors closed	2*	Y	N
Application of safety grounds, after voltage test	3	N	N
Removal of bolted covers (to expose bare, energized parts)	2	N	N
Opening hinged covers (to expose bare, energized parts)	-	-	-
Other 600 V Class (277 V through 600 V, nominal) Equipment – Note 2 (except as indicated) and 3	-	-	-
Lighting or small power transformers (600 V, maximum)	2*	N	N
Removal of bolted covers (to expose bare, energized parts)	1	N	N
Opening hinged covers (to expose bare, energized parts)	2*	Y	Y
Work on energized parts, including voltage testing	2*	Y	N
Application of safety grounds, after voltage test	-	-	-
Revenue meters (kW-hour, at primary voltage and current)	2*	Y	N
Insertion or removal	1	N	N
Cable trough or tray cover removal or installation	1	N	N
Miscellaneous equipment cover removal or installation	2*	Y	Y
Work on energized parts, including voltage testing	2	Y	N
Application of safety grounds, after voltage test	0	N	N
NEMA E2 (fused contactor) Motor Starters, 2.3 kV through 7.2 kV	0	N	N
Contactor operation with enclosure doors closed	0	N	N
Contactor operation with enclosure doors open	2*	N	N
Reading a panel meter while operating a meter switch	3	Y	Y

APPENDIX H: WORK TASKS AND RELATED HAZARD CATEGORY

(Derived from NFPA 70E)

Task (Assumes Equipment is Energized, and Work Is Done Within the Flash Protection Boundary)	Hazard/Risk Category	V-rated Gloves	V-rated Tools
Contactator operation with enclosure doors open	0	Y	Y
Work on energized parts, including voltage testing	3	Y	Y
Work on control circuits with energized parts 120 V or below, exposed	3	N	N
Work on control circuits with energized parts >120V, exposed	2	N	N
Insertion or removal (racking) of starters from cubicles, doors open	3	Y	N
Insertion or removal (racking) of starters from cubicles, doors closed	4	N	N
Application of safety grounds after voltage test	3	N	N
Removal of bolted covers (to expose bare, energized parts)	2	N	N
Opening hinged covers (to expose bare, energized parts)	0	N	N
Metal Clad Switchgear, 1 kV and above	4	N	N
CB or fused switch operation with enclosure doors closed	4	Y	Y
Reading a panel meter while operating a meter switch	2	Y	Y
CB or fused switch operation with enclosure doors open	4	Y	Y
Work on energized parts, including voltage testing	4	Y	Y
Work on control circuits with energized parts 120 V or below, exposed	4	N	N
Work on control circuits with energized parts >120 V, or exposed	2	N	N
Insertion or removal (racking) of CBs from cubicles, doors open	4	Y	N
Insertion or removal (racking) of CBs from cubicles, doors closed	4	N	N
Application of safety grounds, after voltage test	3	N	N
Removal of bolted covers (to expose bare, energized parts)	4	N	N
Opening hinged covers (to expose bare, energized parts)	-	-	-
Opening voltage transformer or control power transformer compartments	2	N	N
	4	Y	Y
	4	N	N

APPENDIX H: WORK TASKS AND RELATED HAZARD CATEGORY

(Derived from NFPA 70E)

Task (Assumes Equipment is Energized, and Work Is Done Within the Flash Protection Boundary)	Hazard/Risk Category	V-rated Gloves	V-rated Tools
Other Equipment 1 kV and above	3	N	N
Metal clad load interrupter switches, fused or unfused	3	Y	Y
Switch operation, doors closed	2	N	N
Work on energized parts, including voltage testing	4	Y	N
Removal of bolted covers (to expose bare, energized parts)	2	Y	N
Opening hinged covers (to expose bare, energized parts)			
Outdoor disconnect switch operation (hookstick operated)			
Outdoor disconnect switch operation (gang-operated, from grade)			
Insulated cable examination, in manhole or other confined space			
Insulated cable examination, in open area			

Legend:

V-rated Gloves are gloves rated and tested for the maximum line-to-line voltage upon which work will be done.

V-rated Tools are tools rated and tested for the maximum line-to-line voltage upon which work will be done.

2* means that a double-layer switching hood and hearing protection are required for this task in addition to the other Hazard/Risk Category 2 requirements of Table 4.

