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Office of Polar Programs

NSF Office of Polar Programs Safety and Occupational Health Policy – Volume 1 (Industrial Safety)

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Release Number	Revision Date (Month Year)	Description of Changes
1	June 2017	Initial Version
2	July 2018	Multiple edits to multiple sections
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5	September 2022	Multiple edits to multiple sections
6	April 2024	1. Policy Identification: This document constitutes Volume 1 of a two-part publication. 2. PQ Section Update: The PQ section has been removed from the Volume and is now a standalone document, accessible at: https://www.nsf.gov/geo/opp/soh/policies.jsp 3. Section Numbering: The section numbering has been adjusted due to the removal and consolidation of sections.

Release Number	Revision Date (Month Year)	Description of Changes
		4. Formatting: Updated formatting for consistency throughout the document. This effort will continue in subsequent revisions. 5. New Section Addition: A new section covering Cranes and Rigging practices has been added as Section 14. 6. USAP Dive Procedures: The USAP Dive procedures have been replaced with policy guidance, shifting the focus away from procedures. The USAP Dive procedures remain posted to the programs page. 7. Consolidation of Sections: Sections 20, Research Safety, and 21, Antarctic Field Safety, have been merged into one cohesive section; Section 18, Research Safety.
7	February 2025	1. Revised: Referenced Standards, Paragraph 7.1 at page 7. 2. Revised: Organizational Responsibilities, Prime Contractors, Paragraph 10.2.1 at page 8. 3. Delete: Appendix A, List of Acronyms, IBC (International Building Code) at Page 89.
8	**May 2025**	**Added Section 17, Guidelines for Scientific Diving (Antarctic Program only)**

Approval Signature

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Overview

1. Purpose and Objective

1.1 The purpose of this policy is to establish a comprehensive accident and illness prevention program for the National Science Foundation's Office of Polar Programs (OPP), which supports research in some of the most hazardous environments on Earth, both in the Arctic and Antarctic regions. Information in the various sections of this policy provides safety expectations and guidance for specific activities common to OPP operations and research support.

1.2. This document provides the ***minimum*** safety standards that OPP expects to protect all program participants from hazards and assists in mitigating program risk to an acceptable achievable level, allowing for the successful completion of science in the polar areas.

1.3. The specific objectives of this policy and its sections are:

- **S**afe performance of activities supported by OPP.
- **A**ppropriate safety standards for all engineering, construction, operating, administrative, research, and maintenance activities.
- **F**acilities and projects that provide an inherently safe environment.
- **E**nsure a proactive safety climate where risk management is something we all live together and not merely something assigned to a few individuals.

2. Applicability and Compliance

2.1. This policy and the procedures prescribed in the supporting sections apply to all program participants, grantees (investigators and students), contractors, federal employees, military personnel, and official visitors working at or visiting a USAP facility, an NSF-managed Arctic station, field camps, ships, or aircraft.

2.2. The revisions of this policy supersede all proceeding OPP Safety policy and guidance. Station management, contractors, and research partners shall develop supplemental guidance and standard operating procedures (SOPs) as prescribed in federal, state, or local statutes and this policy. It will be reviewed at an interval of not more than two years unless serious incidents or trends not currently identified require additional information and policy revision.

2.3. Distribution should be to all OPP stakeholders.

3. General Safety Policy

It is the policy of OPP that all program participants take proactive safety measures so that science and science support are performed in safe working conditions.

- All participants are required to comply with all applicable OPP safety requirements, including those in the contractor's site-specific accident prevention plan. Program participants should perform their duties in a safe manner, comply with all processes and procedures, and are empowered to make safety recommendations or bring safety risks to the attention of senior leaders.
- Grantees are bound by NSF's grant terms and conditions and as such are responsible for the conduct of the research under their award. While being supported by the Office of Polar Programs, researchers

will comply with all contractor and research station policies, procedures, training requirements and other safety measures.
- Individuals will ensure they have required safety and occupational health (SOH) training, review and follow Job Hazard Analyses (JHAs), and utilize personal protective equipment (PPE) as required for specific tasks.
- Safety and Occupational Health considerations will be integrated into the development of all OPP research and project plans. All stakeholders will ensure that a risk assessment is performed for the research activities and projects for which they have authority and/or responsibility.

4. General Responsibilities for Program Participants

4.1. Management and Leadership will implement the risk management process in support of all program activities. They will track and report safety trends, and work to constantly improve work conditions for all program participants.

4.2. Supervisors are responsible for the safe conduct of all work under their control. They shall be familiar with all recognized codes, standards, and regulations relevant to their work and ensure that such requirements are strictly enforced. These include all applicable OSHA standards and applicable host nation requirements. Supervisors will ensure all employees receive a safety orientation that covers hazards in the work environment and other essential safety information.

4.3. Station management shall provide a safety in-brief to all visitors (including Distinguished Visitors) and researchers. The names of attendees and the topics covered at this briefing shall be documented.

4.4. All program participants are responsible for participating in safety briefings and trainings and to report any unsafe conditions or conduct to ensure their safety and the safety of others.

5. Accident Prevention

Accident prevention measures must be integrated into all activities and operational procedures supported by OPP.

6. Risk Management

6.1. Composite risk management (CRM) shall be integrated into implementing OPP-funded research. The five basic steps of CRM are: (1) identify the hazard, (2) assess the hazards to determine risks, (3) develop risk-mitigating controls, (4) implement the controls to eliminate or reduce the hazards, and (5) supervise the implementation of controls and evaluate their effectiveness.

6.2. All research plans, specifications, designs, technical publications, and operating procedures will be reviewed for conformance with established safety codes and standards. The NSF OPP Occupational Health and Safety Officer will provide review assistance and is the final authority in determining compliance with SOH requirements and other applicable codes. For any research activity or project that is found to have a medium to high risk, based on the probability of a safety incident occurring and the severity of loss if one does occur, a safety professional must be consulted to ensure risk is mitigated to acceptable levels and that an accident prevention plan is developed and implemented. This accident prevention plan shall be documented and available for OPP review.

7. Occupational Safety and Health (OSH) Act Standards

7.1. Although the Occupational Safety and Health Administration (OSHA) does not have jurisdiction extra-territorially, **the OSHA standards serve as the foundation and primary source for compliance for all OPPs areas of operation. The OPP also recognizes the value of additional best practices, recommended guidelines, and codes (including the** NFPA (National Fire Protection Association) standards, **ICC (International Code Council), and ACGIH (American Conference of Governmental and Industrial Hygienists)); these resources are considered non-mandatory but serve to supplement and enhance our program by providing valuable insight and recommendations that help create a comprehensive safety framework.**

7.2. The OSH Act is applicable to all OPP employees and will be complied with in applicable workplaces. Executive Order 12196, Occupational Safety and Health Programs for Federal Employees, makes each Federal agency head responsible for establishing and maintaining an effective and comprehensive Occupational Safety and Health Program. The rights and responsibilities of employees, as delineated in Title 29 CFR, Part 1960, Federal Employee Safety and Occupational Health, will be implemented.

7.3. At times, it is not feasible to comply with a specific OSH requirement, due to conflicting circumstances, practices, laws, regulations, or other limitations. In that case a waiver/variance request shall be made to the OPP Safety Officer using form FORM_2000.10-5 (see Appendix E). Work should not proceed without resolving the request with the OPP Safety Officer or designee.

8. Safety Surveys and Inspections

8.1. At a minimum, all operational areas at a research station (and other locations, when possible) shall be surveyed and inspected two or three times a week by someone with knowledge of the safety requirements/standards associated for potential safety hazards. These safety inspections should occur daily during operations and maintenance (O&M) and construction work. All findings not in compliance with safety requirements, codes, and standards shall be identified, tracked, prioritized, and corrected as soon as possible.

8.2. There shall be a central location where all safety-related permits, AHAs/JHAs, Accident Prevention Plans or other risk documents are stored near where significant activities are being performed.

9. Suspending Operations

It is the policy of OPP that anybody who observes an activity or operation that poses a risk to safety of personnel or equipment can temporarily stop that activity until whomever is the senior responsible person is notified and reinitiates the activity. This can be a contractor to contractor, contractor to grantee, grantee to contractor, or any other possible combination.

10. Organizational Responsibilities

10.1. OPP Safety Responsibilities and Authorities

10.1.1. OPP Director

- The Director has delegated responsibility for establishing SOH policy to the NSF OPP Safety and Occupational Health Officer (OPP Safety Officer). The OPP Safety Officer is also responsible for safety and occupational health issues requiring specific actions, interpretations, or directives.

10.1.2. Contracting Officer Representatives (COR)

- The COR is designated by the CO (Contracting Officer) to develop contract tasking and manage contractor performance within a CO-approved annual program plan, which includes any relevant safety and health requirements or standards. Due to the size and complexity of the support contracts in OPP, the COR authorizes Activity Based Managers (ABMs) to manage tasking and expenditures against the approved annual program plan.

10.1.3. NSF OPP Safety and Occupational Health Officer

- The OPP Safety Officer reports to the Director. Therefore, the OPP Safety Officer is independent of the Antarctic or Arctic programs and focused on risk mitigation.
- The OPP Safety Officer has the authority to intervene in all safety and health activities and, where feasible (and within funding constraints), should also have access to all sites, research stations, and contractor safety personnel.
- Duties include:
    - Develops safety and occupational health policy;
    - Develops or reviews specific procedures to protect personnel, property, and the environment;
    - Ensures that contractor safety and health requirements, standards, best business practices, and this policy are being complied with across all OPP-supported activities and sites;
    - Tracks accident trends across OPP activities and shares lessons-learned to prevent similar future incidents;
    - Makes determinations on waivers and variances to SOH requirements and standards;
    - Ensures proper investigation of all recordable accidents and ensures that corrective actions are implemented; and
    - Performs risk analysis and provides risk-mitigation recommendations on SOH matters, as needed.

10.1.4. OPP Activity Based and Program Managers

- Ensure they are familiar with the safety and occupational health requirements within their programs and ensure proper risk mitigation;
- ensure that safety and health planning activities, such as design reviews, specification development, operations, maintenance, and research support are reviewed for compliance with safety and health requirements;
- Request support from the OPP Safety Officer as needed to perform their work;
- Ensure designers use methods and techniques that prevent or reduce hazards associated with use of proposed equipment, processes, or facilities; and
- Act immediately, in consultation with the OPP Safety Officer, when SOH non-compliance is identified to ensure corrections are made to prevent injury or property damage; for immediate-danger-to-life-and-health (IDLH) items, work and/or research must be stopped until these can be corrected.

10.2. Contractor Safety Responsibilities and Authorities

10.2.1. Prime Contractor's Leadership

- Safety starts with senior contractor leadership. It should be clear to OPP that senior leadership for the prime contractor supports and values the OPP Safety Policy described in this document through behaviors, decisions, and actions. Contract leadership shall:

- Ensure compliance with 29 CFR 1910 **and** 1926 standards, during all operations and activities under their control and authority;
- Ensure the organization has an established and documented safety and health program that emphasizes proactive safety measures and has an evident process for accountability;
- Ensure the contractor safety office is staffed appropriately to meet OPP mission support requirements, as identified by OPP; and
- Ensure that supervisors know their safety responsibilities and have supervisory safety training as needed to be successful;
- Recognize exceptional safety performance by teams in the field, thus fostering a safety culture in which hazards are reported openly and employees protect one another.

10.2.2. Contractor's Safety and Health Staff

The prime contractor shall ensure all subcontractors comply with this policy. The prime contractor is responsible for each subcontractor's safety performance. The prime contractor's safety and health team shall:

- Have the training, education, and experience needed to ensure the broad range of safety oversight necessary to provide the required safety oversight and ensure risk mitigation.
- Enforce this policy and the safety standards and processes within;
- Ensure continuing inspection of job sites for compliance with contractual requirements;
- Ensure work meets the requirements of the Code of Federal Regulations (CFR) 1910, 1915, 1917, 1918, 1919, and 1926 or other SOH standards and requirements, where applicable;
- Develop and submit accident prevention plans, and activity hazard analyses for all O&M and construction projects before physical work begins, to include fatigue management;
- Submit Hazard Control Plans and activity hazard analyses to the OPP Safety Officer for review and acceptance when risk assessment code (RAC) for an operational or research project is High to Extremely High, as identified during the risk management process;
- Provide preliminary accident notification information to the OPP Safety Officer within 24 hours
- Provide a complete investigation to the OPP Safety Officer within 30 days for all recordable accidents or injuries;
- Ensure action is taken to prevent a recurrence;
- Ensure work groups hold safety meetings at appropriate frequency (daily or weekly) to inform all workers of planned work and its hazards;
- Require field personnel to include all safety findings in reports, whether negative or positive, and track them in a log;
- Ensure all accidents are investigated and corrections identified and implemented in a timely matter;
- Keep OPP advised about safety findings and make recommendations for changes or improvements where conditions warrant;
- Ensure that adequate fire prevention and protection programs, as well as emergency response plans, are established for all sites and that exercises and drills are performed and documented as required;
- Ensure personnel receive relevant safety training on a regular basis, or as required by the Code of Federal Regulations, specifically 1910 and 1926;
- Provide safety briefings for visitors, to include distinguished visitors (DVs);
- Ensure all new field personnel receive a safety orientation at their work center;
- Ensure all employees with potential exposure to noise levels exceeding OSHA's time-weighted average of 85dba (29 CFR 1910.95) or exposure to hazardous chemicals or toxic wastes (29 CFR 1910 Subpart Z) are placed in a medical surveillance program to ensure their safety and health;
- Provide the necessary PPE for each employee and ensure training is provided on its proper use;

- Evaluate safety performance and develop a programmatic reward system between subcontractors;
- Ensure new designs and station plans prevent or reduce hazards associated with operation, maintenance, and use by personnel; and
- Ensure direct SOH oversight for any high-risk activities (see list in Section 2).

Section 1: Report of Hazard, Unsafe Condition, or Unsafe Practice

1. Purpose and Scope

The processes described in this section provide program participants with a practical means of reporting hazards, unsafe conditions, or unsafe practices encountered while located at a facility or field operations in a geographic area supported by the Office of Polar Programs (OPP).

2. General Requirements

2.1. The Occupational Safety and Health Act of 1970 gives an employee assurance that no discriminatory or discharge action will be taken against any employee who exercises their rights under the Act. NO retribution shall be taken towards any employee or researcher that reports an unmitigated hazard, unsafe condition, or unsafe practice.

2.2. If OPP becomes aware of any such retribution, the Contracting Officer or OPP will investigate and implement corrective actions by all available means.

2.3. If a participant reasonably believes working conditions are unsafe or unhealthful, they have the right, the responsibility, and the authority to **STOP** such work activity.

2.4. All employees, grantees, or guests are encouraged to speak up when an unsafe condition or practice is observed. The participant noticing the condition should notify the affected personnel and the responsible supervisor (or relevant leadership) immediately to remove any one at risk of harm.

2.5. The supervisor and the affected personnel shall investigate the cause for intervention. If the unsafe concern/condition cannot be immediately resolved, or the supervisor does not adequately address the safety concern, the participant, supervisor, or relevant leadership shall contact the Contractor's Safety Office (CSO) for assistance.

2.6. The CSO shall be informed of the concern and details regarding any action or non-action taken to correct the issue. If the CSO takes no action, or the safety concern was not adequately addressed, the concerned individual should notify the appropriate NSF Manager for the geographic area of concern.

3. File a Complaint.
Any participant who believes working conditions are unsafe or unhealthful, may file a confidential complaint with NSF OPP Safety Officer directly by email at oppsafety@nsf.gov.

Section 2: Risk Management, Hazard Control Plans & Analysis

1. Purpose and Scope

The processes described in this section help program participants avoid or control hazards connected to common work activities and the list of High-Risk activities that Office of Polar Programs identifies as having potential for increased threat to employee safety, property loss, and/or mission accomplishment.

Exception: Activities or duties in direct support of DoD aircraft maintenance and operations shall conform with the applicable DoD regulations, USAF instructions, and Unit procedures.

For work involved in construction or dismantling, demolition or removal of improvements, the Contractor shall comply with all pertinent provisions of the latest version of U.S. Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1.

Note: Prime contractors (PC) and principal investigators (PI) retain full responsibility for their sub-contractors, personnel, and project activities.

2. General Requirements

Planning is essential to anticipate emerging hazards during all program activities. Contractors and other program partners are accountable for developing comprehensive risk management plans that identify and analyze program activities in all areas and functions, including but not limited to operations and maintenance, construction, engineering, planning, research, and other inherent risks. This evaluation shall include the assignment of roles and responsibilities, preventive measures, and monitoring activities.

Protecting staff safety and health, limiting property damage, and avoiding program interruptions is a collective effort. To effectively control and prevent these hazards from impacting staff and mission, program participants must identify opportunities for controlling risk using a "hierarchy of controls." Controls must protect staff from workplace hazards and avoid incidents or significant impact to mission achievement.

In addition to compliance with 29 CFR 1910 and 1926, specifications for all OPP activities and contract work shall include additional requirements that ensure a high standard of physical protection and safety performance by those performing activities within the geographic area supported by OPP.

3. Hazard Control Plans

3.1. High-Risk Activities

OPP requires a Hazard Control Plan (HCP) to manage High to Extremely High-risk activities. An HCP describes how the selected controls will be implemented and monitored. These plans are necessary to ensure sufficient planning and control management where OPP-supported activities place personnel and property at the described risk. An effective HCP will address serious hazards to control the identified risks successfully.

3.1.1. Hazard Control Plan (HCP)

- Before performing any activities included in the High-Risk Activities list or deemed high-risk through other internal reviews/assessments, the responsible authority (Prime Contractor or Principal

Investigator) shall develop an HCP. This process ensures that there is genuinely no safe alternative way to accomplish the work other than the proposed method.

- The responsible authority shall submit a HCP and corresponding plans and procedures to OPP Safety and Occupational Health (SOH) team and relevant COR, Activity Based Manager (ABM), and/or Program Officer/Manager for review no less than 21 days preceding the planned activities. The OPP will allow for exceptions only in extreme situations or emergencies. The OPP SOH will review and return initial comments or acceptance within 14 days of receipt. WARNING: Physical operations or activities in these areas cannot begin until the plan is found acceptable by OPP.
- During the planning process for high-risk activities, the PC shall develop an HCP. This plan shall interface with the contractor's overall safety and health program. Yet, it shall remain an activity or project-specific safety and health plan integrated into the planning process.
- During the planning process for high-risk activities, the PI shall develop an HCP. This plan shall interface with the PC's and home institutions' overall safety and health program. Yet, it shall remain an activity or project-specific safety and health plan integrated into the planning process.

3.1.2. Minimum Basic Outline for a Hazard Control Plan

- The HCP shall clearly and specifically outline the scope, purpose, authorization, roles, responsibilities, rules, and techniques to control the hazardous condition. Submitters should not copy relevant OSHA standard(s) word for word; instead, they must provide precise details on how they plan to implement the standards and requirements necessary to complete the activity.
- At a minimum, the HCP shall address the following:
    - Provide the name, title, signature, and phone number of the plan preparer, including qualifications and experience.
    - Include the name and signature of those responsible for the activity and safety.
    - Include a description of the work, the activities and phases, the anticipated duration (start and end dates), and the specific location(s) (include a map).
    - The plan preparer shall justify why work cannot be safely performed in any other fashion. Provide other possibilities considered and why they would not work. "It's just always been done this way" is not an acceptable reason.
    - Describe work practices to be followed; furnish details of the activity and associated hazards and how those hazards will be controlled and managed. Clearly identify who is doing what, when, where, and how, and what equipment is necessary.
    - Describe the job briefing details (method, who, what, when, and where).
    - Provide emergency response plans, with verification/concurrence from the emergency response team(s); include emergency contact information and scheduled drills to test this plan, if applicable.
    - Give a list of any coordination completed or required with other agencies or organizations; include points of contacts for each, and briefly describe safety coordination efforts executed.
    - Include detailed task-specific hazards and controls for each definable activity, formatted equivalent to a Hazard Analysis tool utilized to complete the planning process described in the Contractor Risk Management Process (below).

3.1.3. List of High-Risk Activities

- Activities include but are not limited to:
    - Excavations five feet in depth and greater or at any depth where there is an unsafe physical condition or hazardous atmosphere.

- Work at heights greater than 20 feet or where work must be performed from any height over dangerous equipment, a hazardous environment, or an impalement hazard.
- Energized work or operations adjacent to energized equipment, lines, and substations.
- Critical lifts, hoisting of personnel, hazardous materials (e.g., explosives, highly volatile substances), or submerged loads. Lifts made with more than one crane, or from a blind location, or when loads exceed 75% of the total capacity of load handling equipment's rated capacity, in any configuration.
- McMurdo cargo and fuel off-load, to include shooting lines or other similarly high-risk activities
- Possible overexposure to a hazardous chemical or biological substance (refence the most conservative measure i.e., ACGIH TLVs or OSHA PELs)
- Work that creates or expands snow or earth tunnels.
- Activities with a potential danger of drowning when working at or near the sea ice edge or on ice floes.
- Work with ionizing radiation.
- Diving Operations (reference Section 17).
- Assembling or dismantling prefabricated components (10 tons or greater).
- When conducting blasting operations.
- Complex confined space work or when multiple permits are required.
- Activities in, or traveling through, crevassed zones.
- Other similarly high-risk activities that may cause increased risk to life safety and health as determined by relevant stakeholders and/or the OPP SOH Staff, reference paragraph 3.1.4.

- For questions or matters of interpretation relevant to this list of High-Risk Activates contact the OPP SOH Staff at opp-safety@nsf.gov

3.1.4. Decision-Making Process for Hazard Control Plans.

- Outside of those listed as mandatory in the OPP Safety Policy, other triggers that lead to OPP's request for HPC's include:
  - Any highly complex work or when multiple organizations, groups, or activities are necessary to accomplish a task.
  - Uncertainty in key inputs (Low Confidence).
  - Diversity of knowledge, skills, and abilities of stakeholders.
  - Possibility of high financial stakes or serious program interruptions.
  - Historical incidents of near miss, injury, or equipment issues.

3.2. Contractor Risk Management Process

3.2.1. Before commencement of each work activity, task, or feature of work, the responsible authority shall prepare a documented Hazard Analysis.

3.2.2. Risk management is a business process that includes identifying, assessing, and prioritizing risks to an acceptable level by the coordinated application of resources to minimize, monitor, and control the probability and/or impact of unfortunate events.

3.2.3. Within each significant phase of work (activities, tasks, or definable work features), there will be risk that requires a hazard analysis. The Prime Contractor shall identify significant phases of work that will be performed due to the activities of their contract and complete a hazard analysis for each.

3.2.4. Contractors and other employers typically use Job Safety Analysis (JSAs), Job Hazard Analysis (JHAs), Activity Hazard Analysis (AHAs), or similar Risk Management assessment tools. These documents are considered equivalent. The selected tool shall include:

- Define the steps performed within the activity, task, or defined feature of work (DFOW), identify the work sequences, specific anticipated hazards, site conditions, equipment, materials, personnel, and the controls measures to be implemented.
- Names of the Competent Person(s) and Qualified Person(s) required for a particular activity shall be identified, including proof of their competency/qualification (examples activities include; excavation, scaffolding, fall protection, and others specified by this policy or OSHA).
- An evaluation of the residual risk, risk remaining after controls have been applied for each work sequence.

3.2.5. Risk Acceptance

- Activities determined as High Risk or greater shall be forwarded to the OPP SOH as described in the Hazard Control Plan described in this section (above), include a copy of the Hazard Analysis with all related plans when forwarding the submission.
- Plans shall include an acceptance (at an appropriate management level) for the residual risk.
- Properly communicate the potential hazards to each employee involved.

3.2.6. Once the activity has been completed, the hazard analysis shall be available and kept on file at the site for a minimum of 6 months.

3.3. Construction Safety and Occupational Health Plan

3.3.1. Before initiation of work at the project site, a Construction Safety and Occupational Health Plan shall be developed and submitted for review and found acceptable by the OPP SOH Officer (reference Section 2, Paragraph 1, above). This plan shall address any unusual or unique aspects of the project or activity.

3.3.2. Construction SOH plans shall be developed and submitted by the Prime Contractor. The Contractor shall address each of the elements/sub-elements, in the outline provided in this section in the order that they are provided. If an item is not applicable because of the nature of the work to be performed, the Contractor shall state this exception and provide a justification.

3.3.3. Construction SOH plans shall contain appropriate hazard-specific plans as needed for the work being performed and include a list of each major phase of work that will be performed. They shall also complete a Job Hazard Analysis prior to each activity as outlined in paragraph 3.2.4 above.

3.3.4. At the time of submission, if portions of the work have yet to be known or sub-contracted, the Contractor will add the appropriate revisions to the plan and submit for acceptance by the OPP SOH before initiating the additional work.

3.4. Minimum Basic Outline for a Construction Safety and Occupational Health Plan

- Signature Sheet: Include title, signature, and phone number of the following:
- Plan preparer (include qualifications).
- Plan concurrence (e.g., Chief of Operations, Corporate Chief of Safety, Corporate Industrial Hygienist, project manager or superintendent, project safety professional, project QC).
- Background Information:

  - Contractor.
  - Project Name.
- Brief project description, description of work to be performed, location (include a map or site plan, equipment to be used, anticipated high risk activities, and major phases of work anticipated.
- Statement of Safety and Health Policy.
- Responsibilities and Lines of Authority.
- A statement of the Contractor's ultimate responsibility for the implementation of the Safety and Occupational Health program.
- Identification and accountability of personnel responsible for safety at both corporate and project level, including lines of authority.
- Provide written company procedures for holding manager and supervisors accountable for safety.
- Include policies and procedures regarding employee non-compliance with safety requirements.
- Names of Competent and/or Qualified persons (CP/QP), include proof of current and active competency/qualifications to meet OSHA CP/QP requirements.
- Identify subcontractors and suppliers. If this is not known at the time of initial submittal, the contractor shall include the following statement in their initial plan: "The subcontractors for the following DFOWs/activities are not known at this time, additional information will be submitted to the plan for acceptance by NSF prior to the start of any activities listed." The Prime Contractor shall ensure that any adjustments/substitutions to the accepted slate of qualified personnel are provided to NSF for acceptance to the start of any activities listed.
- Procedures for periodic safety and health Training for Supervisors and Employees.
  - Requirements for new hire SOH orientation.
  - Mandatory training and current certifications that are applicable to expected situations on the project e.g., explosive actuated tools, confined space entry, crane operator, underwater diver, vehicle operator, HAZWOPER training and certification, PPE, etc.) and any requirements for periodic retraining/recertification.
  - Emergency response.
- Safety and Health Inspections.
- Specific assignment of responsibilities for a minimum daily jobsite SOH inspection during periods of work activity: Who will conduct (e.g., Site Safety Professional, PM, QC, supervisors, employees – depends on level of technical proficiency needed to perform said inspections), proof of inspector's current training/qualifications, when inspections will be conducted, procedures for documentation, deficiency tracking system, and follow-up procedures.
- Mishap Reporting and Investigation.
- Mishaps shall be reported as soon as possible, reference section 3, paragraph 4 of this policy for specific instruction.
- The contractor shall report, thoroughly investigate, and analyze all mishaps occurring incidentally to an operation, project, or facility for which this policy is applicable. The contractor shall implement corrective actions as soon as reasonably possible and provide notice to the OPP when corrective actions are complete.
- Plans, Programs and Procedures.
  - Based on a risk assessment of contracted activities and on mandatory OSHA compliance programs, the Contractor shall address all applicable SOH risks and associated compliance plans.
  - The plans shall incorporate project-wide procedures to control hazards to which the employees of all project employers may be exposed.

- These procedures shall be coordinated with all impacted project participants and shall include project-specific, project-wide emergency response and evacuation procedures, PPE, recordkeeping, reporting, and training requirements.
- The plans shall be prepared prior to the start of any work activities on the job site (as much as the information can be known at that point in time). The plans shall be updated throughout the life of the project to include changes in personnel, equipment, conditions, etc., and shall be provided to OPP. Additional revisions shall be incorporated as necessary to reflect changing site conditions, construction methods, personnel roles and responsibilities and construction schedules.
- List of possible programs/plans which may be required.
    - Fatigue Management Plan
    - Emergency Plans
    - Site Sanitation/Housekeeping
    - Medical Support Agreement
    - Exposure Control Plan
    - Automatic External Defibrillator Program
    - Site Layout Plan
    - Access/Haul Road Plan
    - Hearing Conservation Program
    - Respiratory Protection Plan
    - Health Hazard Control Plan
    - Hazard Communication Program
    - Process Safety Management Program
    - Lead Compliance Plan
    - Asbestos Abatement Plan
    - Radiation Safety Program
    - Abrasive Blasting Procedures
    - Heat Stress Monitoring Plan
    - Cold Stress Monitoring Plan
    - Indoor Air Quality Management
    - Mold Remediation Plan
    - Chromium (VI) Exposure Evaluation
    - Lighting Plan for Night Operations
    - Traffic Control Plan
    - Fire Prevention Plan
    - Arc Flash Hazard Analysis
    - Hazardous Energy Control Program & Procedures
    - Standard Lift Plan – Load Handling Equipment
    - Critical Lift Plan – Load Handling Equipment
    - Naval Architectural Analysis – Load Handling Equipment (Floating)
    - Severe Weather Plan
    - Man Overboard/Abandon Ship Procedures
    - Float Plan for Launches, Motorboats, and Skiffs
    - Fall Protection and Prevention Plan
    - Demolition/Renovation Plan
    - Rope Access Work Plan
    - Excavation/Trenching Plan

- Erection and Removal Plan for Formwork and Shoring
- Precast Concrete Plan
- Lift Slab Plans
- Masonry Bracing Plan
- Steel Erection Plan
- Tower Erection Plan
- Explosive Safety Site Plan
- Blasting Plan
- Dive Operations Plan
- Emergency Management Plan for Diving
- Aircraft/Airfield Construction Safety Plan
- Confined Space Program and Entry Procedures

3.5. Special Instructions

3.5.1. Inspections

- All participating parties shall have available onsite for review, required inspection records, and tests indicating compliance with manufacturer and OSHA requirements for infrastructure, facilities, and other assets (e.g., cranes, fire protection systems).
- Equipment failing to meet requirements must not be used, pending compliance.
- When defects render equipment unsafe, contractors shall notify all impacted parties, including relevant Government staff (COR, ABM/PM, and OPP SOH), of the specific corrective actions required and direction to withhold equipment operation until corrections are complete.
- Contractors shall advise the COR, ABM/PM, and OPP SOH of completed actions.

3.5.2. Stop Work Order

- If all attempts to secure voluntary compliance with safety requirements are unsuccessful, the contracting officer (CO) or COR may issue a stop work order.
- The order should only apply to that portion of work affected by the actions or inactions of the contractor; all the facts of the proceedings shall be documented, including uncorrected safety violations.
- The contractor shall be informed in writing of the extent of the work stoppage, include the date and hour work has stopped, provide the reason for the action, and incorporate the conditions under which work may proceed.
- The OPP Safety Officer shall be notified immediately of such action.

3.5.3. Reckless Participants

- The OPP has a zero tolerance for reckless and purposely unsafe behavior or the placement of anyone in a known and imminently unsafe situation where the risk of a serious injury or fatality is great and unmitigated.
- When a contractor, employee, grantee, or other partners purposely endanger their own well-being or the well-being of others by flagrant disregard of known safety standards, the individual or individuals shall be immediately removed from the hazardous condition (if possible) by contractor management and OPP. The Code of Conduct will be utilized to determine the most appropriate response thereafter (See the Polar Code of Conduct, OPP-POL_6000.01).

Section 3: Mishap Reporting and Investigation.

1. Purpose and Scope

1.1. Mishap reporting, investigation, and record-keeping are critical to OPP's safety and health efforts. Determining the cause and identifying the problem areas help us better understand how we can correct hazardous work conditions and broaden the lessons learned to prevent the reoccurrence of similar events in the future.

1.2. A mishap is an unplanned, undesired event occurring during work or activities performed as part of the operations described in this policy. The term "mishap" includes accidents, incidents, and near misses or good catch.

1.3. All mishaps occurring incidentally to an operation, project, facility, or equipment for which this policy is applicable shall be reported, investigated, and analyzed as prescribed in this section.

1.4. This section establishes the requirements for mishap notification, reporting, and investigation within the scope of the OPP's domain; helps to standardize the processes to improve efficiency and helps to ensure all accidents are reported per 29 CFR Part 1904, "Recording and Reporting Occupational Injuries and Illness."

1.5. The OPP Safety and Occupational Health Staff retain the ability to perform or delegate a third party to investigate any mishaps/incidents that occur within the jurisdictional or the geographic areas of OPPs operations.

2. References

- 29 CFR 1904.39, Recording and Reporting Occupational Injuries and Illness.

3. General Requirements

3.1. The reporting and associated investigation of these mishaps is to be used for data collection, data trending and correction of hazards or program deficiencies before they result in an accident. To encourage reporting of these mishaps, for the betterment of all, this data is NOT to be used for any other reason.

3.2. Mishap investigations are not to be used for disciplinary purposes but rather to learn and prevent similar incidents in the future.

3.3. Program participants involved in, or who become aware of, any mishap are responsible for immediately reporting the occurrence to their employer, supervisor, or other responsible employees.

3.4. Program participants shall report all mishaps, near misses, or good catches to relevant on-ice personnel and OPP as soon as they become aware. Researchers must also notify the support contractor and responsible government authority for the sites they visit. Program participants shall perform and/or assist in an investigation for the cause when warranted. Reference Paragraph 4, Mishap Notification Guidelines, and Paragraph 5, Procedures for Recordable Mishaps and Investigations, below.

3.5. No supervisor may decline to accept a report of a mishap, near miss or good catch from a subordinate.

3.6. The general recordable criteria for injuries or illnesses are any work-related injury or illness that results in:

- Death, regardless of the time between the injury and death, or the length of the illness.
- Days away from work (any time lost after day of injury/illness onset).
- Work restrictions and/or transfer of duties resulting from any workplace injury/illness.
- Medical treatment beyond first aid.
- Loss of consciousness or a significant injury or illness diagnosed by a physician or other licensed health care professional, even if it did not result in those above.
- In addition to the requirements identified above, contractors are required to report property damage of $5,000 or greater.

4. Mishap Notification Guidelines.

4.1. Contractors shall capture reports from any activity in their control including subcontractor, and grantee activities, and ensure reporting to NSF OPP as outlined in this section.

4.2. Compliance is requested where Department of Defense (DoD) and other program partners have their own reporting and investigation processes.

4.3. Notification Procedures for Serious Mishaps

4.3.1. Any mishap that results in or appears to have, any of the consequences listed below shall be **immediately** reported to the OPP.

- Fatal injury/illness.
- Permanent total disability injury/illness (a complete loss or part of any member of the body or any permanent impairment to functions of the body or part thereof to the extent that the individual cannot follow gainful employment).
- Permanent partial disability injury/illness (a complete loss or part of any member of the body or any permanent impairment of the functions of the body or part thereof).
- Where one (1) or more persons are hospitalized because of a single occurrence.
- Where damage of $500,000 or more to OPP-funded property and/or equipment is possible.
- When a significant event may not result in death, be life-threatening, or cause severe damage to OPP-funded property and/or equipment but may carry the potential for adverse publicity for NSF and/or the program.

4.3.2. Upon being notified of a **Serious Mishap**, the contractor's management staff (on-site) shall immediately inform the OPP representative or station manager and the contractor's safety staff, the OPP Safety Officer, and the OPP program managers or ABM.

- When an OPP representative or station manager is on-site, the contractor's management staff, or worksite supervisor shall immediately notify him/her by telephone or in-person.
- When an OPP representative or station manager is not on-site, the contractor's management staff, or worksite supervisor shall immediately notify him/her by telephone or when immediate contact is not possible by email.
- Additionally, the contractor's representative will send an email to the OPP representative or station manager with the known details (per para 4.5.) within 4 hours of any serious mishap.
- When notified, the contractor's safety office will immediately notify the OPP Safety Officer by phone and email at opp-safety@nsf.gov.

4.4. Notification Procedures for Less Serious Mishaps

4.4.1. Any mishap that results in or appears to have any of the consequences listed below shall be reported to the OPP.

- Any injury requiring medical care beyond First Aid.
- The operation of a vehicle (whether moving or halted) that results in injury, damage to the vehicle appearing to be beyond $5,000 but less than $500,000 (as estimated by vehicle maintenance department staff or by somebody with the requisite knowledge), or damage to any property beyond $5,000 but less than $500,000.
- Damage beyond $5,000 but less than $500,000 to any property, equipment, or material incident to an OPP-supported facility.
- Explosions; fires involving ammunition and other explosives; exposure above exposure limits, to radiofrequency, LASER, or ionizing radiation; chemical exposures; contamination or damage of property from biological, radiological, or chemical agents; crane accidents (no matter how minor); and confined space incidents (no matter how minor).

4.4.2. Upon being notified of a **Less Serious Mishap** the contractor's management staff or contractor's safety office will notify the OPP representative or station manager, the OPP Safety Officer, and the OPP program managers or ABM within 24 hours of any less serious mishap (per para 4.5.).

4.5. Mishap notifications shall include, but not limited to, the following:

- Name of the participant(s) killed or injured, job title, and specific location.
- Identification of property (ownership) and/or equipment damaged, and dollar estimate of damage.
- Date and time of mishap.
- Location of mishap, to include research station and project name.
- Contract number and the name of contractor (and/or sub).
- Description, (who, when, what, why, and how) in as much detail as possible.
- Immediate actions taken to control the hazard to prevent further injuries and/or damage.
- Any other information considered pertinent.

4.6. Except for rescue and emergency measures, the mishap scene shall not be disturbed until it has been released by the investigating official.

5. Procedures for Recordable Mishap and Investigations.

5.1. Contractors shall conduct investigations for serious and less serious mishaps (as defined in para. 4.3 and 4.4 above.

5.1.1. A formal mishap report shall be submitted to OPP SOH no later than 30 calendar days following the incident.

5.1.2. Updates shall be provided to the OPP Safety Officer every seven days that identify immediate actions taken, actions in progress, and overall status of the investigation.

5.1.3. Reports shall include a root-cause analysis (covering both direct and indirect causes), corrective actions to mitigate the risk of similar future incidents (with cost estimates), and a proposed timeline for implementation of corrective actions.

5.1.4. The following signature chain shall be used to ensure review at appropriate levels.

- Lead investigator (if other than the contractor safety manager)
- Contractor safety manager
- Contractor management
- OPP Program Manager or ABM
- NSF OPP Safety Officer

5.2. All **Serious Mishaps** as defined in paragraph 4.3.1. above, unless determined otherwise by the OPP Safety Officer, require a Board of Investigation (BOI) appointed by the OPP Safety Officer with approval by the OPP Director.

5.3. Other incidents not listed above may require a BOI investigation, if determined appropriate or necessary by the OPP Safety Officer with approval by the OPP Director.

5.4. The OPP Safety Officer will manage the BOI process and ensure a complete and accurate investigations.

5.5. In addition to the above, any mishap occurring in any of the following high hazard areas shall be immediately reported. These mishaps shall be investigated in depth to identify the cause(s) and to recommend hazard control measures.

- Electrical – to include Arc Flash, electrical shock, etc.
- Uncontrolled Release of Hazardous Energy (includes electrical and non-electrical).
- Cranes and/or rigging.
- Fall-from-Height (any level above surface).
- Confined Space.
- Underwater Diving.
- Explosions; fires involving ammunition and other explosives.
- Exposure or suspected exposures, above OSHA permissible limits to radiofrequency, LASER or ionizing radiation.
- Chemical exposures or suspected exposures, above OSHA permissible limits; contamination or damage of property from biological, radiological, or chemical agents.

5.6. Near Misses or a Good Catch, primarily where a severe loss could have occurred, should be investigated, and recommendations for prevention should be developed and implemented to mitigate the risk of injury, fatality, or property loss. Reporting of this nature is a positive indicator of a proactive safety culture. It symbolizes that personnel truly have internalized the safety process, and that leadership is communicating correctly that reporting is to prevent injuries and not for punishment. It is also recommended that the contractor provide a periodic roll-up of these occurrences to the governmental program/area managers and OPP safety officer.

5.7. Safeguarding Accident Information: Completed accident investigation reports and any attachments, copies, or extracts will not be appended to or enclosed with any other report or document, unless the sole purpose of the other report or document is to aid in accident prevention. Requests for copies of accident reports from outside OPP will be in writing and forwarded to NSF.