Y = yes (required)

N = no (not required)

Notes:

1. Maximum of 25 kA short circuit current available, 0.03 second (2 cycle) fault clearing time.
2. Maximum of 65 kA short circuit available, 0.03 second (2 cycle) fault clearing time.
3. For < 10 kA short circuit current available, the Hazard/Risk Category required may be reduced by one number.
4. 42 kA short circuit current available, 0.33 second (20 cycle) fault clearing time.
5. 35 kA short circuit current available, up to 0.5 second (30 cycle) fault clearing time.
6. For < 25 kA short circuit current available, the Hazard/Risk Category required may be reduced by one number.

APPENDIX I: PROTECTIVE CLOTHING AND PERSONAL PROTECTIVE EQUIPMENT MATRIX

(Derived from NFPA 70E)

Protective Clothing & Equipment		Protective Systems for Hazard/Risk Category					
Hazard/Risk Category Number	(Note 3)	-1	0	1	2	3	4
Untreated Natural Fiber		—	—	—	—	—	—
a. T-shirt (short sleeve)	X			X	X	X	
b. Shirt (long sleeve)		X					
c. Pants (long)		X	X (Note 4)	X (Note 6)	X	X	X
FR Clothing (Note 1)		—	—	—	—	—	—
a. Long-sleeve shirt			X	X	X (Note 9)	X	
b. Pants			(Note 4)	X (Note 6)	X (Note 9)	X	X
c. Coverall			(Note 5)	(Note 7)	(Note 9)	X (Note 5)	
d. Jacket, parka, or rainwear			AN	AN	AN	AN	
FR Protective Equipment		—	—	—	—	—	—
a. Flash suit jacket (2-layer)							X
b. Flash suit pants (2-layer)							X
c. Head protection	—	—	—	—	—	—	—
1. Hard hat				X	X	X	X
2. FR hard hat liner					AR	AR	
d. Eye protection			—	—	—	—	—
1. Safety glasses	X	X	X	AL	AL	AL	
2. Safety goggles				AL	AL	AL	
e. Face & head protection	—	—	—	—	—	—	—
1. Arc-rated face shield or flash shield hood				X (Note 8)			
2. Flash suit hood					X	X	
3. Hearing protection (ear canal inserts)				AR (Note 8)	X	X	

APPENDIX I: PROTECTIVE CLOTHING AND PERSONAL PROTECTIVE EQUIPMENT MATRIX

(Derived from NFPA 70E)

Equipment	Protective Systems for Hazard/Risk Category					
Hazard/Risk Category Number (Note 3)	-1	0	1	2	3	4
f. Hand Protection Leather gloves (Note 2)			AN X	X	X	
g. Foot Protection Leather work shoes			AN X	X	X	

Page 2 of 2

Legend:

- AN = As needed
- AL = Select one in group
- AR = As required
- X = Minimum required

Notes:

1. See Table 4 Arc rating for a garment is expressed in cal/cm².
2. If voltage-rated gloves are required, the leather protectors worn external to the rubber gloves satisfy this requirement.
3. Hazard/Risk Category Number “-1” is only defined if determined by Notes 3 or 6 of Table 5.
4. Regular weight (minimum 12 oz/yd² fabric weight), untreated, denim cotton blue jeans are acceptable in lieu of FR pants. The FR pants used for Hazard/Risk Category 1 shall have a minimum arc rating of 4.
5. Alternate is to use FR coveralls (minimum arc rating of 4) instead of FR shirt and FR pants.
6. If the FR pants have a minimum arc rating of 8, long pants of non-melting or untreated natural fiber are not required beneath the FR pants.
7. Alternate is to use FR coveralls (minimum arc rating of 4) over non-melting or untreated natural fiber pants and T-shirt.
8. A faceshield with a minimum arc rating of 8, with wrap-around guarding to protect not only the face, but also the forehead, ears, and neck (or, alternatively, a flash suit hood), is required.
9. Alternate is to use two sets of FR coveralls (the inner with a minimum arc rating of 4 and outer coverall with a minimum arc rating of 5) over non-melting or untreated natural fiber clothing, instead of FR coveralls over FR shirt and FR pants over non-melting or untreated natural fiber clothing.

APPENDIX J: SIMPLIFIED, TWO CATEGORY, FLAME-RESISTANT (FR) CLOTHING SYSTEM

Use of Simplified Approach. The use of Table 4 is suggested as a simplified approach to assure adequate PPE for electrical workers within facilities with large and diverse electrical systems. The clothing listed in Table 4 fulfills the minimum FR clothing requirements of Table 3 and Table 6. The clothing systems listed in this table should be used with other PPE appropriate for the Hazard/Risk Category. See Table 6.