5.8. Accident Reporting Integrity: It shall be the responsibility of on-site managers to take reasonable steps to ensure that all accidents are properly reported. If injuries are mentioned through unofficial discussions, or if

local medical clinics receive injuries, they should be reported to the prime contractor's safety office (while protecting personal information) to investigate whether the injury was work-related, as defined by OSHA and this section.

5.9. Criminal Investigations: If there appears to be criminal involvement, criminal investigations will take precedence over a safety investigation. If the two investigations are concurrent, they must remain separate, to include BOI members. The purpose of this is to ensure the safety investigation remains a non-punitive process, which results in a more open sharing of information that can help determine causation to prevent future occurrence.

6. Immediate Procedures - Serious Incident

6.1. The first concern at an accident scene, regardless of its seriousness, is care of the injured. Nothing should interfere with this concern except safety of the rescuers themselves.

6.2. Protect others and preserve property.

6.3. Refer to paragraph 4 above for notification procedures, ensure the controlling contractor's safety and health office is promptly notified.

6.4. The controlling contractor and/or an onsite government representative shall immediately secure the accident site to prevent any alteration of the scene prior to the completion of the investigation.

6.1.1. The site should be maintained as much as possible as it was at the time of the accident so that it can be examined by the BOI.

6.1.2. The method used to secure the site will depend on the conditions and circumstances involved. Several methods are:

- Roping off the area using barricade tape, string, or rope.
- Closing a walkway or stairway leading to the area.
- Using staff to prohibit access to the area.

6.1.3. Whatever methods used; the following procedures should be followed:

- Nothing should be removed from the scene without government approval.
- All program participants should be instructed not to touch, move, or mark anything at the accident site unless asked to do so by the Board Chair or the appointing authority.
- An entry point should be provided to control entry and exit.
- A list of authorized persons shall be kept preventing unauthorized access.

6.5. Only after the accident site is safe to approach should the actual investigation begin.

6.6. Recording Physical Evidence for the BOI.

6.6.1. With the approval of the OPP Safety Officer an onsite government representative and/or management from the controlling contractor will promptly collect physical evidence that could be lost to environmental conditions or for the preservation of critical supplies materials, and/or equipment.

6.6.2. Walkthrough of the accident site: Conditions at an accident scene will change rapidly. Take notice of the location of all items of evidence. Record this information as walkthrough is made, video documentation is highly recommended. Mark the location of items likely to be moved (injured people, light weight, or high value items, etc.).

6.6.3. Photograph all evidence: Photographs of the general area, major elements of the accident site and articles of evidence should be taken as soon as possible after the accident.

6.6.4. Make a diagram of the accident site: A sketch should be made of the accident scene, showing the location of all evidence essential to understanding the accident situation. Distances involved should be measured and recorded on the sketch. Later, information from the sketch can be used to prepare a scaled diagram for inclusion in the accident report.

6.6.5. Make a list of all potential witnesses: The Board will need to interview all persons who may be able to contribute information about the accident. Develop a list of individuals that witnessed the incident or have knowledge that would aid the investigation. Witnesses may create an individual account to document their recollection of the incident for future submission to the Board. These individual memorandums for record shall be encouraged but not submitted to any individual outside of an appointed BOI member or the OPP Safety Officer.

6.7. All Physical Evidence initially collected following the incident shall be submitted to the appointed Board, the OPP Safety Officer, or other designee.

7. Board of Investigation Procedures

7.1. Appointments

7.1.1. BOI membership shall be based on the background and knowledge needed to conduct a thorough investigation.

7.1.2. The OPP Safety Officer may, at his/her option or at the request of the OPP Director, become involved with the Board of Investigation.

7.2. The OPP Safety Officer or designee and other representatives from OPP shall travel as soon as possible and where practical to the site of all accidents that result in a fatality, taking into consideration travel conditions and environmental hazards.

7.3. The BOI will prepare a written report which should contain details of what happened, when it happened and who was involved. It should develop conclusions regarding the physical cause of the accident but should not deal with the placement of legal liability upon any party.
7.4. Additional information that should be included with the written analysis include photos, sketches, diagrams, and other exhibits essential to presenting a clear picture of the incident. The OPP Safety Office will provide additional guidance with the required elements of the investigation and recommended outline for the written report.

7.5. Three copies of the Board's written report will be submitted to the OPP Safety Officer as soon as practical but no later than 90 days following board formation. Note: In unique circumstances, the deadline may be extended with a formal written (email) request from the Board chair to the OPP Safety Officer.

7.6. Actions Following the BOI

7.6.1. The OPP Safety Officer shall retain responsibility to review the BOI report to determine thoroughness, completeness, and suitability of findings and recommended corrective actions.

7.6.2. The OPP Safety Officer will ensure appropriate government and contractor follow-up in response to BOI recommendations.

- Request development of a corrective action plan (CAP) which defines corrective actions for resolving relevant BOI findings.
- Track CAP implementation and confirm progress remains on schedule.
- Verify CAP implementation.
- Request an effectiveness review once the responsible organization has validated completion of the CAP.
- Document closing of all proceedings.

Section 4: Personal Protective Equipment (PPE)

1. Purpose and Scope

This section prescribes requirements, procedures, and policies for providing personal protective equipment and the apparel necessary to protect the health and safety of all personnel from occupational hazards.

Personal protective equipment is the last choice for the control of workplace hazards. Engineering and administrative controls shall be initiated to reduce or eliminate the hazard before personal protective equipment is required.

When engineering and administrative controls do not eliminate or reduce the hazard, adequate protective equipment and apparel shall be provided to prevent or minimize injury or occupational disease. Any breakdown, failure or misuse of PPE immediately leads to the worker being exposed to the hazard. Whether caused by misuse or improper maintenance, PPE can become ineffective without the wearer realizing it, thereby, creating potentially serious consequences. For this reason, an accurate hazard assessment, proper equipment selection, storage, maintenance, employee training (i.e., including equipment limitations), and mandatory enforcement of equipment use are key elements of an effective PPE program.

2. References

- 29 CFR 1910, Subpart I
- ANSI (American National Standards Institute), Z87.1, (Eye and Face Protection).
- ANSI, Z41 1983, (Safety Toe Footwear).
- ANSI, Z88.2, (Respiratory Protection).
- ANSI, Z89.1, Z89.2 (Protective Headgear)

3. General Requirements

3.1. Responsibilities

3.1.1. It is an employer's responsibility to ensure that the proper PPE (e.g., hard hat, respirator, safety eyewear, protective footwear, gloves, harnesses, personal fall protection systems) is available to personnel. It is the supervisor's responsibility to ensure PPE is provided to *personnel* and worn when necessary. Supervisors or on-site managers will inform all visitors to a research station, project, field camp, or other OPP-supported site of the need to wear specific PPE in certain areas and ensure such equipment is available.

3.1.2. It is the responsibility of *personnel* to wear their personal protective equipment when required, report any damage that may have occurred to it during use, and store it as the manufacturer recommends.

3.2. Protective Eyewear Policy

All *personnel* working in eye-hazard areas are required to wear eye protection specific to the hazard encountered.

- Supervisors are responsible for ensuring that eye-hazard operations and hazard areas are identified, and that *personnel* are provided adequate PPE, to include corrective lenses if needed. (Note: NSF OPP will not pay for prescription safety glasses, since there are safety glasses and/or goggles that can be worn over prescription glasses.) Examples of eye-hazard operations are welding, grinding, abrasive

blasting, using acids or corrosives, and chipping. Bright sunlight is also a hazard. Eye-hazard areas are those areas immediately surrounding operations in which light, chemicals, projectiles, particles, or dust would be reasonably expected to cause eye damage if an unplanned event occurs.

- Supervisors are also responsible for ensuring that all PPE and eye tests provided to *personnel* are essential for performing their work. For *personnel* who are only intermittently exposed to eye hazards, using goggles over their glasses may be a suitable alternative to the purchase of safety glasses.
- Eye hazards and protective equipment requirements shall be reviewed with *personnel* during orientation and periodically thereafter. All personnel shall be informed of eye hazards and required to wear safety glasses or equivalent while conducting eye-hazardous operations or while in eye-hazardous areas in OPP facilities or on OPP-funded projects or research.
- All industrial safety glasses shall meet the requirements of American National Standards Institute (ANSI) Z87.1.
- Contact lenses are not considered appropriate substitutes for eye protection.
- For chemical, eye-hazardous operations, emergency eyewashes shall be readily available.

3.3. Protective Footwear Policy

All *personnel* conducting foot-hazard operations or working in foot-hazard areas (extreme cold, snow, around heavy equipment, heavy material handling) are required to wear protective footwear.

- Supervisors are responsible for ensuring that foot-hazard areas are identified and that *personnel* are using the appropriate protective footwear for the hazards associated with the specific job. Foot-hazard operations are those operations that have a high potential for foot injuries, such as cold exposure, material handling, construction, or field operations.
- Foot hazards and protective equipment requirements shall be reviewed with *personnel* during orientation and periodically thereafter.
- Protective footwear when working in areas where there is a danger of foot injuries due to falling or rolling objects, or objects piercing the sole, or when the use of protective footwear will protect the affected employee from an electrical hazard, such as a static-discharge or electric-shock hazard, that remains after the employer takes other necessary protective measures shall meet the requirements of ANSI Z41.1 or ASTM F-2412-2005
- Waterproof boots will be considered protective footwear. If a compression hazard exists along with the hazard of excessive moisture, then the waterproof boots will be the type that have a safety toe built in.
- Protective footwear shall be properly maintained by the *participant* while it is in the employee's possession.

3.4. Respiratory Protection

- When respiratory protective equipment is required, a respiratory protection program shall be developed and implemented. The program shall include, but not be limited to, training, fit testing, equipment selection, maintenance, and medical surveillance, in accordance with 29 CFR 1910.134.
- The medical status of individuals who are to wear respirators shall be evaluated, and a statement from a physician or licensed healthcare professional that indicates the individual is qualified to wear the specified type of respirator shall be kept by the prime contractor's safety office.
- Only approved respiratory protective devices shall be provided and used. "Approved" means that the respirator and its component parts have been tested and listed as satisfactory by the National Institute for Occupational Safety and Health (NIOSH), or applicable host nation requirements, where available.

- A competent person knowledgeable of inhalation hazards and respiratory protective equipment shall conduct a step by step evaluation to ensure only appropriate respiratory protection for the conditions of exposure (including high altitude) is utilized.

3.5. Protective Headwear

All *personnel* shall wear hard hats when working in or visiting a hard hat area or working at heights.

- Hard hat areas shall be identified, and all points of entry to a hard hat area shall have a hard hat caution sign posted.
- Hard hat areas shall be general areas, such as construction, alteration, or demolition sites rather than specific portions of a building or project.
- All protective headgear shall meet the requirements of ANSI Z89 Class C, E, and/or G.
- Protective headgear worn near electric lines and equipment shall be of the appropriate class.

For additional information see Section 15: Helmet Policy.

3.6. Hearing Protection

- All *personnel* that are exposed to excessive noise shall be considered for inclusion in a medical surveillance program for hearing conservation, in accordance with 29 CFR 1910.95.
- Noise monitoring shall be coordinated by the contractor's safety office.
- Results of the noise monitoring shall be used to determine the appropriate type of hearing protection.
- All *personnel* working in a noise-hazardous area shall wear hearing protection.
- Supervisors are responsible for identifying potential hazards, training *personnel* in the proper use of hearing protection, and enforcing the use of hearing protection. The need for hearing protection is suspected when any one of the following three conditions exist:
    - *Personnel* have difficulty communicating with each other by voice when in the presence of noise.
    - *Personnel* report head noises or ringing in the ears (tinnitus) after working for several hours in the noise.
    - *Personnel* sustain a temporary hearing loss following several hours of noise exposure, which has the effect of muffling speech and other sounds.

3.7. Miscellaneous PPE

A number of chemical, physical, and environmental hazards can be controlled with miscellaneous PPE.

- Clothing, such as coats, parkas, pants, or coveralls made of special materials designed to protect against specific or general exposures to irritant, toxic, or corrosive materials may be reusable or disposable. In most cases, protective clothing is made of special impervious materials, which can withstand repeated or prolonged contact with solvents, acids, alkalis, or other chemical or physical agents.
- Special foot protection, such as slip-on toe protectors, metatarsal protectors, hip boots, oil or chemical resistant boots, waterproof boots, or insulated boots.
- Personal flotation devices (PFDs).
- Insect bite kits, for protecting employees who are sensitive to or allergic to insect bites.
- Chaps, for protection when using chain saws.
- Safety harnesses and lanyards for fall protection.
- Insect repellent in areas infested with chiggers, mosquitoes, and ticks.
- Arc flash clothing and face shields.

Section 5: Fall Protection and Prevention

1. Purpose and Scope

1.1. This section provides the minimum requirements for fall protection applicable to those exposed to falls, working at heights, and/or using fall protection equipment.

1.2. The policies and procedures of this section aim to protect program participants by reducing the risk of injury or fatality due to falls, either from height or from the same level.

1.3. The OPP SOH will provide technical guidance and assistance to help maintain compliance and issue waivers or variances as specified in this policy.

2. References

- 29 CFR 1910, Subpart D Walking-Working Surfaces
- 29 CFR 1926 Subpart M Fall Protection
- 29 CFR 1910.132 Personal Protective Equipment

3. General Requirements

3.1. When program participants are exposed to falls, contractors and program partners working under the jurisdiction of the National Science Foundation (NSF), Office of Polar Programs (OPP) are responsible for developing a written fall protection and prevention program ((FPPP) (See Paragraph 7)).

3.2. The fall protection threshold height requirement for work covered by this policy, unless specified separately, will be 4 ft (1.2 m) or more above adjacent floor or ground level.

3.3. Military members while conducting inherent military operations shall comply with service instructions, regulations, and operational orders.

3.4. Walking and working surfaces of a workplace must be kept clean, orderly and in sanitary condition and to the extent feasible, dry.

3.5. Any program participants exposed to fall hazards shall be protected from falling to a lower level using standard guardrails, work platforms, temporary floors, safety nets, engineered fall protection systems, personal fall arrest systems, or the equivalent, in the following situations:

3.5.1. Whenever workers or researchers are exposed to falls from unprotected sides or edges, access ways, unprotected roof edge or floor openings, holes and skylights, unstable surfaces, leading edge work, scaffolds, formwork, work platforms, re-bar assembly, steel erection, towers, and engineered metal buildings.

3.5.2. Whenever workers or researchers operate on access ways or work platforms over water or ice, or machinery.

3.5.3. When workers are installing or removing sheet piles, h-piles, cofferdams, or other interlocking materials from which they may fall six feet (1.8 meters) or more.

5.4. Wherever there is a possibility of a fall from any height onto dangerous equipment, hazardous operation, into a harmful environment, or onto an impalement hazard.

3.5.5. Whenever connectors are working at the same connecting point (for steel erection activities), they shall connect one end of the structural member before going out to connect the other end. The connectors shall always be tied off 100%.

4. Fall Hazards

4.1. Fall hazards must be evaluated to determine the preferable method of control. The order of control measures (the hierarchy of controls) to abate fall hazards or to select and use a fall protection method to protect workers performing work at heights shall be:

4.1.1. Elimination. Remove the hazard from work areas; change the task, process, or controls; or use other means to eliminate the need to work at heights, with its subsequent exposure to fall hazards (i.e., build roof trusses on ground level and then lift into place, or design a change by placing a meter or valve at a lower level). This control measure is the most effective.

4.1.2. Prevention. Isolate and separate fall hazards from work or research areas by erecting same-level barriers, such as guardrails, walls, covers, or parapets.

4.1.3. Work platforms. Use scaffolds, scissor lifts, work stands, or aerial lift equipment to facilitate access to work or research locations and to protect personnel from falling when performing work at elevated locations.

4.1.4. Administrative Controls. Introduce new work practices that reduce the risk of falling from heights or warn people to avoid approaching a fall hazard (i.e., warning systems, warning lines, audible alarms, signs, or training for workers and/or researchers to recognize specific fall hazards).

4.1.5. Personal Protective Systems and Equipment. Use fall protection systems, including (in order of preference) restraint, positioning, or personal fall arrest. All systems require the use of full body harness, a means of connecting, and a safe anchorage system.

5. Roles and Responsibilities

5.1. Fall Protection Program Manager (FPPM)

5.1.1. The Prime Contractor's FPPM is the designated authority responsible for the overall development, implementation, monitoring, and evaluation of the Fall Protection Program. This person can also function as a Qualified Person (QP), Competent Person (CP), CP trainer, QP trainer and/or competent rescue trainer if so trained.

5.1.2. Certifies through documentation that the inspections required by this section have been accomplished (See Paragraph 10).

5.2. Qualified Person for Fall Protection

5.2.1. The QP is responsible for technical support of the Fall Protection Program.

5.2.2. The QP shall have an advanced understanding and knowledge of the requirements, equipment and systems, physical sciences, and engineering principles that affect equipment and systems for fall protection and rescue.

5.2.3. The QP will supervise the design, selection, installation and inspection of certified anchorages, and horizontal lifelines.

5.3. Competent Person for Fall Protection

5.3.1. The CP is responsible for the immediate supervision, implementation, and monitoring of the Fall Protection Program.

5.3.2. The CP shall have the authority to stop the work immediately if it is determined to be unsafe and take prompt corrective measures to mitigate fall hazards.

5.4. End User

5.4.1. The End User shall understand workplace activities and follow the policy and procedures and the instructions of the CP regarding the use of fall protection and rescue systems and equipment.

5.4.2. Bring all unsafe or hazardous conditions or actions that may cause injury to them or others, to the attention of the CP.

5.4.3. Properly use, inspect, maintain, store and care for their fall protection equipment and Systems.

5.4.4. Inspect all fall protection equipment for damage or defects, prior to each use and notify the CP of recognized problems and shall not use that equipment.

5.5. Rescue Personnel

5.5.1. Competent Rescuer: The Competent Rescuer is responsible for anticipating the potential for planned rescue and ensuring effective rescue plan/procedures and methods are in place before End Users starts any work at heights. This function may be performed by local emergency services, in-house professionals, competent or qualified persons or contractor services.

5.5.2. Authorized Rescuer: Authorized Rescuers are responsible for performing and/or assisting in workplace rescues for personnel suspended in or attached to fall protection systems.

6. Training

6.1. Training for all involved personnel, the Program Manager, Qualified Person(s), Competent Person(s), End Users, Authorized and Competent Rescuers, as well as any associated fall protection trainers, shall be in accordance with the requirements prescribed in ANSI/ASSE Z359.2.

6.2. Competent Person for Fall protection (CP) shall be trained by a CP trainer or a Qualified Person Trainer (see ANSI/ASSE Z359.2).

6.3. Documentation

6.3.1. A training record shall be maintained for each participant and retained for current program and previous program participants for a period of no less than one (1) year.

6.3.2. Individual certification of completion shall contain names of participants trained, the time, date, and location of training, and the name and contact information for the trainer.

6.3.2. Organizational documentation shall include trainer/evaluator's name, list of students, training or evaluation organization's name, dates and times of training and evaluations, course objectives, content of training program, and description of performance based physical demonstrations of skills or exercises.

7. Fall Protection and Prevention Plan

7.1 The OPP requires the development and implementation of a detailed fall protection and prevention plan (FPPP) and believes it essential to safeguard program participants at risk for a fall.

7.2. This plan may be developed by the FPPM, CP or QP.

7.2.1. If the plan includes fall protection components or systems requiring direction, supervision, design calculations or drawings by a QP, the name, qualifications, and responsibilities of the QP shall be addressed.

7.3. The plan shall describe, in detail, the specific practices, equipment and control methods used to protect workers from falling to lower levels.

7.4. This plan shall be updated as conditions change, at least every twelve months and shall include:

- Duties and responsibilities: Identify CPs and QPs and their responsibilities and qualifications.
- Descriptions of training requirements to include safe use of fall protection equipment.
- Anticipated fall hazards and prevention/control methods.
- Inspection, maintenance, and storage locations of fall protection equipment.
- Design of anchorages/fall arrest and horizontal lifeline systems.
- Rescue plan and procedures.
- Inspection and oversight methods.
- Means used to enforce compliance with the FPPP.
- Procedures for evaluating program effectiveness.