Table 4: Simplified, Two Category, Flame Resistant Clothing System

Clothing*	Applicable Tasks
<p>Everyday Work Clothing</p> <p>FR long-sleeve (minimum arc rating of 4) worn over an untreated cotton T-shirt with FR pants (minimum arc rating of 8)</p> <p><i>or</i></p> <p>FR coveralls (minimum arc rating of 4) worn over an untreated cotton T-shirt (or an untreated natural fiber long-sleeve shirt) with untreated natural fiber pants.</p>	<p>All Hazard/Risk Category 1 and 2 listed in Table 6</p> <p>On systems operating at less than 1,000 volts, these tasks include work on all equipment <i>except</i></p> <ul style="list-style-type: none"> • Insertion or removal of low-voltage motor starter “buckets,” • Insertion or removal of power circuit breakers from switchgear cubicle or • Removal of bolted covers from switchgear. <p>On systems 1,000 volts or greater, tasks also include the operation of switching devices <i>with equipment enclosure doors closed</i>.</p>
<p>Electrical “Switching” Clothing</p> <p>Multilayer FR flash jacket and FR bib overalls worn over either FR overalls (minimum arc rating of 4) or FR long-sleeve shirt and FR pants (minimum arc rating of 4), worn over untreated natural fiber long-sleeve shirt and pants, worn over an untreated cotton T-shirt</p> <p><i>or</i></p> <p>Insulated FR overalls (with a minimum arc rating of 25, independent of other layers) worn over untreated natural fiber long-sleeve shirt with untreated denim cotton blue jeans (“regular writhe”, minimum 12 oz/yd² fabric weight), worn over an untreated cotton T-shirt.</p>	<p>All Hazard/Risk Category 3 and 4 tasks listed in Table 6.</p> <p>On systems operating at 1,000 volts or greater, these tasks include work on exposed live parts of all equipment.</p> <p>On systems of less than 1,000 volts, tasks include insertion or removal of low-voltage motor starter MCC “buckets”, insertion or removal of plug-in devices into or from busaway, insertion or removal of power circuit breakers and removal of bolted covers from switchgear.</p>

* Note other PPE required for the specific tasks listed in Tables 5 and 6, which include arc-rated face shields or flash suit hoods, FR hardhat liners, safety glasses or safety goggles, hard hat, bearing protection, leather gloves, voltage-rated gloves, and voltage-rated tools.

APPENDIX K: GLOVE VOLTAGE REQUIREMENTS

Class Designation of Glove or Sleeve	Maximum AC Use Voltage rms, V	AC Retest Voltage rms, V	Maximum DC Use Voltage avg, V	DC Retest Voltage avg, V
00	500	2 500	750	10 000
0	1 000	5 000	1 500	20 000
1	7 500	10 000	11 250	40 000
2	17 000	20 000	25 500	50 000
3	25 500	30 000	39 750	60 000
4	36 000	40 000	54 000	70 000

APPENDIX L: PROTECTIVE CLOTHING CHARACTERISTICS

(Table derived from NFPA 70E)

Typical Protective Clothing Systems		
Hazard Risk Category	Clothing Description (Typical number of clothing layers is given in parentheses)	Required Minimum Arc Rating of PPE [(cal/cm ²) J/cm ²]
0	Non-melting, flammable materials (i.e., untreated cotton, wool, rayon, or silk, or blends of these materials, with a fabric weight at least 4.5 oz/yd ² (1)	
1	FR shirt and FR pants or FR overall (1)	4 (16.74)
2	Cotton underwear – conventional short sleeve and brief/shorts, plus FR shirt and FR pants (1 or 2)	8 (33.47)
3	Cotton underwear plus FR shirt and FR pants plus FR coverall, or cotton underwear plus two FR coveralls (2 or 3)	25 (104.6)
4	Cotton underwear plus FR shirt and FR pants plus multi-layer flash suit (3 or more)	40 (169.36)

NOTE: Arc rating is defined in Article 100 and can be either ATPV or E_{BT}. ATPV is defined in ASTM F 1959-99 as the incident energy on a fabric or material that results in sufficient heat transfer through the fabric or material to cause the onset of a second-degree burn based on the Stoll curve. E_{BT} is defined in ASTM F 1959-99 as the average of the five highest incident energy exposure values below the Stoll curve where the specimens do not exhibit breakopen. E_{BT} is reported when ATPV cannot be measured due to FR fabric breakopen.

APPENDIX M: VOLTAGE REQUIREMENTS FOR BLANKETS

Class Designation of Blankets	AC Use Voltage, rms, max ^A	A-C Retest Voltage max	DC Retest Voltage, max
0	1 000	5 000	20 000
1	7 500	10 000	40 000
2	17 000	20 000	50 000
3	26 500	30 000	60 000
4	36 000	40 000	70 000

^aThe maximum use voltage is based on the following equations:

Maximum a-c use voltage = 0.95 a-c maximum retest voltage – 2 000_v
Classes 1, 2, 3, and 4.

Maximum a-c use voltage = 0.95 d-c maximum retest voltage – 30 500_v
Classes 1, 2, 3, and 4.

Maximum a-c use voltage = 0.95 d-c maximum retest voltage – 18 000_v
Class 0.

APPENDIX N: EXCAVATION/ PENETRATION PERMIT

ORNL Chestnut Ridge Campus (8000 Area) Excavation/Penetration Permit (E/PP)

SECTION A – Initiation		
PROJECT/JOB TITLE:	REQUESTED PERMIT TYPE <input type="checkbox"/> Excavation <input type="checkbox"/> Penetration	E/PP NUMBER:
REQUESTOR: (Name/Organization/Telephone Number):	CONTRACT, SRO, OR DATA STREAM NUMBER (if applicable):	
DESCRIPTION OF WORK:		
LOCATION: (Area/Building/Floor/Column):		
APPLICABLE DRAWING / SKETCH NUMBER(S):		

ON THE BASIS OF INFORMATION AVAILABLE, UNDERGROUND, EMBEDDED OR HIDDEN UTILITIES MARKED "YES" IN THE TABLE BELOW ARE KNOWN TO EXIST AT OR ADJACENT TO THE EXCAVATION(S) OR PENETRATION (S) COVERED BY THIS PERMIT. THIS LISTING MAY NOT BE A COMPLETE DESCRIPTION OF ALL OBSTRUCTIONS. SITE UTILITIES DRAWINGS ARE NOT COMPLETE AND MAY CONTAIN INACCURACIES. THOSE PERFORMING EXCAVATION/PENETRATION WORK MUST BE ALERT TO ENCOUNTERING UNCHARTED OR INACCURATELY CHARTED UNDERGROUND OBSTRUCTIONS. EXCAVATIONS WILL NOT BEGIN UNTIL THE WORK AREAS HAVE BEEN SURVEYED USING THE APPROPRIATE MEANS OF DETECTION AND DETECTED UTILITIES PHYSICALLY MARKED. **STOP WORK IMMEDIATELY** AND CONTACT THE CONSTRUCTION FIELD/MAINTENANCE REPRESENTATIVE IF OBSTRUCTIONS OTHER THAN THOSE DEFINED ARE ENCOUNTERED.

SECTION B – Review											
UTILITY	DISP	Yes / No	INITIAL	UTILITY	DISP	Yes / No	INITIAL	UTILITY	DISP	Yes / No	INITIAL
SANITARY SEWERS	CV			CHILLED WATER	ME			EXHAUST DUCTWORK	ME		
STORM DRAINS	CV			TELECOMMUNICATIONS	EE			NATURAL GAS	ME		
ELECTRICAL	EE			PROCESS WASTE	ME			CRYO CHASE	CV		
GROUND GRID	EE			HOT WATER	ME			STRUCTURAL	ST		
SANITARY WATER / FIRE WATER	ME			COOLING TOWER WATER	ME			FIRE BARRIER SYSTEM (Penetration Permits Only)	FP		
RESPONSIBLE CIVIL ENGINEER (CV)			TELEPHONE	DATE	RESPONSIBLE STRUCTURAL ENGINEER (ST)			TELEPHONE	DATE		
RESPONSIBLE ELECTRICAL ENGINEER (EE)			TELEPHONE	DATE	RESPONSIBLE FIRE PROTECTION ENGINEER (FPE)			TELEPHONE	DATE		
RESPONSIBLE MECHANICAL/PIPING ENGINEER (ME)			TELEPHONE	DATE	Other			TELEPHONE	DATE		