7.5. Rescue and Evacuation Plan and Procedures

7.5.1. Provide a Rescue and Evacuation Plan in accordance with ANSI Z359.2 and include in the FPPP.

7.5.2. Include a detailed discussion of the following: methods for assisted rescue; methods of self-rescue; equipment used; training requirement; specialized training for the rescuers; procedures for requesting rescue and medical assistance; and transportation routes and methods to a medical facility.

8. Equipment and Systems

8.1. Enforce the use of personal fall protection equipment and systems for each specific work activity and designate in a Site-Specific Fall Protection and Prevention Plan and JHA/AHA where program participants are exposed to a fall hazard (to include fall arrest, restraint, and positioning). Grantees shall comply with the

contractor's site-specific plans or submit a valid plan for government acceptance when performing work activities at an OPP controlled site or station.

8.2. Personal fall protection systems and equipment are required when working from an articulating or extendible boom, swing stages, or suspended platform. In addition, personal fall protection systems are required when operating other equipment such as scissor lifts. The need for tying-off in such equipment is to prevent ejection of the employee from the equipment during raising, lowering, travel, or while performing work.

8.3. Provide personal fall protection equipment, systems, subsystems, and components that comply with 29 CFR 1926.500 Subpart M, ANSI Z359.0, ANSI Z359.1, ANSI Z359.2, ANSI Z359.3, ANSI Z359.4, ANSI Z359.6, ANSI Z359.7, ANSI Z359.11, ANSI Z359.12, ANSI Z359.13, ANSI Z359.14, ANSI Z359.15, ANSI Z359.16 and ANSI Z359.18.

8.3.1. Only a full-body harness with a shock-absorbing lanyard or self-retracting lanyard is an acceptable personal fall arrest body support device. The use of body belts is not acceptable.

8.3.2. Equip all full body harnesses with Suspension Trauma Preventers such as stirrups, relief straps, or similar equipment to provide short-term relief from the effects of orthostatic intolerance.

8.3.3. Snap hooks and carabineers must be self-closing and self-locking, capable of being opened only by at least two consecutive deliberate actions and have a minimum gate strength of 3,600 lbs. (1633 kg) in all directions.

8.3.4. Only use webbing, straps, and ropes made of synthetic fiber.

8.5. The maximum free fall distance when using fall arrest equipment must not exceed 6 feet (1.8 m) nor contact a lower level.

8.6. A personal fall arrest system that was subjected to an impact must be removed from service immediately.

8.7. Anchorage

8.7.1. Anchorages used for attaching the Personal Fall Arrest System (PFAS) shall be independent of any anchorage used to support or suspend platforms. They shall be capable of supporting at least 5,000 lbs. (22.2 kN) per worker attached or designed by a QP for twice the maximum allowable arrest force on the body.

8.7.2. The anchorage strength requirement for restraint systems shall be 3,000 lbs. (13.3 kN) or designed by a QP for two times the foreseeable force.

8.7.3. Anchorage strength for Ladder-Climbing Devices (LCD) shall be a minimum of 3,000 lbs.

8.7.4. Do not use electric conduits, utility pipes, ductwork, or unstable points as anchorages.

8.8. Connectors used to tie the PFAS to any anchorage shall be capable of withstanding without breaking 5,000 lbs. (22.2 kN) load per worker attached.

8.9. Horizontal Lifelines (HLL)

8.9.1. Provide HLL in accordance with 29 CFR 1926.500.

8.9.2. Commercially manufactured HLL's must be designed, installed, certified, and used, under the supervision of a qualified person, for fall protection as part of a complete fall arrest system which maintains a safety factor of two (2).

8.9.3. The competent person for fall protection may (if deemed appropriate by the qualified person) supervise the assembly, disassembly, use and inspection of the HLL system under the direction of the qualified person.

8.9.4. Locally manufactured HLLs are not acceptable unless they are custom designed for limited or site-specific applications by a Registered Professional Engineer who is qualified in designing HLL systems.

8.9.5. Steel cable/wire rope guardrails may not be used as a Horizontal Lifeline (HLL) unless designed and approved by a QP.

8.10. Ladder-Climbing Devices

8.10.1. A LCD is a sleeve or cable/rope attached to a fixed ladder over 20 ft (6 m) in length.

8.10.2. The free fall distance when using a LCD shall not exceed 2 ft (0.6 m).

8.10.3. There shall be 100% transition at the top of the LCD for safe access to above work surface or roof.

9. Additional Measures

9.1. Covers

9.1.1. Install covers (or other methods of control) on any hole 2 in (5.1 cm) or more in its least dimension on walking/working surfaces such as floors, roofs or other openings.

9.1.2. Covers shall be capable of supporting without failure, at least twice the weight of the worker, equipment, and material combined.

9.1.3. Covers shall be secured when installed, clearly marked with the word "HOLE", "COVER" or "Danger, Roof Opening-Do Not Remove" or color-coded or equivalent methods (e.g., red or orange "X").

9.2. Guardrails. Design, install and use guardrails in accordance with 29 CFR 1926 Subpart M.

9.3. Nets. Design, install and use safety nets in accordance with 29 CFR 1926 Subpart M.

9.4. Warning Line Systems (WLS). WLS must be developed in accordance with 29 CFR 1926.502 and must be approved by the Contractor's Safety and Health before program participants are exposed to fall hazards.

9.5. Safety Monitoring Systems (SMS). The use of SMS as a fall protection method is prohibited.

9.6. Other Engineered Fall Protection Systems

9.6.1. Fall protection is required on fixed ladders taller than (or that extend beyond 24 ft. As of November 19, 2018, cages are no longer considered compliant fall protection in newly installed fixed ladders. To meet the new standards, a personal PFAS or ladder safety system is required.

9.6.2. A personal fall arrest system or ladder safety system will be used to replace any damaged or nonfunctioning section, cage, or well previously installed on a fixed ladder.

9.6.3. As of November 19th, 2036, cages will no longer be accepted as a form of fall protection, and all fixed ladders taller than (or that extend beyond) 24 feet high must use a personal fall arrest system or a ladder safety system.

9.6.4. Existing fixed ladders that do not meet these requirements shall be brought to the attention of NSF OPP.

10. Inspection Requirements

10.1. The FPPM shall conduct an inspection of this program annually to certify that established procedures and requirements are being followed.

10.2. Periodic inspections shall be performed by an accepted Fall Protection Competent Person.

10.3. Inspections shall:

- Correct any deviations or inadequacies identified.
- Be documented, include the date of the inspection, contain any person(s) included in the inspection, and identify the qualified, competent, and/or authorized person(s) completing the inspections.
- Contain a review of the FPPP application and effectiveness.
- Include an evaluation of End User understanding of their roles and responsibilities.
- Include the deviations and inadequacies with recommended corrective action(s) and provide anticipated date(s) of completion and reinspection.

11. Reports

11.1. The contractor shall designate and submit qualifications and training certificates of qualified and/or competent person(s) designated as the authority with management responsibility for the FPPP and additionally submit qualifications of other designated competent and/or qualified persons with administrative responsibility to the NSF, OPP, Office of Safety and Occupational Health (SOH) when changes are made.

11.2. The contractor's designated authority (FPPM) shall complete an annual FPPP program review and certify through documentation that the inspections required by this section have been accomplished (See Paragraph 10).

Section 6: Hazardous Energy Control Program (Lockout and Tagout Procedures)

1. Purpose and Scope

1.1 The requirements of this section apply to the application of the Hazardous Energy Control Program (HECP) and Lockout/Tag-Out (LO/TO) procedures.

1.2 These policies and procedures are designed to protect participants from the accidental or unintended release of stored energy, movement, or flow in electrical potential, mechanical, or material systems, resulting in an injury or fatality.

1.3. Hazardous energy is any energy, including but not limited to mechanical (e.g., power transmission apparatus, counterbalances, springs, pressure, and gravity), pneumatic, hydraulic, electrical, chemical, nuclear, and thermal (e.g., high or low temperature) energies, that could cause injury to people(s).

1.4. The OPP SOH will provide technical guidance and assistance to help maintain compliance and issue waivers or variances as specified in this policy.

2. References

- 29 CFR 1910.147, The Control of Hazardous Energy (Lockout/Tagout)
- 29 CFR 1915.89, Control Energy (Lockout / Tags-Plus)
- NFPA 70E, Standard for Electrical Safety in the Workplace

3. General Requirements

3.1. Contractors and program partners working under the jurisdiction of the National Science Foundation (NSF), Office of Polar Programs (OPP) when working on or near any system that produces, uses, or stores hazardous energy are responsible for developing a written Hazardous Energy Control Program (HECP) (see Hazardous Energy Control Program below).

3.2. If an energy isolating device is capable of being locked out, the energy control program shall utilize lockout, unless it can be demonstrated that the use of a tag-out system will provide a level of safety equivalent to that obtained by using a lockout system.

3.3. As of January 2, 1990, whenever replacement, major repair, renovation, or modification of equipment is performed, and whenever new equipment is installed, energy isolating devices for such equipment shall be designed to accept a lockout device.

4. Roles and Responsibilities

4.1. Contractor SOH

4.1.1. Ensure that adequate HECP and LO/TO procedures are developed and implemented to verify the safety of employees and program partners and/or machinery or equipment.

4.1.2. Ensure that all Supervisors receive training on the HECP and LO/TO procedures.
4.1.3. Assist Supervisors/Foreman with developing equipment specific HECP and lockout procedures.

4.1.4. Regularly provide updates and changes and conduct annual reviews of HECP and LO/TO procedures.

4.1.5. Certify through documentation that the inspections required by this section have been accomplished (> See Paragraph 10 of this Section).

4.1.6. Ensure outside contractors have a HECP and LO/TO policy that complies with all applicable regulations and are at least as stringent as regulatory requirements.

4.2. Supervisors/Foremen

4.2.1. Assist with developing equipment specific LO/TO procedures.

4.2.2. Ensure that HECP and LO/TO procedures are properly applied in their area of operations.

4.2.3. Ensure that employees under their supervision apply HECP and LO/TO procedures where necessary.

4.2.4. Ensure that employees under their supervision have received training on how the HECP and LO/TO procedures function.

4.2.5. Ensure the availability of locks, tags, lockout box(s), and equipment specific lockout procedure(s) to all employees required to use them.

4.2.6. Determine who will be the Responsible/Lead (Primary) Authorized Individual for coordinating multiple sources/multiple crew lockouts.

4.2.7. Conduct a periodic inspection of the energy control procedure (at least annually) to ensure that the procedure and the provisions of this section are followed.

4.2.8. Identify and prioritize equipment list for LO/TO procedures.

4.3. Authorized Individuals: A person who locks out or tags out machines or equipment to perform servicing or maintenance on that machine or equipment.

4.3.1. Conduct, implement and coordinate hazardous energy isolation LO/TO procedures as required by the employers HECP.

4.3.2. Apply and remove their own locks and/or tags and no one else's. Reference the employer's HECP for the removal of LO/TO devices.

4.3.3. Indicate when LO/TO procedures are required before submitting work requests to Supervisor.

4.3.4. Notify affected employees and participants of the application and removal of LO/TO devices in the work area.

4.3.5. Attend LO/TO training.

4.4. Affected Individuals

An employee or program participant whose job requires him/her to operate or use a machine or equipment on which servicing, or maintenance is being performed under LO/TO procedures, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed.

4.4.1. Abide by the rules of the LO/TO procedures.

4.4.2. Follow instructions of authorized individuals.

4.4.3. Contact their supervisor if there are any questions concerning the LO/TO situation.

5. Training

5.1. All program participants will receive initial and periodic (annual) training to recognize hazardous energy sources, the types and magnitude of the energy present in the workplace, and the methods and means necessary for energy isolation and control.

5.2. Contractors and program partners shall ensure training applicable to the roles and responsibilities is provided to authorized individuals and confirm their understanding of the purpose and function of the HEC procedures and that they possess the knowledge and skills required for the safe application, use, and removal of HEC devices.

5.3. When tagout systems are used (only when lockout is not possible), authorized individuals shall be trained in the limitations of tags.

5.4. Authorized individuals shall be retrained in HEC procedures whenever:

- There is a change in job responsibilities or a change in systems or processes that present a new energy control hazard.
- A periodic inspection reveals, or there is reason to suspect the presence of, inadequacies in or deviations from the authorized individual's knowledge or use of HEC procedures.
- There is a change in a contractor or local HEC procedure(s).

5.5. Affected individuals whose work operations are or may be in an area where energy control procedures may be used shall be instructed about the procedure and about the prohibition against attempting to restart or re-energize machines or equipment that are locked out or tagged out. This training may be accomplished during regularly scheduled safety meetings. They shall be made aware that lockout or tag-out are performed only by the authorized individuals performing the servicing or maintenance.

5.6. Documentation

5.6.1. A training record shall be maintained for each participant and retained for current program and previous program participants for a period of no less than one (1) year.

5.6.2. Individual certification of completion shall contain names of participants trained, the time, date, and location of training, and the name and contact information for the trainer.

5.6.3. Organizational documentation shall include trainer/evaluator's name, list of students, training or evaluation organization's name, dates and times of training and evaluations, course objectives, content of training program, and description of performance based physical demonstrations of skills or exercises.

6. Hazardous Energy Control Program

6.1. The HECP shall clearly and specifically outline the scope, purpose, authorization, roles and responsibilities, rules, and techniques to be used for the control of hazardous energy and provide the requirements of this Section (See Paragraph 6.2) and those of 29 CFR 1910.147, ANSI Z244.1, and ANSI A10.44.

6.2. The HECP shall include, but are not limited to, the following:

6.2.1. HECP procedures, required equipment, specific steps to control each energy source and include isolating, blocking, verifying, and securing systems.

6.2.2. Means of coordinating and communicating HEC activities with all site personnel (include all contractor's, government, suppliers, visitors and any other affected individuals) to ensure continuity of protection.

6.2.3. Responsibilities and procedural steps for the placement, removal, and transfer of locks, tags and other control devices.

6.2.4. Responsibilities, procedural steps, and means of accounting for placing and removing protective grounds.

6.2.5. Coordination (Shift/Schedule and redeployment changes). Provisions shall be made to ensure total continuity of HEC protection during shift, personnel, and staff redeployment changes.

6.2.6. Procedural steps, responsibilities, and requirements for testing the system to verify the effectiveness of isolation and control.

6.2.7. Instruction for emergency procedures.

6.2.8. The means used to enforce compliance with the HECP.

6.2.9. Procedures for evaluating program effectiveness.

7. Equipment and Systems

7.1. No LO/TO device shall be removed by anyone other than the individual who placed it.

7.2. Locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners, or other hardware shall be provided for isolating, securing, or blocking equipment from energy sources.

7.3. LO/TO devices shall be singularly identified, shall be the only devices used for controlling energy, shall not be used for other purposes.

7.4. LO/TO devices shall be capable of withstanding the environment to which they are exposed for the maximum period that exposure is expected.

7.4.1. Tags shall be constructed and printed so that exposure to weather conditions or wet and damp locations will not cause the tag to deteriorate or the message on the tag to become illegible.
7.4.2. Tags shall not deteriorate when used in corrosive environments, such as areas where acid and alkali chemicals are handled and stored.

7.5. LO/TO devices shall be standardized within the facility according to at least one of the following criteria: color, shape, or size. Additionally, tag-out devices should be standardized in print and format.

7.6. LO/TO devices shall be substantial:

7.6.1. Lockout devices shall be substantial enough to prevent their removal without the use of excessive force or unusual techniques, such as with the use of bolt cutters or other metal cutting tools.

7.6.2. Tags, including their means of attachment, shall be substantial enough to prevent inadvertent or accidental removal.

7.7. LO/TO devices shall clearly identify the authorized individual (by name) applying the device, include the individuals trade, contact information and redeployment date.

7.8. LO/TO devices shall warn against the hazardous condition if the machine or equipment is energized.

8. Additional Measures

8.1. Removal of LO/TO devices by other than the Authorized Individual is considered a High Hazard Activity. LO/TO devices may be removed by the Authorized Individual's immediate trade Supervisor, if the Authorized Individual who applied the HEC device is not available.

8.2. The Supervisor must:

8.2.1. Verify that the Authorized Individual who applied the device is unavailable, every effort must be exhausted to contact this individual.

8.2.2. Verify the servicing and/or maintenance are complete, and the equipment is ready for normal operation. Check the area or equipment to ensure:

- Operating controls are set to the "off" position.
- Tools and nonessential items are removed, and equipment components (e.g. guards) are in place.
- Affected employees and others in the work area must be warned that power is about to be restored.
- Ensure all persons are safely positioned away from the equipment/system.
- Verify other Locks or tags are removed from the energy isolating device(s) by the employees who applied them.
- 8.1.3. Document that all reasonable efforts were made to contact the Authorized Individual to inform him/her that his/her device has been removed.

8.1.4. Document that the Supervisor has contacted the responsible Manager to notify and verify that the lock needs removal.

8.1.5. Before the Authorized Individual returns to work, ensure they are informed that their lock/tag has been removed.

9. Inspection Requirements

9.1. A qualified individual shall conduct an inspection of the energy control procedures at least annually to ensure that established procedures and requirements are being followed.

9.2. Periodic inspections shall be performed by a competent person other than the one(s) utilizing the energy control procedures being inspected.

9.3. Periodic inspections shall be performed by a competent and/or authorized persons to identify machinery or equipment requiring HEC provisions. This inspection shall identify and list the machine or equipment on which the energy control procedures are used.

9.4. Inspections shall:

9.4.1. Correct any deviations or inadequacies identified.

9.4.2. Be documented, include the date of the inspection, contain any person(s) included in the inspection, and identify the qualified, competent, and/or authorized person(s) completing the inspections.

9.4.3. Contain a review of the HECP and LO/TO procedures application and effectiveness.

9.4.4. Include an evaluation of authorized individuals, affected employees, and participants understanding of their roles and responsibilities.

9.4.5. Include the deviations and inadequacies with recommended corrective action(s) and provide anticipated date(s) of completion and reinspection.

10. Reports

10.1. The contractor shall designate and submit qualifications and training certificates of qualified and/or competent person(s) designated as the authority with management responsibility for the HECP and additionally submit qualifications of other designated competent and/or qualified persons with administrative responsibility to the NSF, OPP, Office of Occupational Safety and Health (SOH) when changes are made.

10.2. The contractor's designated authority shall complete an annual HECP and LO/TO program review and certify through documentation that the inspections required by this section have been accomplished (See Paragraph 9, Inspection Requirements of this Section (above)).

Section 7: Confined Space Entry Program

1. Purpose and Scope

This section contains requirements for practices and procedures to protect personnel from the hazards associated with entry into permitted confined spaces.

This section applies to all operations and research activities performed under OPP auspices.

2. References

- 29 CFR 1910.146
- DHHS (NIOSH) Publication No. 87-113; "A Guide to Safety in Confined Spaces" http://www.cdc.gov/niosh/docs/87-113/default.html

3. General Requirements

This section explains the minimum requirements for an acceptable, written, site-specific confined space program. In situations where competing requirements exists, the most restrictive requirement prevails. General requirements include:

- At each activity, a competent person shall evaluate whether there is potential for permit-required confined space entry.
- The evaluation shall use the definitions presented in paragraph 4 of this section to determine the presence of confined spaces.
- A list of confined spaces (both permit-required and non-permit-required) shall be maintained on site.
- All permit-required confined spaces shall be identified with a sign or by any other equally effective means to inform personnel of the existence, location of, and danger posed by the permit-required confined space. Signage will be written in English and the host nation language and will read as follows:
    - DANGER -- PERMIT-REQUIRED CONFINED SPACE, DO NOT ENTER

3.1. Responsibilities

3.1.1. Authorized Entrants

Authorized entrants shall:

1. Communicate with the attendant as necessary so the attendant can monitor entrant status and alert entrants of any need to re-evaluate the permit-required confined space.
2. Evacuate the permit-required confined space and alert the attendant whenever they:
    a. Recognize any warning signs or symptoms of exposure to a dangerous situation,
    b. Or if they detect a prohibited condition, or whenever the attendant or entry supervisor orders evacuation, or whenever an evacuation alarm is activated.