SECTION C – Approval		
Permit Issued To (Print Name/Organization/Telephone Number):	SIGNATURE - Competent Individual from Executing Organization	DATE
<input type="checkbox"/> E/PP and JSA have been reviewed with the executing organization prior to execution of work.	APPROVAL SIGNATURE – CFMR	DATE
<input type="checkbox"/> Requirement for obtaining and submitting As-Built survey data of all underground installations reviewed with the executing organization prior to execution of work.		DATE
<input type="checkbox"/> Positive location of underground utility is required before excavation.	Permit Expiration: (Excavation Permits expire in 30 and Penetration Permits in 90 calendar days from date signed by approver. Expired permits must be resubmitted if work is to continue. No renewals will be granted.)	DATE

SECTION D – Closeout		
<input type="checkbox"/> E/PP executed. Verification of completion of work. <input type="checkbox"/> Received Red lined drawings and As-Built survey data, as required.. <input type="checkbox"/> E/PP expired prior to completion of work. <input type="checkbox"/> E/PP no longer needed.	SIGNATURE - Competent Individual from Executing Organization	DATE
SIGNATURE - FIRE PROTECTION ENGINEER (FPE) – Required if Fire Barrier marked "YES"	E/PP CLOSED - SIGNATURE – CFMR	DATE

**ORNL Chestnut Ridge Campus (8000 Area)
Excavation/Penetration Permit (E/PP)**

Exclusions:

Prior to initiating a Permit, the Requestor shall review the following list of exclusions:

Excavation Activities Exclusions:

1. Soil borrow areas pre-designated by the Site Services Organization (SSO)
2. Replacement of the same location, depth, and size as the items being replaced (i.e. sign posts, etc.)
3. Earth / rock excavations 12 inches or less in depth with surface area not in excess of 25 square feet, using hand held tools excluding jackhammers

Penetration Activities Exclusions:

1. Work associated with the installation of fasteners to newly constructed floors, walls, and ceilings. "New" construction work is considered to be an integrated activity of an overall sub-project being managed under a single responsible and knowledgeable construction contractor.
2. Penetration of masonry walls.
3. Installation of self-tapping **PLASTIC** (requires NO drilled pilot holes) 1-5/8" maximum sheetrock anchors for supporting white boards and pictures specifically in office areas.

Definitions:

1. Construction Field/Maintenance Representative (CFMR) – The individual with overall responsibility of overseeing activities of the E/PP.
2. Excavation/Penetration Permit (E/PP) – A document required for all excavation and penetration activities on the Chestnut Ridge Campus.
3. Excavation/Penetration Permit Coordinator (E/PPC) – The individual with responsibility of assigning E/PP numbers and ensuring E/PPs are closed in a timely manner and submitted to the Document Control Center.
4. Executing Organization – The organization performing the work associated with the E/PP. This could be a subcontractor or other internal organizations.
5. Requestor – The individual responsible for initiating an E/PP.
6. Job Safety Analysis (JSA) - The JSA shall identify the task and the steps necessary to complete the task, the hazards associated with each step of the task, and the means to protect the workers performing the tasks from those hazards.

SECTION A - Initiation of the E/PP

The Requestor will:

- Complete Section A of the E/PP except for the E/PP number.
- Attach sketches or marked up drawings showing exact location of each excavation or penetration.
- Attach the JSA for the work activity resulting from a thorough field investigation.
- Forward the E/PP and attachments to the E/PPC.

The E/PPC will:

- Review the E/PP for accuracy.
- Assign and record the unique E/PP number in Section A and update the Excavation/Penetration Permit Log.
- Forward the original E/PP to one of the Responsible Design Disciplines with instructions for routing.
- Determine if additional review is warranted and obtains review signatures.

SECTION B - Review of the E/PP

Each Responsible Discipline Engineer (CV, EE, ME, ST, and FP) will perform the following in the appropriate block of Section B:

- Review the E/PP and indicate "YES" or "NO" and initial the appropriate discipline block.
- Record name, phone number, and date in the appropriate box below the utility review section.
- The responsible discipline will attach the latest revision of applicable Chestnut Ridge Campus Underground Site Utilities drawings. The drawings shall be marked up to reflect the scope of work covered by the E/PP.
- The last discipline reviewer forwards original E/PP and attachments to the E/PPC.

SECTION C - Approval of the E/PP

- The E/PPC forwards the E/PP to the CFMR.
- The CFMR will review the E/PP and JSA with the Executing Organization before field activities begin, and document the review in Section C.
- The Executing Organization will retain the original E/PP at the work site until the work is complete.

**ORNL Chestnut Ridge Campus (8000 Area)
Excavation/Penetration Permit (E/PP)**

SECTION D – Closeout of E/PP

- Upon completion of work, the Executing Organization shall check the appropriate disposition boxes, sign, date, and return the original E/PP to the CFMR. If any changes were made to underground electrical or mechanical features, a red lined mark-up drawing or sketch along with As-Built survey data of the changes shall be attached to the E/PP.
- The CFMR obtains the Fire Protection Engineer’s signature as required. The Fire Protection Engineer must sign Section D if “YES” is indicated in Section B for the Fire Barrier System. The CFMR signs the E/PP to verify that the work is complete and any changes properly noted.
- The CFMR forwards the signed original E/PP to the E/PPC.
- The E/PPC updates the Excavation/Penetration Permit Log and forwards the closed original E/PP and attachments to the Site Services Document Coordinator.
- The Site Services Document Coordinator will forward the closed E/PP to the Document Control Center. In addition the Site Services Document Coordinator will ensure redlines and/or As-Built Survey Data is incorporated into the Underground Utility As-Built drawings.

Notes:

1. The boundaries for the areas requiring a Chestnut Ridge Campus E/PP are defined in Attachment A.
2. This document reflects the guidance provided in the ORNL SBMS Subject Area: Excavation/Penetration for the 8000 – Area at ORNL (Chestnut Ridge Campus). The major exceptions or differences are as follows:
 - There is no current requirement which involves excavated soil to be verified for Radiological Contamination.
 - Contents Section Differences include *Complete Section 1 of the permit and submit to E/PP Permit Coordinator’s Office.*
 - Performing Excavation and Penetration Work and Permit Closeout includes *Suspend work and contact the SNS Central Control Room if unknown utility is encountered. Returns the Permit with as-built information to Site Services after work has been completed.*
 - Emergency Work includes *Obtains approval from SNS Central Control Room; reviews Chestnut Ridge Campus Underground As-Built Utility drawings.*
 - 8000 Area utilizes one form for both excavation and penetration permits.
3. A meeting between the CFMP and Executing Organization to determine the need for surveys using detection equipment and/or personnel protective measures is required.
4. A copy of this E/PP shall be available for review at the work site at all times when work associated with this E/PP is being done.
5. Penetration permit is required for work associated with penetration of floors, walls and ceilings.
6. Penetration permit is required for all core drilling.
7. Excavation Permits expire in 30 and Penetration Permits in 90 calendar days from date signed by approver. Expired permits must be resubmitted if work is to continue. No renewals will be granted.

Special Work Requirements and Precautions:

1. Lockout and tagout all energized utility systems that present hazards to workers.
2. Positive location of utility lines shall be conducted using the Metrotech Pipe and Cable locating system.
3. Proper warning signs shall be posted and maintained where underground energized circuits are suspected but the exact locations are unknown. Personnel shall be advised of such circuits, the hazards involved, and protective measures to be taken.
4. Flag persons (ground-level observers) shall be required for heavy excavation equipment (non-hand-held equipment) operations in areas of inexactly located energized electrical circuits and other in-service utilities, as well as when the equipment operator can no longer maintain eye contact with the surface being excavated.
5. Hand digging is required within 2 feet of marked utilities unless exact location of utility is known. Hand-held tools, excluding jackhammers, shall be used once contact with duct banks and other underground utilities is made. Heavy equipment shall not be used again until the duct bank/utilities are completely exposed.
6. All excavation activities shall be completed in areas around utilities PRIOR to re-energizing system.

Reference Documents:

1. Attachment B - Excavation/Penetration Permit Procedure Process Flow

APPENDIX O: CRITICAL LIFT PERMIT

CRITICAL LIFT PERMIT

Section I: Approvals and Documentation

A. Identification

Subcontract Number: _____ Location: _____

Lift Identification Name: _____

Date of Lift: _____ Time: _____

Lift Description: _____

B. Approvals (Signatures Required)

Subcontractor Field Manager/S&H: _____
Date _____

Subcontractor Lift Supervisor: _____
(This individual is to be present during the lift)
Date _____

Project Engineer: _____
Date _____

Project Manager: _____
Date _____

Operator: _____
Date _____

Project S&H: _____
Date _____

SNS/CNMS Level II Manager: _____
Date _____

C. Attachments

- _____ 1. Operator Certifications
- _____ 2. Capacity Certificates and Inspection Reports for all other Lifting Equipment
- _____ 3. Inspection Reports for all Rigging Equipment
- _____ 4. Rigging Diagram
- _____ 5. Free Body Diagram