3.1.2. Attendants

Attendants shall:

1. Remain outside the permit-required confined space during entry operations until relieved by another attendant.
2. Take action when conditions warrant evacuation of the permit-required confined space, inform the entry supervisor of conditions, and warn persons approaching the permit-required confined space.
3. Maintain an accurate list of personnel within the permit-required confined space and a means to identify the personnel.
4. Communicate with entrants as necessary to monitor them and alert them of the need to evacuate.
5. Immediately order evacuation of the permit-required confined space if additional hazardous conditions emerge.
6. Perform non-entry rescue as specified in the permit and summon rescue or other emergency services as necessary.
7. Not perform any other duty other than that of attendant during permit-required confined space entry.

3.1.3. Entry supervisors

Entry supervisors shall:

1. Verify that all tests specified by the permit have been conducted and that all necessary equipment and procedures are in place before entry.
2. Terminate the entry when assigned work is completed or when conditions warrant evacuation.
3. Verify that rescue services are available and that means of summoning them are operable.
4. Ensure that entry operations are consistent with the terms of the entry permit and that acceptable conditions are maintained.

3.2. Permit-Required Confined Space Entry Procedures

- The designated official shall develop and implement a system for preparing, issuing, and canceling permit-required confined space entry permits. At a minimum, these permits must have the information listed in the sample permit (Appendix C) in whatever format is desired. Additional information may be included if necessary or desired.
    - Before entry begins, the entry supervisor identified on the permit shall sign the permit to authorize entry.
    - The completed permit shall be posted at the entry portal so that entrants can confirm the pre-entry preparations have been completed.
    - The permits shall be kept in a log book on-site for review by OPP.
    - The duration of the permit shall not exceed the time required to complete the task identified on the permit.
- Plans and procedures shall be developed for summoning rescue personnel and for preventing unauthorized personnel from attempting a rescue.
- The entry supervisor shall designate at least one attendant who will remain outside the permit-required confined space for the duration of the activity.
- The designated official shall develop procedures to ensure that when more than one crew is authorized entry, the activities of one crew will not interfere with the work of the other crew.
- The designated official shall review the entry program periodically to ensure the measures contained in the program are still adequate.

3.3. Training Requirements

- All employees shall be instructed not to enter permit-required confined spaces without the proper permit that describes procedures and practices for the space.
- Employees who are required to enter permit-required confined spaces or act as attendant or entry supervisor shall be trained in the knowledge and skills necessary for the safe performance of their work. The employees must also be familiar with the hazards associated with the entry and the measures used to ensure safe conditions.
- Training shall conform to the requirements of the references above.
- All training shall be certified by the instructor upon successful completion by participants.
- Evidence of training shall be available onsite where the entry is occurring for government review if needed.

3.4. On-Site Rescue Teams

- Each member of the rescue team shall be trained in the use of personal protective equipment and other equipment necessary to perform a rescue.
- Each member of the rescue team shall practice making a rescue at least once every 12 months. The practice drill shall simulate actual conditions within the permit-required confined space.
- Each member of the rescue team shall receive the same level of training as authorized entrants and shall be trained in basic first aid and cardiopulmonary resuscitation (CPR).

3.5. Off-Site Rescue and Emergency Services

- To ensure availability in case of need, contact must be made with emergency services before entry into a permit-required confined space. If there are no emergency services, a rescue team must be established and trained in permit-required confined space rescue procedures, with all necessary emergency equipment.
- The rescue service shall be informed of the associated hazards that may be present during a rescue.
- A rescue team shall be provided access to all permit-required confined spaces for which rescue may be necessary so the service can develop appropriate plans. The team shall be trained in permit-required confined space rescue procedures, with all necessary emergency equipment at the work site.

3.6. Retrieval Systems

- Each authorized entrant shall use a chest or full body harness, with a retrieval line attached at the center of the entrant's back near the shoulder level or above the entrant's head.
- Retrieval lines shall be attached to a mechanical device or fixed point outside the permit space in such a manner that rescue can begin as soon as the rescuer becomes aware of the need for rescue.
- A mechanical device shall be available to retrieve personnel from vertical permit-required confined spaces more than 1.5 meters (5 feet) deep.

3.7. Recordkeeping

Records shall be maintained at each facility by the supervisor documenting the training. Records shall include safety drills, inspections, tests and maintenance, and any atmospheric tests made, to include time, date, atmospheric concentrations of substances for which there is a permissible exposure limit, PPE used, and employees' names.

3.8 Sample Activity Hazard Analysis, Confined Space Entry

Listed below are hazards associated with entering a confined space and possible means of controlling those hazards.

Hazard: Toxicity

Causes:

- Toxic levels of substances in confined space
- Decomposition of organic material in confined space
- Toxic mixture of substances in confined space
- Substances being used in confined space, e.g., cleaning solvents
- Residual vapors from previous contents of confined space
- Welding fumes or vapors

Controls:

- Evaluate previous history of the confined space to avoid reactions with residual chemicals, wall scale, and/or sludge, which can be highly reactive.
- Check for compatibility of materials when structural members and/or equipment are introduced e.g., aluminum ladder, cleaning solvents.
- Utilize proper respiratory equipment based on air monitoring.

Hazard: Insufficient Oxygen

Causes:

- Rust
- Use of other gases, e.g., nitrogen, carbon dioxide.
- Welding

Controls:

- Maintain atmospheric oxygen level of 21% by volume through ventilation and/or exhaust.
- Provide and maintain adequate ventilation and exhaust, as per specific conditions in the confined space.
- Self-contained breathing apparatus.

Hazard: Explosion/Fire in Confined Space

Causes:

- Combination of combustible gases and a spark from activity of an employee in confined space (dip testing tank, welding, electric tools, light bulbs, matches).

Controls:

- No matches, lighters, or other flame-producing sources allowed in confined space.
- Explosion proof bulbs.
- Provide adequate ventilation to prevent an enriched oxygen atmosphere or to eliminate the explosive or flammable atmosphere.

Hazard: Explosion/Fire at Point of Entry.

Causes:

- Employee welding, using power tool, or engaging in other spark-generating activity at point of entry.
- Driving automobile near confined space containing combustible materials.

Controls:

- Use non-sparking tools.
- Barricade entry point at a reasonable distance.
- Prohibit vehicles within immediate area.

Hazard: Electrocution/Electric Shock

Cause:

- Conductive walls of confined space picking up an electrically "hot" source in confined space.

Control:

- Ensure all electrical apparatus used comply with National Electrical Code (NEC) standards.
- Lock out electric sources.

Hazard: Caught In/Crushing

Cause:

- Entering a machine or area that has not been locked out, then having it activated.

Control:

- Manually isolating each piece of equipment before workers enter or while they work in a confined space (Locking out).
- Follow specific procedures for mechanical lockout.

Hazard: Struck by Falling Objects in Confined Space

Cause:

- Falling objects from walls of confined space.
- Objects falling through point of entry.

Control:

- Barricade entry of confined space.
- Wear appropriate personal protective equipment, i.e., hard-hat.
- Assess hazards before entry.

Hazard: Falls While in Confined Space

Causes:

- Wet, oily floors

- Configuration of internal surfaces.
- Holes/breaking through part of confined space.
- Falls over object or /tools.
- Poor lighting.
- Uneven surfaces.

Controls:

- Ensure floor or base is clean and dry.
- Wear proper foot protection.
- Locate, identify, and barricade existing holes
- Provide adequate illumination.
- Practice good work habits (housekeeping).
- Use guardrails and scaffolding properly.

Hazard: Bodily Reactions, Strains, Abrasions

Causes:

- Entering or leaving a cramped, sharp edged, high-level, or hazardous point of entry to a confined space.
- Maneuvering within a confined space.
- Low head room/striking head.

Controls:

- Wear personal protective equipment.
- Training to ensure awareness.
- Reduce "bulkiness" of clothing and equipment.
- Engineering controls to eliminate condition.

Hazard: Eye Injuries

Causes:

- Falling dust
- Grinding, chipping, other operations that cause flying debris.

Control:

- Wear proper eye protection at all times.

Hazard: Contact with Temperature Extremes

Causes:

- Steam discharge
- Welding surfaces
- Weather conditions

- Compressed gases, e.g., nitrogen.

Controls:

- Wear appropriate clothing and PPE.
- Limit time of exposure.
- Know symptoms of excessive exposure.
- Frequent breaks to ensure high fluid intake to compensate for hot climates and for hot conditions inside PPE.

4. Definitions

Acceptable entry conditions: The conditions that must exist in a permit space to allow safe entry by personnel.
Attendant: The individual stationed outside a permit space who monitors the authorized entrants and performs assigned duties.
Authorized entrant: Person who is authorized to enter a permit space.
Confined space: A space that:

- is large enough and so configured that an employee can bodily enter and perform work;
- has limited or restricted means of entry and exit; and
- is not designed for continuous employee occupancy.

Entry: The action by which an employee passes through an opening into a permit-required confined space. Entry is assumed to be as soon as the employee's body breaks the plane of the opening.
Entry permit: The written document that is provided to allow and control entry into a permit-required confined space.
Entry supervisor: The person responsible for determining acceptable conditions prior to entry into a permit-required confined space and for terminating entry.
Designated official: The person responsible for evaluating permit-required confined spaces and ensuring program elements are enforced.
Hazardous atmosphere: An atmosphere that may expose employees to risk of death or injury from one or more of the following causes:

- Flammable gases or vapors in excess of 10 percent of the lower flammable limit (LFL).
- Airborne combustible dust in concentration equal to or greater than its LFL.
- Atmospheric oxygen less than 19.5% or greater than 23.5%.
- Atmospheric concentration of any substance that has a permissible exposure limit (PEL).
- Any other atmospheric condition that is immediately dangerous to life and health.

Non-permit confined space: A confined space that does not contain or, with respect to atmospheric hazards, does not have the potential to contain any hazard capable of causing death or serious physical harm.
Permit-required confined space: A confined space that has one or more of the following characteristics:

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

Permit system: The written procedures for preparing and issuing permits for entry and for returning the permit space to service upon termination of entry.
Rescue service: The personnel designated to perform rescue functions in permit-required spaces.

Retrieval system: The equipment used for non-entry rescue of a person from permit-required spaces.
Testing: The process by which hazards are identified and evaluated for entry into permit-required space

Section 8: Respiratory Protection Program

1. Purpose and Scope

The purpose of this section is to prescribe requirements and procedures for selecting, using, and maintaining respirators.

This section applies to all employees who may wear a respirator. Contractors are required to submit a standard operating procedure (SOP) on the proper selection, use, maintenance, and disposal of respirators.

2. References

- 29 CFR 1910.134, OSHA Standard for Respiratory Protection
- ANSI Z88.2, Practice for Respiratory Protection

3. General Requirements

It has long been recognized that the respiratory tract is the most important route by which toxic substances enter the body. Most industrial poisonings are caused by inhaling toxic substances. The primary effort to control such hazards should be in the form of engineering controls, such as specially designed ventilation systems. If engineering controls cannot be implemented, or are cost prohibitive, infeasible, or inadequate, respirators must be used to protect the individual whenever hazardous conditions exist. A respiratory protection program shall be established and implemented in accordance with 29 CFR 1910.134. This program shall encompass, but not limited to, training, maintenance, and awareness of the limitations associated with various types of respirators.

3.1. Responsibilities

3.1.1. All Personnel

All personnel who might wear a respirator shall become familiar with the respiratory protection program, as outlined in this section. A copy of the program shall be maintained in the local safety office.

3.1.2. Supervisors

All supervisors shall:

- Request assistance from the contractor's safety office in conducting atmospheric testing of the work area to determine if employees are exposed to contaminant levels in excess of the threshold limit values (TLV) and/or permissible exposure limits (PEL).
- Request assistance from the contractor's safety office for respirator fit-testing.
- Enforce the use of respirators by employees. Written documentation of an employee's failure to wear respirators shall be cause for disciplinary action and shall be forwarded to the safety office for inclusion in the employee's medical records.
- Ensure all employees are trained in the proper use of respirators and report to their medical surveillance examinations.

3.1.3. Employees

All employees shall:

- Wear and maintain respirators as required.
- Notify supervisors of any problems with respirators, or if they are having respiratory problems.
- Report for training and medical surveillance examinations.

3.1.4. Contractor's Safety Office

The contractor's safety office shall:

- Ensure all respirators are approved by the National Institute for Occupational Safety and Health (NIOSH) or meet host nation requirements for local national employees.
- Provide oversight to ensure compliance with the respiratory protection program.

3.2. Program Requirements

- Respirators and cartridges/filters shall be selected according to the hazards to which the worker is exposed. Accordingly, project personnel must know which type of respirator or cartridge/filter to use in each particular situation.
- Supervisors shall be instructed in the proper use of respirators and their limitations (e.g., respirators designed for protection against one hazard may be ineffective against another).
- Employees shall ensure respirators are regularly cleaned, disinfected, and stored in a convenient, clean, and sanitary location.
- Employees shall be trained in the care of their respirator. Training shall include inspection for defects, cleaning and disinfection, repair, and storage.
- Supervisors shall not assign personnel to tasks requiring the use of respirators unless it has been determined that they are medically able to wear respirators while performing their work (see "Medical Requirements" below).

3.3. Training Requirements and Respirator Use

- Supervisors as well as employees must know which respirators and cartridges/filters are to be used in each situation. There must be written procedures in place that describe this. When new operations or projects develop, supervisors should contact the local safety office for assistance, as necessary.
- An additional person must be present in areas where the failure of a respirator could result in the wearer being overcome by a toxic or an oxygen-deficient atmosphere. Effective communications (visual, voice, or signal line) will be maintained between both (or all) individuals present.
- Supervisors shall ensure that their employees have an opportunity to handle the respirator, have it fitted properly, test its seal, and familiarize themselves with the respirator by wearing it at periodic training sessions.
- It must be stressed that respirators shall not be worn when a good fit cannot be achieved. A good fit cannot be achieved by anyone who has a beard, long sideburns, a long mustache, or stubble. Also, the absence of dentures can affect the fit of a face piece.
- If air-line respirators are used, the supplied air source shall be inexhaustible and the hose length cannot exceed 300 feet from the source to the user.

3.4. Maintenance, Care, and Storage

- Each respirator shall be inspected by the employee for defects before and after each use, and at least monthly, to assure it is in good working order. The inspections shall include a check of the tightness of

the connections and a check of the face piece, valves, connecting tube, and cartridge. All rubber and elastic parts must be inspected for pliability and signs of deterioration.

- Each self-contained breathing apparatus shall be inspected by the employee monthly. Air cylinders shall be fully charged, according to the manufacturer's instructions.
- If respirators are used regularly, they may be assigned to individual workers for their exclusive use.
- Respirators shall be regularly cleaned and disinfected. Those issued for the exclusive use of one worker shall be cleaned after each day's use. Those used by more than one person shall be thoroughly cleaned and disinfected after each use. To clean and disinfect respirators, they should be washed with detergent in warm water using a soft brush, rinsed thoroughly in clean water, rinsed in a disinfectant solution, rinsed again in clean water (to prevent skin irritation), and air dried in a clean place. Cleaner and sanitizer solutions that clean effectively and contain bactericide are also available.
- After inspection, cleaning, and necessary repair, respirators shall be stored in sanitary locations to protect against dust, sunlight, heat, extreme cold, excessive moisture, and damaging chemicals. It is useful to store non-emergency respirators in plastic bags after they have been cleaned and disinfected.
- Defective respirators shall be tagged and removed from service by the supervisor.
- Respirators shall not be stored in tool boxes and lockers unless they are in carrying cases or other protective containers.
- When stored, the face piece and exhalation valve must be in an upright or resting position. If stored in a bent, folded, or abnormal position, the face piece and exhalation valve can warp or become deformed and thereby void the NIOSH approval.

3.5. Identification of Respirators and Cartridges

Most manufacturers use the following guidelines when designing their product. Therefore, while the identification information given below is necessary to know, it is usually not of major significance to the purchaser. Assistance in ordering specific respirator equipment may be obtained from the local safety office.

- The primary means of identifying respirator cartridges should be via properly worded labels. Each cartridge shall have bold letters stating "Cartridge for (name of contaminant)." It shall also state "For respiratory protection in atmospheres containing not more than [X] percent by volume of (name of contaminant)."
- Each cartridge shall have a label warning that gas masks should be used only in atmospheres with enough oxygen to support life (at least 16 percent by volume), since the cartridges are only intended to neutralize or remove contaminants from the air.
- Each cartridge shall be painted a distinctive color for a particular contaminant. For example, an organic vapor cartridge is signified by the color black. A cartridge for use in ammonia gas atmospheres (limited to 300 ppm) is green.
- The use of one manufacturer's cartridge with another manufacturer's respirator is unacceptable. The problem with interchanging brand names is that an airtight seal cannot be guaranteed. In addition, the interchanging of respirator components voids any approval granted by NIOSH.

3.6. Medical Requirements

It is important that no employee be assigned to tasks requiring the use of respirators if, based upon their most recent medical examination, the examining licensed healthcare provider determines the employee will be unable to function normally while wearing a respirator, or if the safety and health of the employee or other

employees will be impaired by his or her use of a respirator. The focus of the medical examination should be on pulmonary and cardiovascular fitness.

Workers who have indications of coronary artery disease, myocardial infarction, angina pectoris, or progressive or severe hypertension should only wear a continuous-flow, air-line respirator, unless approval from their physicians is obtained.

Those whose duty it is to respond to emergencies should not wear any type of respirator if they have a cardiovascular deficiency. Other physical conditions, such as diabetes or grand mal epilepsy, may limit respirator use. The final decision regarding respirator use for any individual is the responsibility of the examining physician.

4. Guide for Selecting Respirators

The contractor's safety office is responsible for advising supervisors on the type of respirator required. In selecting a respirator, safety and supervisory personnel should assemble the information needed by answering the following questions:

- What is the measured or estimated contaminant concentration at the breathing zone of the worker?
- What is the PEL and/or TLV of the contaminant? (Use the more stringent of the two.)
- Is the workspace oxygen deficient (less than 19.5% oxygen)?
- What is the lower explosive limit (LEL) of the contaminant?
- Does an IDLH situation exist at contaminant concentration?
- If the contaminant is a gas or vapor, is efficient sorbent available and is there adequate warning containing the contaminants dangers?
- Will eye irritation occur at contaminant concentration?
- Will skin absorption pose a problem?
- Are there other circumstances or conditions that should be considered?

Section 9: Hearing Conservation Program

1. Purpose and Scope

The purpose of this section is to eliminate occupational, noise-related hearing loss among personnel. Noise is unwanted sound that may injure the hearing mechanism in the ear. Noise-induced hearing loss may be temporary or permanent depending on the frequency and intensity of the noise and the duration of exposure.

This section applies to all personnel who may be exposed to noise greater than OSHA's PELs. The provisions of this appendix do not apply to deaf personnel, as defined in ANSI S3.20.

2. References

- 29 CFR 1910.95, OSHA, Occupational Noise Exposure
- 29 CFR 1926.52, OSHA, Occupational Noise Exposure

3. General Requirements

Employers are responsible for becoming familiar and implementing the requirements established in this section. They are responsible for identifying those areas where employees are exposed to high noise levels, posting notices in noise hazardous areas, using engineering controls, and educating employees on preventing hearing loss and the use of personal protective equipment (PPE). Noise hazards will be included in the position hazard analysis.

Employers shall notify the contractor's safety office of suspected noise hazardous areas. The local safety office shall then coordinate noise surveys to determine the level of exposure. In areas where employees are subjected to continuous noise levels of 85 dBA or impulse levels of 140 dBA, regardless of duration, engineering and administrative controls (such as limiting the duration of exposure) will be implemented to reduce the noise hazard. In noise hazardous areas where engineering and administrative controls are not feasible, any employee exposed to 85 dBA or greater shall be provided hearing protection devices and will be entered in the medical surveillance program. Nobody should be exposed to impulse or impact noise above 140 dBA peak sound pressure level.

3.1. Responsibilities

3.1.1. Employers

Employers shall:

- Request that the contractor's safety office measure and analyze all areas and equipment suspected of being noise hazardous. An area where one has to shout to communicate is probably over 85 dBA.
- Ensure engineering controls are established to protect employees from noise hazards.
- Ensure that only hearing-protective devices that meet requirements established by ANSI S3.19, are issued to employees exposed to noise-hazard areas.
- Ensure that the applicable job description contains the requirement that the employee must wear hearing protection in the performance of the job.
- Ensure that employees exposed to a noise-hazard work environment are considered for inclusion in the hearing conservation program.