APPENDIX O: CRITICAL LIFT PERMIT (PAGE 2 OF 5)

Section II: Pre-Lift Planning

A. Pre-Lift Checklist

		(Initials)	
		Yes	No
1.	Has an inventory of equipment been done?	_____	_____
2.	Have weather conditions been considered?	_____	_____
3.	Have the general safety precautions been reviewed?	_____	_____
4.	Have the electrical safety procedures been reviewed?	_____	_____
5.	Have the safe rigging practices been implemented?	_____	_____
6.	Have the safety precautions been reviewed?	_____	_____
7.	Has a method of attachment and handling been determined?	_____	_____
8.	Are all lifting lugs engineered to specifications?	_____	_____
9.	Has the matting been inspected and approved?	_____	_____
10.	Has the stability of the ground been assured?	_____	_____
11.	Is a tag line going to be used?	_____	_____
12.	Have disconnecting/connecting means been developed?	_____	_____
13.	Has the orientation of equipment been confirmed?	_____	_____
14.	Is survey equipment required?	_____	_____
15.	Is a Pre-Lift Meeting planned?	_____	_____
16.	Is a total weight below 95% of capacity?	_____	_____
17.	Are all required approvals signed?	_____	_____

APPENDIX O: CRITICAL LIFT PERMIT (PAGE 3 OF 5)

Section III — Load and Capacity Calculations

A. Weight of Equipment - Live Load

1. Equipment Condition	New ()	Used ()
2. Weight of Equipment Empty	_____	lbs.
3. Weight of Attachments:		
a. Platforms and Ladders	_____	lbs.
b. Piping and Accessories	_____	lbs.
c. Liquids Inside	_____	lbs.
d. Dirt and Debris	_____	lbs.
e. Internal Trays or Liners	_____	lbs.
4. Total Weight of Equipment	_____	lbs.

B. Total Load

Erection Crane

1. Percent of Equipment Weight	_____ %	7. Weight of Jib Erected	_____ lbs.
2. Amount of Equipment Weight	_____ lbs.	Stored	_____ lbs.
3. Weight of Headache Ball	_____ lbs.	8. Weight of Jib Headache Ball	_____ lbs.
4. Weight of Block	_____ lbs.	9. Weight of Cable (Load Fall)	_____ lbs.
5. Weight of Lifting Bar	_____ lbs.	10. Auxiliary Boom Head	_____ lbs.
6. Weight of Slings and Shackles	_____ lbs.	11. Other: _____	_____ lbs.

TOTAL WEIGHT _____ lbs.

Tailing Crane

1. Percent of Equipment Weight	_____ %	7. Weight of Jib Erected	_____ lbs.
2. Amount of Equipment Weight	_____ lbs.	Stored	_____ lbs.
3. Weight of Headache Ball	_____ lbs.	8. Weight of Jib Headache Ball	_____ lbs.
4. Weight of Block	_____ lbs.	9. Weight of Cable (Load Fall)	_____ lbs.
5. Weight of Lifting Bar	_____ lbs.	10. Auxiliary Boom Head	_____ lbs.
6. Weight of Slings and Shackles	_____ lbs.	11. Other: _____	_____ lbs.

TOTAL WEIGHT _____ lbs.

Source of Load Weight _____
 (Name Plate, Drawings, Calculated, Weighed)

Weights Verified By: _____

APPENDIX O: CRITICAL LIFT PERMIT (PAGE 4 OF 5)

C. Capacities of the Crane

Erection Crane Configuration

- 1. Type of Crane _____
- 2. Rated Capacity _____ Tons
- 3. Lifting Arrangement
 - a. Max. Radius During Lift _____ ft.
 - b. Length of Boom _____ ft.
 - c. Angle of Boom at Pick _____ deg.
 - d. Angle of Boom at Set _____ deg.
 - e. Rated Capacity Under Most Severe Conditions
 - 1. Over Rear _____ lbs.
 - 2. Over Front _____ lbs.
 - 3. Over Side _____ lbs.
 - f. Rated Capacity for Lift _____ lbs.
- 4. Jib
 - a. Is the Jib to be used _____
 - b. Length of Jib _____ ft.
 - c. Jib Angle _____ deg.
 - d. Rated Jib Capacity _____ lbs.
- 5. Cable
 - a. Number of Parts _____
 - b. Size of Cable _____ inch.
 - c. Maximum Capacity _____ lbs.