3.1.2. Supervisors

Supervisors shall:

- Post signs or sticker labels on equipment or areas where noise is a hazard.
- Enforce the use of hearing-protective equipment.
- Include noise exposure in employees' activity hazard analyses (AHAs).
- Requisition hearing protection equipment that reduces ambient noise level to no more than 85 dBA at the wearer's ear.
- Use disciplinary actions when necessary to enforce the proper use of hearing protection.
- Ensure that employees receive orientation and ongoing training on hearing conservation during safety meetings.

3.1.3. Employees

Employees shall:

- Wear the provided and proper hearing protection, when required.
- Report for audiometric testing when required.
- Attend and participate in periodic safety and occupational health training.

3.2. Contractor's Safety and Occupational Health Office

The contractor's safety and occupational health office shall:

- Ensure that only calibrated equipment is used for measuring and analyzing noise.
- Notify supervisors of areas or equipment that produce hazardous noise.
- Maintain all noise survey records for 40 years.
- Make provisions to schedule personnel for audiometric testing and yearly follow-up hearing tests for all personnel included in the hearing conservation program (i.e., those who will potentially be exposed to 85 dBA for more than eight hours per day).

3.3. Occupational Health Nurses/Medical Testing Facility

Occupational health nurses and/or the medical testing facility shall:

- Ensure audiometric testing is conducted by a physician, audiologist, otolaryngologist, or a certified technician under the supervision of one of the listed professionals.
- Ensure that the audiometric testing is conducted in an environment that allows 0 dBA hearing levels at test frequencies of 500, 1000, 2000, 3000, 4000, and 6000 Hz. Testing shall also include pure tone, air-conductive hearing threshold levels in each ear, with test frequencies of at least 500, 1000, 2000, 3000, 4000, and 6000 Hz.
- Notify employees of any validated standard threshold shift (STS) in hearing loss.
- Maintain a roster of all personnel included in the hearing conservation program.

Section 10: Hazard Communication (HAZCOM) Program

1. Purpose and Scope

The purpose of this section is to establish a formal hazard communication program to inform and educate personnel on the occupational health hazards associated with the chemicals in their workplace.

This section is applicable to all personnel who are performing work or research within OPP funded and/or supported locations.

The hazard communication program has been developed, in accordance with 29 CFR 1910.1200, to ensure that all chemical substances that are brought into the workplace have been evaluated for their physical and health hazards. Information concerning these hazards must be transmitted to those employees with potential exposure. Examples of such exposure would be employees subjected to the hazardous chemical in the course of employment, through any route of entry (inhalation, ingestion, impaction, skin contact, or absorption), under normal conditions of use or in an emergency. Note that only those chemicals that have been classified as health or physical hazards, in accordance with 29 CFR 1910.1200, are required to be included in the hazard communication program. Employees should consult with the contractor's safety office if there is an uncertainty as to a chemical's inclusion.

2. References

- 29 CFR 1910.1200
- 29 CFR 1926.59
- UN Globally Harmonized System of Classification and Labelling of Chemicals (GHS)

3. General Requirements

3.1. Major Elements

There are five major elements of the hazard communication program; 1) written hazard communication program; 2) chemical assessment and inventory; 3) hazardous chemical labeling system; 4) safety data sheets (SDSs); and 5) employee training. This appendix of the OPP SOH policy constitutes the written hazard communications program. The remaining elements are discussed below.

3.1.1. Chemical Hazard Assessment and Inventory

Every chemical funded by OPP (directly or indirectly) will be assessed for its chemical or physical hazards. Where applicable, substitute chemicals that are less hazardous shall be purchased for the assigned tasks. Chemical manufacturers or importers are required, by federal and international laws, to determine if the chemicals they sell or import are hazardous, and to provide this information via label, SDS, mark, or tag to the purchaser. Based on this information, the chemicals purchased shall be included in the hazardous chemicals and materials inventory, and the inventory will be continually updated.

As hazardous chemicals are purchased, they will be added to the inventory. As hazardous chemicals are disposed of, they will be removed from the list. However, data on their hazards will be maintained by the relevant supervisor and the contractor's safety office. Industrial hygiene and workplace inspections will include a check to ensure the accuracy of the inventory.

3.1.2. Hazardous Chemical Labeling System

Chemical manufacturers, importers, and distributors are required by federal and international laws to label, mark, or tag each container of hazardous chemicals leaving their workplace with:

- The identity of the hazardous chemical(s) contained within;
- An appropriate hazard warning label; and
- The name, address, and telephone number of the chemical manufacturer or importer or other source that can provide additional information on the hazardous chemical(s) and appropriate emergency procedures.

Supervisors shall ensure that each container of hazardous chemicals in the workplace is labeled, tagged, or marked accordingly and that the label or other form of warning is legible, in English and in the host nation language, and is prominently displayed on the container. Supervisors shall also ensure the information is readily available during each work shift.

For the purpose of this requirement, container means any bag, barrel, bottle, box, can, cylinder, drum, storage tank, or similar enclosure that contains a hazardous chemical. Pipes and piping systems are not considered to be containers. However, pipe and piping systems will be labeled as specified above if substances that are transported within them are or will be contained in the hazardous material inventory and must meet GHS requirements. ANSI/ASME A13.1 provides the most common pipe identification standard in the United States and may be used for proper labeling references.

Portable containers into which hazardous chemicals are transferred shall be marked to indicate the chemical, hazardous or non-hazardous, which they contain. Containers that both contain and process chemicals may have signs, placards, process sheets, batch tickets, operating procedures, or other such forms of identity to ensure employees are aware of the hazards involved with the chemical or process.

3.1.3. Safety Data Sheets (SDS)

Federal law 29 CFR 1910, requires chemical manufacturers and importers to obtain or develop a Safety Data Sheet for each hazardous chemical they produce or import and employers to maintain a SDS for each hazardous chemical they procure and use. The inclusion of Federal Acquisition Regulation (FAR) clause 52.223-3 in purchase orders for chemical products will ensure that the manufacturer or distributor provides SDSs for those products. The contractor's procurement office will ensure that every purchase order will include FAR clause 52.223-3.

SDSs may take various forms (including operating procedures), and they may be designed to cover groups of hazardous chemicals if it is appropriate to address the hazard of the process rather than the individual chemicals. In these circumstances, the information contained in the SDS must be provided for each chemical in the process and be readily accessible during each work shift to all affected personnel.

When work center personnel receive an SDS, they shall forward a copy to the contractor's safety office and ensure the SDS is readily accessible to personnel in the work area, in a language understood by each worker. The new chemical will be included in the hazardous material inventory and added to the work area inventory. Information on the SDS will be used by the safety office to develop adequate hazard control and abatement procedures and establish training requirements for personnel exposed to the chemical.

3.1.4. Employee Information and Training

Supervisors are responsible for providing their personnel with an orientation on the purpose and requirements of this program, and specific training on hazardous chemicals in their workplace. This training will be conducted during the first four weeks of a new employee's assignment, when a new chemical is introduced in the workplace, or whenever the need exists. Specific training shall include, as a minimum:

- A description of those operations in the employee's work area where hazardous chemicals are present and in use;
- A chemical hazard evaluation. This will include a listing of those chemicals included in the hazardous material inventory for the work area, the work area labeling system, and the use of safety data sheets. Training in the use of the safety data sheets shall include the physical and chemical hazards of the chemical and the specific measures required to protect the employee from these hazards; and
- Methods and observations that may be used to detect the presence or release of a hazardous chemical within the work area.
- The supervisor will contact the contractor’s safety office within the first four weeks of the new employee’s assignment to schedule formal training for the employee in hazard communication.

3.2. Non-Routine Tasks

Before undertaking a non-routine task, supervisors shall inform employees of any hazards associated with the non-routine work they have been assigned. Generally, these hazards will have been pre-determined and brought to the supervisor's attention.

If the hazards have not been pre-determined, the supervisor will notify the safety office and request a hazard evaluation. The employee will then be informed of the associated hazards.

3.3. Hazard Communication for All Activities

All design plans and specifications for structures or activities will list any hazardous substances and materials incorporated in the design, including those used in the construction of the structure or performance of the activity. This list will serve as the primary notice to contractors of the hazardous materials and substances to which their employees may be exposed to while performing their work. It is also required that the contractor provide documentation of employee training in hazardous substances and chemicals used on every job site. It is required that the contractor develop an activity hazard analysis acceptable to the COR that identifies those hazards, including chemical hazards, anticipated during a particular phase of work, and proposes methods to control those hazards. Contractors shall utilize those sections of the activity hazard analysis and applicable SDSs to provide training to their employees.

Section 11: Fire Prevention and Protection

1. Purpose and Scope

1.1. This section provides the minimum elements for maintaining and administering a fire prevention and protection program and includes guidance for all OPP facilities to develop site-specific plans.

1.2. These procedures are designed to protect participants from risks associated with emergency events, which could result in an injury or fatality.

1.3. If in a location where OSHA has no jurisdiction, and compliance with a requirement is not feasible due to the environment, unavailability of equipment, or other reason, a waiver or variance may be requested using the Authority Having Jurisdiction (AHJ) process.

1.4. In the USAP, all facilities are owned by NSF OPP, and the prime contractor is obligated to ensure they are kept safe from fire risk. ASC Safety personnel shall ensure that fire hazards are corrected if local efforts are not effective. If ASC Safety cannot successfully correct a fire hazard, then the NSF OPP Safety Officer shall be notified, along with the USAP Authority Having Jurisdiction (AHJ).

2. References

- 29 CFR 1910.38, Emergency Action Plans
- 29 CFR 1910.39, Fire Prevention Plans
- The International Code Council (ICC)
- USAP Building Code (USAP-BC) USAP Existing Building Code (USAP-EBC) and USAP Fire Code (USAP-FC)

3. General Requirements

3.1. The only building fires that should be fought by program participants are small, incipient fires that can be readily put out by fire extinguishers (and only if personnel are so trained), unless a trained fire brigade is available on-site.

3.2. Contractors shall develop site-specific plans and procedures that minimize the risks of fire and maximize protection of all staff, program participants, and guests exposed to fire emergencies within the geographic areas and domains supported by their contract (See Paragraphs 4 and 5).

3.3. Operational fire prevention and protection shall comply with 29 CFR 1910.38 and 1910.39.

3.4. Construction engineering and maintenance engineering require compliance with the ICC, version in effect at the time of use.

3.5. Coordination shall be made with local emergency response units and/or fire stations.

3.5.1. In areas supported by local fire departments, facilities managers shall establish, memoranda of understanding with local fire departments for firefighting services.

3.5.2. If there is no fire department at a research station, project site, field camp or other location where serious fire hazards exist, a fire brigade shall be proposed to the OPP program manager responsible for that location's research or operational support.

3.5. Emergency telephone numbers and reporting instructions shall be conspicuously posted.

3.6. An emergency evacuation plan shall be posted in all facilities.

3.7. Fire Protection

3.7.1. In accordance with International Fire Code (IFC) Section 906, portable fire extinguishers will be recharged and serviced as indicated by the manufacturer for the specific type of fire extinguisher. Record tags will be attached to all extinguishers and the dates they were inspected and weighed or recharged will be indicated thereon.

3.7.2. Participants who will be working in high-risk fire location (e.g., laundry facility, fueling station) shall be trained on the proper handling and operation of fire extinguishers.

3.7.3. Adequate firefighting equipment will be provided at temporary buildings and places where combustible materials are stored, as follows:

- Class A fire (wood, paper, textiles, rubbish): water or foam extinguisher.
- Class B fire (oil, grease, gasoline, and similar flammable materials): foam, carbon dioxide, or dry-chemical extinguishers.
- Class C fire (electrical): carbon dioxide or dry-chemical extinguisher.

3.7.4. Using carbon tetrachloride or chlorobromomethane as fire extinguishing agents is prohibited.

3.7.5. Where unusual fire hazards exist or emergencies develop, additional fire-fighting facilities, such as larger portable chemical units, fire pumps, fire hoses, and outside assistance shall be developed as necessary to ensure reasonable protection.

3.8. Electrical Safety for Fire Prevention

3.8.1. All electrical installations shall be accomplished in accordance with the current edition of the National Electrical Codes (up to one year after publication) unless the AHJ has otherwise approved a waiver.

3.8.2. Electrical devices and power strips shall follow a nationally recognized testing laboratory and identified as such (e.g., UL or CE).

3.8.3. Only qualified and competent individuals shall be exposed to arc flash hazards. Arc Flash hazards shall be identified based on survey by a qualified and competent person and labelled accordingly on outside of panels (High Voltage). Arc Flash risk shall be mitigated through use of LOTO (where possible) and wearing proper arc flash PPE.

3.9. Housekeeping Requirements

3.9.1. Excess stacks of paper, crating materials, packing boxes, and other combustibles shall be organized or cleared from buildings (when permissible) to limit accumulation of combustible debris.

3.9.2. All entrances, fire exits, stairs, halls, passageways, and electrical panels shall allow free, unrestricted passage always. No material or equipment of any type shall ever be placed or stored to block or restrict free access and egress (and at no time shall space for emergency egress be less than 28 inches).

3.9.3. Combustible cleaning materials shall be stored in closed metal containers. No combustible materials shall be stored beneath or stacked within three meters (10 feet) of buildings.

3.9.4. All rags, waste, and other items soiled by flammable or combustible materials shall be placed in tight or closed metal containers for daily disposal, when a flammable locker for storage of these is not available.

3.9.5. Incinerators used for burning municipal materials and industrial waste must allow for no visible paper ash to escape during use. These operations will only be utilized by personnel who have received training and have a certificate of training on file. PPE, such as gloves and safety glasses, will be worn when placing documents into incinerators and when removing ash with shovels. Incinerators should not be placed within 50 feet of ignition sources or buildings. The manufacturer's recommended operating instructions should be readily available to operators.

3.10. Smoking Requirements

3.10.1. Smoking is permitted only in approved locations.

3.10.2. Smoking is prohibited inside all OPP facilities aside from designated smoking shelters.

3.10.3. For this policy, smoking shall refer to the use of any of the following tobacco products:

- Any smoke or vapor-emitting product, including but not limited to cigarettes, cigars, cigarillos, and pipes.
- Any smoke or vapor-emitting product or device designed or intended to simulate a tobacco product, including but not limited to e-cigarettes, but excluding gum and prescription medications.

3.10.4. Employees and visitors who wish to smoke must go outside the building to a spot at least 25 feet *downwind* from the door, unless designated smoking areas are available. The following smoking requirements shall be complied with:

- Smoking is prohibited inside any vehicle or heavy equipment.
- Smoking is allowed outdoors, except adjacent to building entrances and air intake ducts, and except where it presents a safety hazard, such as near fuel, explosives, and vehicle, aircraft, and small boat operations.
- Smoking near building entrances may be further restricted by station management to protect workers and visitors from tobacco smoke in the workplace. General guidance is that smoking is not allowed within 25 feet of building entrances.
- All materials used for smoking, including cigarette butts and matches, must be fully extinguished and disposed of in appropriate containers.
- For the USAP, designated indoor smoking shelters are provided at McMurdo and South Pole Stations.
- There are no indoor smoking areas at any field camp.
- Smoking is prohibited in any aircraft.

4. Fire Prevention Plans

4.1. A written fire prevention plan shall be available for each high-hazard location, as identified by the fire department or other qualified person with the requisite knowledge and training.

4.2. Fire prevention plans shall be reviewed annually and updated as needed.

4.3. The fire department shall be provided inventories of all hazardous material in the facility and a map showing storage locations, and fire department personnel shall be walked through the facility so they understand the layout and dangers should a fire occur.

4.4. All program participants shall be informed of the fire hazards of materials and processes to which they are exposed.

4.5. The plan shall include:

- A list of major work-place fire hazards.
- Storage and handling procedures for fire hazards, to include general housekeeping and procedures for the control of flammables and combustibles.
- Potential ignition sources and control procedures, to include smoking, cutting, grinding, and welding.
- A list of fire protection equipment and written procedures for its use.
- Standard operating procedures (SOPs) for specific maintenance operations that present unique fire hazards, such as hot work and confined space work.
- Title of personnel responsible for maintaining fire equipment and those responsible for fire hazards.
- Required maintenance and testing procedures -- and required frequency of maintenance and testing -- for all fire equipment and systems, e.g., CO2 systems, detectors, alarm systems.
- Designated parking spaces for emergency vehicles and firefighting equipment (at locations where these assets are available).

5. Evacuation Plans

5.1. Evacuation plans shall be reviewed annually and updated as needed.

5.2. The plan shall include:

- Response procedures to alerts and alarms.
- Notification procedures - fire department, supervisors, visitors. Include phone numbers.
- Evacuation routes, to include designation of safe locations outside of facility where employees would wait for further instructions. If a mezzanine is present without a secondary emergency exit and a throw ladder is being utilized to escape, this must be clearly communicated, and signage placed at the access point to the mezzanine identifying this as the only way to escape if the stairs become blocked due to fire.
- Fire extinguishing activities, if required to egress safely (locations, training).
- Emergency escape procedures and escape route assignments.
- Procedures to account for all employees after evacuations have taken place.
- Drill requirements, to include evacuation and rescue operations.
- Responsible employees, such as fire marshals and coordinators, who can provide further information or explanation of duties under the plan.
- Fire reporting procedures, accident investigation procedures.

6. General Building Operational and Basic Structure Requirements (Minimums)

6.1. In every building or structure, exits shall be so arranged and maintained as to provide free and unobstructed egress from all parts of the building or structure at all times of occupancy. No lock or fastener shall be installed to prevent free escape from the inside of any building.

6.2. Every exit shall be clearly visible, or the route to it shall be conspicuously marked in such a manner that every occupant of every building or structure who is physically and mentally capable will readily know the direction of escape from any point. Any doorway or passageway that is not an exit, but could possibly be thought of as an exit, shall be so arranged or marked to prevent occupant confusion with actual fire exits. Every effort shall be taken to avoid occupants mistakenly traveling into dead-end spaces during a fire.

6.3. Where hazardous processes or storage are of such character as to introduce the potential for an explosion, explosion venting, or an explosion suppression system specifically designed for the hazard involved shall be provided.

6.4. Clearance of at least 45 cm (18 inches) shall be maintained between the top of stored material and sprinkler deflectors (if present).

6.5. Clearance shall be maintained around lights and heating units to prevent ignition of combustible materials.

7. Inspection Requirements

7.1. Contractors shall conduct monthly inspections that address life safety and fire protection compliance.

7.1.1. Facilities that do not meet safety and fire requirements shall be expeditiously corrected.

7.1.2. All deficiencies shall be reviewed quarterly until corrected.

8. Reports

8.1. Contractors shall provide the NSF OPP SOH Office a written report of all fires experienced by facility for each station annually.

8.2. Contractors shall provide a summary of their monthly inspections quarterly; inspections shall address life safety and fire protection issues by facility for each station.

Section 12: Electrical Safety

1. Purpose and Scope

This section prescribes requirements, procedures, and policies for electrical safety to mitigate risk of electrocution. This section does not include control of hazardous energy (see section 5), Hazardous Energy Control Program). Electrocutions are in OSHA's (Occupational Safety and Health Administration) "Fatal Four" (https://ehsdailyadvisor.blr.com/2019/05/oshas-fatal-four-leading-causes-of-fatalities-in-the-workplace/).

2. References

- 29 CFR 1910 Subpart S (Electrical Safety)
- 29 CFR 1926 Subpart K (Electrical Standards for Construction)
- NEC (National Electric Code)
- EM 385-1-1, USACE Safety and Health Requirements Manual
- NFPA 70E (Standard for Electrical Safety in the Workplace)

3. General Requirements

3.1. Responsibilities

3.1.1. It is a supervisor's responsibility to ensure that personnel are aware of their exposure to electrical hazards, are trained in how to prevent electrocutions to include proper use of appropriate PPE (Personal Protective Equipment), and ensure personnel comply with these requirements.

3.1.2. It is the responsibility of *personnel* to comply with all safety requirements and report unsafe situations, near miss or safety incidents to their supervisor promptly in accordance with Section 3, Mishap Reporting and Investigation.

3.1.3. Qualified Person (QP) is defined as someone with the training, experience, and verifiable credentials responsible for performing electrical work that complies with the National Electrical Safety Code (NESC), National Electric Code (NEC), National Fire Protection Association (NFPA), OSHA Occupational Safety and Health Administration (OSHA), and the United States Coast Guard (USCG). If the work being performed conflicts with the any of the codes listed above, the most stringent shall apply. Verifiable credentials consist of State, National and/or Local Certifications/Licenses that a Master or Journeyman Electrician may hold, depending on the work being performed, and should be identified in the appropriate JHA/AHA.

3.2. Emergency Plans and Procedures-Required Training: Employees exposed to shock hazard and those employees responsible for acting in case of emergency shall be trained in release methods for victims in contact with exposed energized electrical conductors or circuit parts. Employees shall be instructed in methods of first aid and emergency procedures, such as approved methods of resuscitation, if their duties warrant such training. Training and re-training of employees in approved methods of resuscitation, including cardiopulmonary resuscitation and automatic external defibrillator (AED) use, shall be certified by the employer as required by OSHA 29 CFR 1910.151 and NFPA 70E 110.2(c).

3.3. Isolation

3.3.1. Before work begins, a Qualified Person in charge shall ascertain by inquiry, direct observation and by instruments, whether any part of an electric power circuit (exposed or concealed) is located such that the performance of work could bring any person, tool, or machine into physical or electrical contact with it. This verification procedure shall be documented prior to work beginning.

3.3.2. All equipment and circuits to be worked on shall be de-energized before work is started. Personnel shall be protected by a Hazardous Energy Control Program (HECP) and procedures (i.e. lockout/tagout, blanking, positive means of blocking, grounding, etc.). Positive means shall be provided for rendering controls or devices inoperative while repairs or adjustments are being made to the machines they control. See Section 5, Hazardous Energy Control Program.

3.3.3. If work MUST be performed on an energized system, then the employer must first demonstrate that de-energizing introduces additional or increased hazards (i.e., interruption of life support equipment, removal of light for an area, etc.) or is infeasible due to equipment design or operational limitations (i.e., testing, troubleshooting, etc.) and provide that justification to the NSF OPP prior to the start of work (outside of emergency conditions).

3.3.4. Energized work may never be performed without prior authorization. Once it has been determined that equipment must be worked on in an energized condition, an energized work permit shall be submitted to the Government Designated Authority (GDA) for acceptance (See NFPA 70E). Permits must be prepared in advance and include, as a minimum:

- Description of work and location;
- Justification for why the work must be performed in an energized condition;
- Description of work practices to be followed;
  - An electrical shock analysis and boundaries (safe working distances);
  - Arc flash hazard analysis and arc flash boundary determination;
  - Identification of PPE necessary to safely perform the task;
  - Means to restrict access of unqualified persons in work area;
  - Evidence of completing the job briefing (includes safety, tools, PPE, any other hazards and controls).
- Live parts of wiring or equipment shall be guarded to protect all persons or objects from harm.
- High voltage equipment (i.e., switchyards, transformers, etc.) shall be protected from unauthorized access. Entrances not under constant observation shall be kept locked; metallic enclosures shall be guarded and signs warning of high voltage and prohibiting unauthorized entrance shall be posted at entrances.
- Enclosure gates or doors shall swing outward or provide clearance from installed equipment.

3.4. Arc Flash

3.4.1. Whenever work on or near energized parts greater than 50 volts is necessary, a hazard analysis /arc flash hazard analysis will be conducted in accordance with NFPA 70E. The flash protection boundary, approach distances, hazard/risk category and personal protective equipment (PPE) requirements shall be identified.

3.4.2. PPE that provides appropriate arc flash protection is required for all personnel working on or near exposed energized electrical equipment operating at 50 volts or more. Identification of required PPE is based on equipment arc flash labels or NFPA 70E task tables.
3.4.3. Garments, to include fall protection harnesses, worn over arc rated protective clothing, must also be arc rated.

3.4.4. All personnel entering the identified arc flash protection boundary must be Qualified Persons as defined by OSHA and properly trained in NFPA 70E requirements and procedures. Unless permitted by NFPA 70E, Article 130.4, no Unqualified Person shall be permitted to approach nearer than the Limited Approach Boundary of energized conductors and circuit parts. Training must be administered by an electrically qualified source and documented.

3.5. Overcurrent Protection, Disconnects and Switches

3.5.1. All circuits shall be protected against overload.

3.5.2. Access and working space shall be provided and maintained around all electrical equipment to permit ready and safe operation and maintenance in accordance with NFPA70, Article 110.26, Spaces About Electrical Equipment. Where required clearance is not feasible, procedures shall be in place to ensure sufficient clearance is maintained for fully opening the door and/or servicing the electrical enclosure.

3.5.3. Disconnecting means shall be located or shielded so that persons will not be injured when the disconnect is operated. Disconnecting means shall be capable of accepting a lock and of being locked in the open (de-energized/off) position.

3.5.4. A readily accessible, manually operated switch shall be provided for each incoming service or supply circuit.

3.5.5. Grounding: All electrical circuits, equipment and enclosures shall be grounded in accordance with the NEC and NESC to provide a permanent, continuous, and effective path to ground unless infeasible (e.g., facility on hundreds of feet of snow and ice). In such cases where grounding is infeasible, a hazard analysis needs to demonstrate equivalent protection through other means and be documented.

3.5.6. Ground-Fault Circuit Interrupter (GFCI) devices shall be calibrated to trip within the threshold values of 5 ma +/- 1 ma as specified in UL Standard 943. GFCI devices shall be tested before initial use and before use after modification.

3.6. Work Near Energized Overhead Lines

3.6.1. Work activity adjacent to overhead lines shall not be initiated until a survey has been made (and documented) to ascertain the safe clearance from energized lines.

3.6.2. Any overhead line shall be considered energized unless the person owning such line certifies that it is not energized, and it has been visibly grounded and tested.

Section 13: Vehicles, Machinery, and Equipment

1. Purpose and Scope

1.1. This Section establishes the requirements for contractors and program partners' operations of Vehicles, Machinery, and Equipment while working under the jurisdiction of the National Science Foundation (NSF), Office of Polar Programs (OPP), and its geographic areas of operation and domain.

1.2. The polar environment presents an additional risk of injury or fatality when operating vehicles, machinery, and equipment. The extreme cold can hamper control and function, presenting challenges with traction and braking and present hazards, including crevasses and sea ice present in the polar environment. The purpose of this section is to mitigate risk.

1.3. This policy applies to all vehicles, machinery, and equipment owned by OPP or operated in support of OPP operations. Compliance with federal, state and host nation laws are also required, with the most stringent requirements prevailing.

2. General Requirements

2.1. All operators shall be trained and qualified (verified by an electronic record, license, certificate, and/or permit) to operate vehicles, machinery, all-terrain vehicles (ATVs), unmanned vehicles (UVs), or other specialty (snow) vehicles.

2.2. Vehicles, machinery, and equipment not meeting safe operating conditions shall be immediately removed from service, its use prohibited until unsafe conditions have been corrected, and re-inspected before being placed in service.

2.3. A copy of the operator’s manual will be kept by the contractor at the issuing center and be available for review on request.

2.4. The number of passengers shall not exceed the number that can be safely seated per manufacture instructions.

2.5. Operating Rules

2.5.1. Operators are strictly prohibited from operating vehicles or equipment under the influence of alcohol or other substances that may impair an operator’s capacity to use such vehicles or equipment.

2.5.2. If equipped, all operators and occupants of vehicles or equipment must wear seatbelts unless specified otherwise in the manufacturer’s operating manual and justified in a JHA/AHA.

2.5.3. Cellular phones shall not be used while operating a vehicle unless with hands-free function or devices.

2.5.4. Text messaging while operating a vehicle is strictly prohibited.

2.5.5. Smoking in vehicles or equipment is prohibited.
2.5.6. Using portable headphones, earphones, or other listening devices while operating a vehicle or equipment is prohibited. An exception is permitted for operational purposes to facilitate communications that have hearing protection w/ microphones and speakers to integrate with radios.

2.5.7. Getting on or off any vehicle while it is in motion is prohibited.

2.5.8. Whenever vehicles, machinery, and equipment are parked, the parking brake, if equipped, shall be set.

2.5.9. Vehicles, machinery, and equipment parked on an incline shall have the wheels chocked and the parking brake set.

2.5.10. Global Positioning Systems (GPS) shall be used when leaving established roadways.

2.5.11. Driving above the speed limit is prohibited.

2.5.12. No vehicle or combination of vehicles or equipment hauling unusually heavy loads shall be moved until the driver has been provided with the required permits (as applicable), the correct weights of the vehicles and load, and a designated route to be followed.

2.5.13. When maneuvering or performing back-up operations, operators will take precaution. If a signal person or spotter is not used (or not available), operators will walk behind their vehicle or equipment to view the area for possible hazards or obstructions before performing back-up operations.

2.5.14. Personnel who are involved in vehicle incidents shall be evaluated for medical fitness by a medical professional (paramedic or nurse, at a minimum) before returning to duty. Vehicle incidents occurring in locations without medical support would be exempt from this policy, but operators should consider obtaining a medical evaluation upon returning to an area where medical support is available. The employee shall not be responsible for paying for this medical clearance, where payment is expected.

3. Roles and Responsibilities

3.1. Each operator is responsible for operations under their direct control. Whenever there is a safety concern, he/she shall have stop work authority until the unsafe condition has been reasonably mitigated.

3.2. Supervisors shall suspend or revoke operator privileges if operators fail to maintain qualifications or demonstrate carelessness or unsafe behavior in operation of equipment.

4. Training

4.1. Proof of qualification and/or competency to use equipment (such as a certificate or permit) shall be available for government review at the work location.

4.2. Only trained, qualified/certified and designated operators shall be permitted to operate a powered industrial truck (PIT). Qualification shall be in writing via a license, permit or other documentation.

4.2.1. Training must be both classroom and practical operation and in accordance with OSHA Standard 29 CFR 1910.178. It must be on the same type of truck the operator uses on the job.

4.2.2. The employer must certify that the operator has been trained and evaluated as required by the standard. The certification shall include the name of the operator, the date of the training, the date of the evaluation, and the identity of the person(s) performing the training or evaluation.

4.3. Members of drilling crews shall be provided training based on the equipment operating manual and the JHA/AHA. This training shall include, at a minimum,

- The operation, inspection, and maintenance of the equipment.
- The safety features and procedures to be used during operation, inspection, and maintenance of the equipment.
- Overhead and underground hazards.

4.4. For snowmobiles, ATVs, or other types of specialty vehicles, a driver qualification and training program shall be established specific to the vehicle. In addition, a SOP that includes, at a minimum, safe operations, limits of operational work areas, required PPE (such as helmets, which are required for snowmobiles and ATVs), and vehicle safety equipment requirements shall be established for all such vehicles.

5. Equipment and Systems

5.1. Seat belts: Seat belts and anchorages meeting the requirements of 49 CFR 571 shall be installed and worn in all motor vehicles (installation on buses is optional).

5.1.1. Seatbelts that have been damaged or removed shall be replaced immediately and meet the requirements of 49 CFR 571 and/or Society of Automotive Engineers (SAE) Standard J386.

5.2. Lights

5.2.1. All vehicles shall have functioning headlights and taillights.

5.2.2. When visibility is limited or when work is conducted in darkness, additional portable lighting shall be utilized where practicable.

5.3. Guarding and Safety Devices

5.3.1. All belts, gears, shafts, pulleys, sprockets, spindles, drums, flywheels, chains, or other reciprocating, rotating, or moving parts of equipment shall be guarded when exposed to contact by persons or when they otherwise create a hazard.

5.3.2. All hot surfaces of equipment, including exhaust pipes or other lines, shall be guarded or insulated to prevent injury and fire.

5.3.3. Platforms, foot walks, steps, handholds, guardrails, and toe boards shall be designed, constructed, and installed on machinery and equipment to provide safe footing and access ways.

5.3.4. Equipment shall be provided with suitable working surfaces of platforms, guardrails, and hand grabs. Platforms and steps shall be of nonskid material.

5.3.5. No guard, safety appliance, or device shall be removed from machinery or equipment, or made ineffective, except for making immediate repairs, lubrications, or adjustments, and then only after the equipment has been de-energized and a hazardous energy control program (lockout/tag-out) implemented. All guards and devices shall be replaced immediately after repairs and adjustments are completed and before power is turned on.

5.4. Reverse Signal (Back-Up) Alarm

5.4.1. All self-propelled construction and industrial equipment, dump trucks, and cargo trucks for which the trailer/body permanently blocks the view to the rear, whether moving alone or in combination, shall be equipped with a back-up alarm.

- Equipment designed and operated so that the operator is always facing the direction of motion does not require a back-up alarm.
- Commercial cargo vehicles (such as pick-up trucks, utility cargo or tool trucks, and flatbed cargo trucks intended for roadway use) that have a normally clear view through the rear window are not required to have back-up alarms. If the view is temporarily obstructed by a load or permanently blocked by a utility or toolbox or other modification, then a signal person may be used if the value outweighs the risk, as determined by an JHA/AHA. In lieu of a signal person, a backup alarm must be installed.

5.4.2. Back-up alarms shall be audible and sufficiently distinct to be heard above surrounding noise level.

5.4.3. Alarms shall operate automatically upon commencement of backward motion and shall operate throughout the entire backward motion.

5.4.4. Removing or disabling a back-up alarm is strictly prohibited.

5.5. The glass used in vehicles, machinery, and equipment windshields or cabs shall be safety-rated. If safety glass is unavailable for immediate replacement, safe alternatives shall be utilized, such as plexiglass.

5.6. All powered industrial trucks (PIT), commonly called forklifts or lift trucks shall be equipped with substantial overhead protection; guards that meet the structural requirements defined in ANSI/ASME B56.1.

5.7. Falling object protective structures (FOPS)

5.7.1. All bulldozers, tractors, or similar equipment used in clearing operations shall be provided with guards, canopies, or grills to protect the operator from falling and flying objects, as appropriate to the nature of the clearing operations.

5.7.2. Falling Object Protection (FOP) for other construction, industrial, and grounds-keeping equipment will be furnished when the operator is exposed to falling object hazards.

5.7.3. FOPs will be certified by the manufacturer or licensed engineer as complying with the applicable recommended practices of SAE Standards J231 and J1043.

5.8. Rollover Protective Structures (ROPS) shall be installed on:

5.8.1. Tracked and rubber-tire tractors including dozers, push and pull tractors, winch tractors, self-propelled pneumatic earth movers, front-end loaders, backhoes, rollers, and compactors.

5.8.2. ROPS are not required on: Trucks designed for hauling on public roads, self-propelled rollers, and compactors (type that do not have an operator's station).

5.8.3. ROPs will be certified by the manufacturer or licensed engineer as complying with applicable SAE Standards (i.e., J167, J1040, J1042, J1084, and J1194).

5.9. Drilling equipment

5.9.1. Drilling equipment shall be equipped with two easily accessible emergency shutdown devices, one for the operator and one for the helper.

5.9.2. Rigs must be shut down before any helpers enter a barricaded area.

5.9.3. Auger heads must be in the hole, or a cover placed over the hole before workers enter the barricaded area. Note: If infeasible due to type of drill equipment being used, a risk assessment shall be performed by a Competent Person (CP) and documented in the JHA/AHA as to why this requirement is not practical. Identification of additional precautions and/or controls shall be identified to ensure an equal level of safety is being accomplished.

5.9.4. Outriggers shall be extended per the manufacturer's specifications.

5.9.5. When drilling equipment is operated in areas with the potential for classification as a confined space, the requirements of Section 6 shall be followed.

5.9.6. Drill crewmembers shall not wear loose clothing, jewelry, or equipment that might become caught in moving machinery.

6. Additional Requirements

6.1. Inspections, Tests, Maintenance, and Repairs

6.1.1. Qualified persons shall conduct inspections, tests, maintenance, and repairs according to the manufacturer’s recommendations.

6.1.2. Before initial use, vehicles not otherwise inspected by a state or local authority shall be inspected by a qualified mechanic and determined to be in safe operating condition and compliance with all required vehicle safety standards. This one-time inspection shall be documented and available for review at the worksite.

6.1.3. All vehicles and equipment shall be inspected on a scheduled maintenance program.

6.1.4. Before each shift, the operators shall check vehicles and equipment to ensure the following parts, equipment, and accessories (as applicable) are in safe operating condition and free of apparent damage that could cause failure while in use:

- Service brakes, including trailer brake connections

- Parking system (hand brake)
- Emergency stopping system (brakes)
- Tires
- Horns
- Steering mechanism
- Coupling devices
- Seat belts
- Operating controls
- Safety devices (e.g. back up alarms and lights, fire extinguishers, first-aid kits, window punch, seatbelt cutter)
- Accessories, including lights, reflectors, windshield wipers, and defrosters, where such equipment is necessary.

6.2. A safety tire rack, cage, equivalent protection, or process controls shall be provided and used when inflating, mounting, or dismounting tires on split rims or on rims equipped with locking rings or similar devices.

6.3. All motor vehicles shall be shut down prior to and during fueling operations.

Section 14: Cranes and Rigging

1. Applicability.

1.1. The requirements of this policy are applicable to all cranes with a hoisting/lifting capacity over 2,000 pounds or more.

2. Purpose and Scope

2.1. This Section establishes a consistent and uniform policy for the safe and reliable conduct of load handling for contractors and program partners while working under the jurisdiction of the National Science Foundation (NSF), Office of Polar Programs (OPP), and its geographic areas of operation and domain.

2.2. The polar environment presents an additional risk of injury or fatality when operating cranes. The extreme cold can hamper control and function, presenting challenges with traction and braking and present hazards, including crevasses and sea ice present in the polar environment.

2.3. This policy strives to provide an increased level of worker safety through pre-planning load handling activities, specified levels of training, knowledge, and experience of involved workers, as well as equipment design, maintenance, inspection, and repair.

3. References

3.1. Policies and procedures in this policy are based on requirements and industry standards presented in the regulations and publications listed below. This policy should not be used to the exclusion of the referenced publications.

- 29 Code of Federal Regulation (CFR) 1910, Occupational Safety and Occupational Health Standards for General Industry; https://www.osha.gov/laws-regs/regulations/standardnumber/1910
- 29 Code of Federal Regulation (CFR) 1926, Occupational Safety and Occupational Health Standards for Construction Industry, Subpart CC; https://www.osha.gov/laws-regs/regulations/standardnumber/1926
- Applicable American Society of Mechanical Engineers (ASME)/ American National Standards Institute (ANSI) B30 standards.

4. General Requirements

4.1. The contractor will comply with all applicable manufacturer, ASME, and OSHA requirements.

4.2. The procedures applicable to the operation of the equipment, including rated capacities (load charts), recommended operating speeds, special hazard warnings, instructions, and operator's manual, must be readily available in the cab for use by the operator.

4.3. Equipment must not be operated over its rated capacity.

4.4. Barricades or caution lines, and signs must be erected to prevent all employees from entering the fall zone. No employees are permitted in the fall zone except for qualified riggers (connecting and disconnecting).

4.5. When there are accessible areas in which the cranes rotating superstructure (permanently or temporarily mounted) poses a risk of striking or pinching/crushing an employee against another part of the equipment or another object, employees will be prevented from entering these areas.

4.6. All cranes will be equipped with anti-two blocking/hoist-limit device. They will be tested by a CP prior to operating the crane for each shift.

4.7. Crane operations will not begin unless all operational aids are in proper working order, except where the contractor meets the specified temporary alternative measures described by OSHA 29 CFR 1926.1416.

4.8. Environmental considerations.

4.8.1. Plan work activities according to the latest weather forecast and be prepared to stop operations, until bad weather has safely passed. Make determinations as necessary to reduce load chart ratings, load position, boom location, ground support, and speed of movement, required to safely make the lift.

4.8.2. Cranes will not be operated when wind speeds at the site attain the maximum wind velocity based on the surface/load ratio recommendations of the manufacturer.

- At winds greater than 20 mph (9 m/s), the operator, rigger, and lift director will cease all crane operations, evaluate conditions, and determine if the lift will proceed. This determination will be based on wind calculations per manufacturer's recommendations.
- The determination to proceed or not will be documented in the crane operator's logbook and the lift plan.

4.8.3. When lightning is observed, all outdoor crane operations must stop. A determination will be made as to proximity to operation being performed. If lightning is 10 miles away or less, work must stop until 30 minutes after the last audible thunder or visible flash of lightning.