D. Percent of Cranes Capacity

$$\frac{\text{Total Weight X 100}}{\text{Rated Capacity}} = \text{_____ \%}$$

E. Size of Slings

- 1. Sling Selection
 - a. Type of Arrangement _____
 - b. Number of Slings to Hook _____
 - c. Sling Size _____ inch.
 - d. Sling Length _____ ft.
 - e. Rated Capacity _____ lbs.

APPENDIX O: CRITICAL LIFT PERMIT (PAGE 5 OF 5)

C. Capacities of the Crane (continued)

Tailing Crane Configuration

- 1. Type of Crane _____
- 2. Rated Capacity _____ Tons
- 3. Lifting Arrangement
 - a. Max. Radius During Lift _____ ft.
 - b. Length of Boom _____ ft.
 - c. Angle of Boom at Pick _____ deg.
 - d. Angle of Boom at Set _____
 - e. Rated Capacity Under Most Severe Conditions
 - 1. Over Rear _____ lbs.
 - 2. Over Front _____ lbs.
 - 3. Over Side _____ lbs.
 - f. Rated Capacity for Lift _____ lbs.
- 4. Jib
 - a. Is the Jib to be used _____
 - b. Length of Jib _____ ft.
 - c. Jib Angle _____ deg.
 - d. Rated Jib Capacity _____ lbs.
- 5. Cable
 - a. Number of Parts _____
 - b. Size of Cable _____ inch.
 - c. Maximum Capacity _____ lbs.

D. Percent of Cranes Capacity

$$\frac{\text{Total Weight X 100}}{\text{Rated Capacity}} = \text{_____ \%}$$

E. Sizing of Slings

- 1. Sling Selection
 - a. Type of Arrangement _____
 - b. Number of Slings to Hook _____
 - c. Sling Size _____ inch.
 - d. Sling Length _____ ft.
 - e. Rated Capacity _____ lbs.

APPENDIX P: SPECIAL SCAFFOLDING NOTICE

Describe the special scaffolding situation: _____

Describe the scaffolding task: _____

Identify hazardous conditions: _____

Type of scaffolding to be utilized: _____

Is the intended scaffolding area within 25 feet of an existing or occupied structure? Yes No

If yes, protection measures: _____

Will people or machinery be prevented from passing beneath the scaffold? Yes No (If no, attach a copy of the protective measures to be used to prevent injury or damage to those below the scaffold.)

Will materials be piled or stacked on the scaffold? Yes No

Are any special precautions required to protect workers while on the scaffold? Yes No

If yes, protection measures: _____

Other remarks or information: _____

Date: _____

Competent Person: _____ Company: _____

Safety Designee/Representative: _____

APPENDIX Q: HOT WORK PERMIT

Side 1

Date _____
Building _____
Dept. _____ Floor _____
Work to be done _____

Special Precautions _____

Is Fire Watch Required? _____ Name _____

The location where this work is to be done has been examined, necessary precautions taken, and permission is granted for this work. (see other side).

Permit Expires _____

Signed _____
Permit Authorizing Individual

Time Started _____

Time Completed _____

FINAL CHECK

Work area and all adjacent areas to which sparks and heat might have spread (including floors above and below and on opposite side of wall(s) were inspected 30 minutes after the work was completed and were found firesafe.

Signed _____
Permit Authorizing Individual

Side 2

ATTENTION

Before approving any hot work permit, the PAI shall inspect the work area and confirm that precautions have been taken to prevent fire in accordance with NFPA 51B

PRECAUTIONS

- Sprinklers in service
- Hot work equipment in good repair

WITHIN 35 FT OF WORK

- Floors swept clean of combustibles
- Combustible floors wet down, covered with damp sand, metal, or other shields
- All wall and floor openings covered
- Covers suspended beneath work to collect sparks

WORK ON WALLS OR CEILINGS

- Construction noncombustible and without combustible covering
- Combustibles moved away from opposite side of wall

**WORK ON ENCLOSED EQUIPMENT
(tanks, containers, ducts, etc)**

- Equipment cleaned of all combustibles
- Containers purged of flammable vapors

FIRE WATCH

- To be provided during and 30 minutes after operation
- Supplied with a fully charged and operable fire extinguisher
- Trained in use of equipment and in sounding fire alarm

FINAL CHECK

- To be made 30 minutes after completion of any operation unless fire watch is provided

Signed _____
Permit Authorizing Individual (PAI)