4.8.4. Crane operations performed during weather conditions that produce icing of the crane or reduced visibility will be performed at reduced functional speeds and with signaling means appropriate to the situation.

4.9. Powerline clearance.

4.9.1 The contractor will determine if any part of the crane, load line or load (to include rigging and lifting accessories), if operated up to the crane's maximum working radius could get within 20 ft (6 m) of the power line one of the following must be met:

- De-energize and ground. Confirm from the utility owner/operator that the power line has been de-energized and visibly grounded at the worksite.
- Twenty Feet Clearance (20 ft clearance). Ensure no part of the crane, load line or load gets closer than 20 ft (6 m) to the power line by implementing the following:
  - Conduct a planning meeting with the site/lift director, signal person/rigger, operator, crew, and the other workers who will be in the area. Review location of the power lines and the control measures to prevent encroachment or electrocution.
  - If tag lines are used, they must be non-conductive.

- Erect and maintain an elevated warning line, barricade, or line of signs in view of the operator, equipped with flags or similar high-visibility markings, at 20 ft (6 m) from the power line or at a minimum approach distance under Table 16-1.

TABLE 16-1

Minimum Clearance from Energized Overhead Electric Lines

Voltage (nominal, kV, alternating current)	Minimum clearance distance
Up to 50	10 ft (3 m)
51 – 200	15 ft (4.6 m)
201 – 350	20 ft (6 m)
351 – 500	25 ft (7.6 m)
501 – 750	35 ft (10.7 m)
751 – 1000	45 ft (13.7 m)
Over 1,000	(As established by the utility owner/operator or RPE who is a QP with respect to electrical power transmission and distribution).

- In addition, at least one of the following must be in place:
  - Use of a dedicated spotter who is in continuous contact with the operator. The spotter must have a visual aid to assist in identifying the minimum clearance distance (e.g., clearly visible marking on the ground). The spotter must be positioned to effectively gauge the clearance distance;
  - A proximity alarm set to give operator sufficient warning;
  - A device that automatically limits range of movement, set to prevent encroachment.
  - An insulating link/device installed at a point between the end of the load line (or below) and the load.

4.10. Power Line Safety While Traveling Under or Near Power Lines with NO Load.

4.10.1 The contractor must ensure that:

- The boom/mast and its support system are lowered sufficiently to ensure clearances in Table 16-2 are maintained;
- Effects of speed and terrain on equipment movement (including boom/mast) are considered to ensure clearances in Table 16-2 are maintained;

- If any part of the LHE, while traveling will get closer than 20 ft (6 m) to the power line, a dedicated spotter who is in continuous contact with the operator is used.

TABLE 16-2

Minimum Clearance Distance from Energized Overhead Electric Lines While Traveling with No Load

Voltage (nominal, kV, alternating current)	While traveling - minimum clearance distance
Up to 0.75	4 ft (1.2 m)
.76 – 50	6 ft (1.8 m)
51 – 345	10 ft (3.0 m)
326 – 750	16 ft (4.9 m)
751 – 1000	20 ft (6.1 m)
Over 1,000	(As established by the utility owner/operator or RPE who is a QP with respect to electrical power transmission and distribution).

Note: Environmental conditions like fog, smoke or precipitation may require increased clearances.

4.11. Before crane components are erected, they will be visually inspected for damage. Cranes will be erected/dismantled in accordance with the manufacturer's recommended procedures and under the supervision of a lift director.

4.12. The crane logbook will be used to record operating hours and all crane inspections, tests, maintenance, and repairs. The log will be updated daily as the crane is used and will be signed by the operator. Service mechanics will sign the log after conducting maintenance or repairs on the crane.

5. Roles and Responsibilities
5.1. **Contractor**: Responsible for implementing this policy during all crane activities and will ensure:

5.1.1. A lift director that has authority over all critical lifts is assigned.

5.1.2. All crane operators are trained, certified, or licensed, and physically fit to operate the equipment.

5.1.3. Rigging is performed by a qualified rigger.

5.1.4. Signal person(s) and trained and designated.
5.1.5. Proof of training for crane operator, qualified rigger, and signal person is maintained onsite.

5.1.6. Cranes are maintained and safe to operate according to all applicable manufacturer, ASME, and OSHA requirements.

5.1.7. Task specific job/activity hazard analysis (JHA / AHA) are current and reflects all hazards involved with the crane operation.

5.2. **Lift Director**: Responsible for overseeing the planning of the work being performed by the lift crew and will ensure:

5.2.1. Competence and skill demonstrated through training and experience.

5.2.2. All critical lift operations are supervised.

5.2.3. The category of the load handling activity, along with developing, reviewing, and implementing the appropriate lift plan.

5.2.4. Crane operations will be safely halted if alerted to an unsafe condition. Operators must use discretion in determining how to safely stop operations without creating another hazardous condition.

5.2.5. Area preparations are completed before crane operations commence.

5.2.6. Necessary traffic controls are in place.

5.2.7. Signal persons understand hazards.

5.2.8. Hazard control plans are completed for special lifting operations, such as multiple crane lifts.

5.2.9. Load is properly rigged, and balanced.

5.3. **Crane Operator**: Responsible for safe hoisting operations and will ensure:

5.3.1. They are trained, certified, or licensed for the equipment they are operating.

5.3.2. Required inspections are completed prior to each shift in accordance with all applicable manufacturer, ASME, and OSHA requirements.

5.3.3. Procedures for communication are established and agreed upon.

5.3.4. All safety devices and operational aids are fully functional.

5.3.5. Read and have a full understanding of the operator's manual.

5.3.6. Assist with lift planning and discuss it with the team.

5.3.7. Operators will not engage in any practice or activity that diverts his/her attention while engaged in operating the equipment, such as the use of cellular phones (other than when used for signal communications).

5.3.8. All locking devices are set, and the crane is powered off prior to exiting.

5.3.9. They have a full understanding of emergency shut-off procedures.

5.3.10. Load is secured and balanced before hoisting.

5.3.11. All personnel are clear of swing radius of the counterweight.

5.3.12. Aware of all overhead hazards.
5.3.13. The swing path is clear of obstructions and adequate clearance will be maintained.

5.4. **Rigger**. Responsible for safe rigging and will ensure:

5.4.1. Understand all applicable manufacturer, ASME, and OSHA requirements.

5.4.2. Assist lift director and operator with planning.

5.4.3. Rigging gear is inspected before and after each use. When not in use remove rigging gear from the job site and properly store it.

5.4.4. Knowledge, training, and experience are sufficient to calculate loads, load weights, safe capacities, and apply other safe rigging principles and procedures.

5.4.5. Understand crane operations, to include limitations, crane dynamics involved in swinging and stopping loads, boom deflection and hoisting.

5.4.6. Effective communication with all members involved in the lifting activities.

5.4.7. Loads are protected from sharp edges with correct softeners.

5.4.8. Load does not exceed the safe working load limit at any time.

5.4.9. All safety related deficiencies are reported and addressed in a timely manner.

5.5. **Signal Person**. Responsible for effective communications during crane operations and have:

5.5.1. Training, experience, and understanding of equipment-operating characteristics, capabilities, and limitations.

5.5.2. Knowledge and understanding on the type of signals used (radio, cell, hand, etc.). If hand signals are used, the signal person must know and understand the standard method for hand signals.

6.0 Lift Planning
6.1. All lifts must be planned to avoid situations where the operator cannot maintain safe control of the lift. All lifts will follow applicable standard operating procedures, manufacturer, ASME, and OSHA requirements. This policy provides requirements for two types of lifts, standard and critical, defined below.

6.2. Standard Lift Plan (SLP) is required for mobile and overhead cranes.
6.2.1. SLP's will be prepared for every lift or series of lifts (if duty cycle or routine lifts are being performed). The SLP will be developed and reviewed by all personnel involved in the lift. The SLP will be maintained on the crane for the current lift(s) being made.

6.2.2. The standard lift plan can be documented on a JHA/AHA and will include at a minimum:

- Personnel roles and responsibilities of those involved in the lift.

- Area preparation to include load handling location and path of travel, blocking/cribbing, overhead lines, obstructions (power lines, structure, etc.), and ground/surface stability.
- Crane considerations to include inspections, capacity, configuration, and counterweight swing area.
- Load parameters to include weight, center of gravity, radii, and crane configuration.
- Rigging to include type, inspection, and need for softeners.
- Environmental considerations to include wind, storms, precipitation, etc.

6.3. Critical Lift Planning is required for mobile and overhead cranes.

6.3.1. A non-routine crane lift requiring detailed planning and additional or unusual safety precautions. These lifts require a hazard control plan as described in section 2 of this policy.

6.3.2. The following lifts are defined as critical lifts:

- Lifts involving hazardous materials (e.g., explosives, highly volatile substances).
- Hoisting personnel
- Lifts made with more than one crane.
- Lifts made when the load weight is 75% of the rated capacity of the crane load chart or more (not applicable to gantry, overhead, or bridge cranes).
- Lifts without the use of outriggers using rubber tire load charts.
- Lifts using more than one hoist on the same crane.
- Lifts involving multiple lift rigging (MLR) assemblies or other non-routine or technically difficult rigging arrangements.
- Lifts involving submerged loads.
- Lifts out of the operator's view. *Note:* Exception- If hand signals are used by a signal person in view of the operator or radio communications are available and in use, the load does not exceed two tons, and it is determined a routine lift by the lift director, then it is not considered a critical lift.
- Load Tests.
- When land-based crane is mounted on barges, pontoons, or other means of flotation that are required to travel while lifting the load.
- When two or more tower cranes are set up in the same operating envelope.
- Any lift the operator believes should be considered critical.

6.3.3. The critical lift plan will include at a minimum:

- The make and model of each crane.
- The exact size and weight of the load to be lifted and all crane and rigging components that add to the weight.
- The manufacturer's maximum load limits for the entire range of the lift, as listed in the load charts, must also be specified.
- Specify the lift geometry and procedures, including the crane position, height of the lift, the load radius, and the boom length and angle, for the entire range of the lift.
- Site drawing will be included to identify placement/location(s) of crane, adjacent equipment and/or facilities, etc.
- Proof of qualifications for the lift director(s), crane operator(s), rigger(s), and signal person(s).
- A rigging plan that shows the lift points and describes rigging procedures and hardware requirements. Note: For tandem crane lifts, identify the requirements for an equalizer beam if applicable.
- Description of the ground/surface conditions, outrigger or crawler track requirements, and, if necessary, the design of mats, necessary to achieve a level, stable foundation of sufficient bearing capacity for the lift.
- List environmental conditions under which lift operations are to be stopped.
- Specify coordination and communication requirements for the lift operation.
- For floating cranes: describe the operating base (platform) condition and any potential maximum list/trim.

7.0 Inspections

7.1. Site inspection. Inspections or determinations of road and shoulder conditions, overhead, and structure obstructions will be made in advance to assure that clearances and load capacities are safe for the passage or placing of any crane.

7.2. Inspection criteria for cranes.

7.2.1. Inspections of cranes will be in accordance with all applicable manufacturer, ASME, and OSHA requirements.

7.2.2. Records of all crane tests and inspections shall be maintained onsite. Contractors will make these records readily available upon request.

7.2.3. Whenever any crane is found to be unsafe, or whenever a deficiency that affects the safe operation of the crane is observed, the affected crane will be immediately taken out of service and its use prohibited until unsafe conditions have been corrected.

7.2.4. Inspection procedures for cranes are divided into three general classifications based on the intervals at which inspections will be performed. The intervals depend on the nature of critical components of the crane

and the degree of their exposure to wear, deterioration, or malfunction. The three general types are: Shift, Monthly and Annual.

- Shift and monthly inspections. Before every LHE operation (at the beginning of each shift) or following a change of operator, a Competent Person (CP) will, at a minimum, visually inspect all required items. Equipment will not be used until this inspection demonstrates that no corrective action is required.
- Periodic inspections. At least every 12 months, wire ropes (running and standing) in use on equipment must be inspected by a QP in accordance with all applicable manufacturer, ASME, and OSHA requirements. The frequency of these inspections should be based on activity, severity of service, and environment.
- These inspections must be documented and include the results of the inspection, the name and signature of the CP who conducted the inspection, and the date of the inspection. Documentation will be maintained for the life of the crane.

7.3. Rigging equipment inspection and inventory.

7.3.1. All rigging equipment must be used and inspected in accordance with all applicable manufacturer, ASME, and OSHA requirements.

7.3.2. Rigging equipment will be inspected each day or shift prior to use.

7.3.3. Periodic inspections must be performed by a CP at least every 12 months. The frequency of these inspections should be based on frequency of use, severity of conditions, and nature of load handling activities.

7.3.4. Documentation of these inspections will be maintained onsite.

7.3.5. Rigging gear when not in use will be safely stored.

Section 15: Snowmobile and All-Terrain Vehicle

1. Purpose and Scope

1.1. This Section establishes the requirements for contractors and program partners' operations of snowmobile and all-terrain vehicles (ATV) while working under the jurisdiction of the National Science Foundation (NSF), Office of Polar Programs (OPP), and its geographic areas of operation and domain.

2. General Requirements

2.1. Only personnel requiring snowmobiles or ATVs for relevant activities that the supervisory chain approves shall use the equipment to support the mission, sustainment functions, or approved recreational activities.

2.2. All operations shall be per manufacturer’s instructions and recommendations. Equipment shall not be operated in a manner that will endanger persons or property nor shall the safe operating speeds or loads be exceeded.

2.3. A copy of the operator’s manual will be kept by the contractor at the issuing center and be available for review on request.

2.4. The number of passengers shall not exceed the number that can be safely seated per manufacture instructions.

2.5. Getting off or on any equipment while it is in motion is prohibited.

2.6. Inspections, tests, maintenance, and repairs shall be conducted by a qualified person in accordance with the manufacturer's recommendations.

2.7. Equipment not meeting safe operating conditions shall be immediately removed from service, its use prohibited until unsafe conditions have been corrected, and re-inspected before being placed in service again.

2.8. Guarding

2.8.1. All belts, gears, shafts, pulleys, sprockets, spindles, drums, flywheels, chains, or other reciprocating, rotating, or moving parts of equipment shall be guarded when exposed to contact by persons or when they otherwise create a hazard.

2.8.2. All hot surfaces of equipment, including exhaust pipes or other lines, shall be guarded, or insulated to prevent injury and fire.

2.8.3. No guard, safety appliance, or device shall be removed, or made ineffective, except for making immediate repairs, lubrications, or adjustments.

2.9. ATV’s tires shall be inflated to the pressures recommended by the manufacturer.

3. Roles and Responsibilities

3.1. Supervisors shall suspend or revoke operator privileges if operators fail to maintain qualifications or demonstrate a careless disregard in operation of equipment.

4. Training

4.1. Operators shall Complete all operational or safety training the manufacturer requires for the specific equipment used.

4.2. All operator training and evaluations shall be conducted by persons who have the knowledge, training, and experience to train the equipment operators and evaluate their competence.

5. Equipment and Systems

5.1. Helmets shall be always worn while operating a snowmobile or ATV.

5.2. All passengers shall wear helmets. This includes those on a sled towed by any snowmobile or ATV.

5.3. Helmets must be approved by the Department of Transportation (DOT) or Snell Foundation for snowmobile or ATV use.

5.3.1. Climbing and rigging helmets are permitted in limited circumstances for personnel in transit during tower inspections and maintenance. This exception shall be documented as part of a Job Hazard Analysis with recommended safe speeds for the selected equipment used

Section 16: Ships and Vessels

1.Purpose and Scope

1.1. The purpose of this section is to ensure that the risk of serious injury or fatality is mitigated in ship operations.

1.2. The policy applies only to the USAP.

2. General Requirements

2.1. Policy

- Ships and vessels meeting the United States Coast Guard (USCG) requirement for inspection shall maintain USCG compliance.
- All passengers shall receive a safety briefing before the vessel departs that covers potential hazards *such as the ship lurching forward or sideways during rough seas*, emergency procedures, and incident reporting requirements. This briefing shall be documented with passenger signatures indicating they understand.
- For cargo unloading and loading, a coordinated safety plan shall be developed with all the various stakeholders (e.g. New Zealanders, NAVCHAPS, contractors), documented, and kept close to the dock for review if needed during operations. The plan shall also contain individual AHA's, broken out by activity, such as crane operations, rigging, and transportation. The enforcer of this plan is the onsite contractor. NSF expects that all organizations comply with the agreed-upon safety plan. Being that NSF will bear the burden for emergency support if a serious incident or fatality occur, NSF expects compliance with the contractor's safety requirements to include fall protection when workers are on top of containers. (See Section 2: Risk Management, Hazard Control Plans & Analysis).

2.1.1. Lines

- Lines shall be carried to shore, with risk managed appropriately, and this decision shall be the captain’s. The hierarchy of line carrying, from least risky to most risky is: 1) tossing by hand (if able), 2) carried across by small boat, 3) shot from gun, and 4) launched with rocket launcher. All weapon and explosive safety requirements shall be documented and enforced.
- Before shooting lines, clearance zones shall be established and maintained. At common access routes (walking or riding), signage warning personnel not to enter shall be in place.
- Personnel at tie-up points on shore shall be protected if line is being shot by gun or rocket launcher.
- Just before line shooting is to begin, and at a minimum 30-minutes prior, and where possible, a warning shall be communicated broadly to all in the vicinity to follow the safety requirements on clearance zones or any other contractor-dictated safety precaution.

Section 17: Guidelines for Scientific Diving (Antarctic Program Only)

1. Purpose and Scope

1.1. Diving is an activity that carries some risk, which can be mitigated through training and experience. Diving in Antarctica carries additional risks associated with the environmental conditions and the often-remote diving locations, where diving support, medical support, and life-support infrastructure are limited or absent. This policy and these standard operating procedures are intended to provide a framework by which underwater diving for both operations and maintenance (O&M) and scientific purposes can be conducted safely.

1.2. The Office of Polar Programs (OPP) within the Geosciences Directorate of the National Science Foundation (NSF) provides support for scientific diving associated with the research activities it funds. The OPP Scientific Diving Standards are developed to ensure that all scientific diving is conducted in a manner that will minimize scientific divers' exposure to risk for accidental injury or illness associated with diving, while optimizing the researchers' ability to conduct research. These Standards are modeled after the American Academy of Underwater Sciences (AAUS) Standards for Scientific Diving, a document that has provided a template for scientific diving at most academic and research institutions in the United States over the last fifty years. The AAUS approach has been recognized by the Occupational Safety and Health Administration (OSHA) as an effective method for protecting scientific divers. While OSHA does not have jurisdiction in Antarctica, Code of Federal Regulations, 29.1910 Subpart T, which governs diving safety in the U.S., provides a framework for USAP diving along with these USAP Scientific Diving Standards. Development of these standards allows home institution Dive Safety Officers (DSOs) to evaluate divers from their institutions, who participate in USAP diving, using criteria similar to their own organization.

2. References

- 29 CFR 1910.401-440 and Subpart T
- AAUS Standards for Scientific Diving

3. General Requirements

3.1. There are inherent risks in diving and doing so in Polar Regions involves additional risks because of the environmental conditions and remoteness. These standards provide a structure within which to manage those risks and allow underwater diving in support of the scientific enterprise to proceed safely. Each scientific diver should acknowledge those risks and commit to conducting their underwater diving activities in accordance with this policy and directed procedures.

4. Responsible Authorities and Personnel

4.1. Safety and Occupational Health Officer (SOHO): The SOHO is responsible for the safety of all USAP participants and is the administrative position to which the Dive Safety Officer reports. The SOHO has ultimate responsibility over all phases of the dive program and its management. The DSO exercises responsibility over all technical components of the scientific diving program.

4.2. OPP Dive Safety Manager: A direct contract position with OPP SOH. Colloquially known as the OPP DSO to align with the science diving community nomenclature, the OPP DSO acts as a liaison between the SOHO and the research divers. The DSO has the authority to act on behalf of the SOHO in all diving matters, pending

concurrence of the SOHO. The DSO typically represents OPP in technical matters concerning diving operations, diving safety, or projects utilizing diving as a tool in their research. The DSO has the responsibility to:

4.2.1. Review and recommend approval by the SOHO, all divers, diving plans, and diving locations submitted by the various research projects.

4.2.2. Evaluate and recommend equipment for polar diving use.

4.2.3. Recommend facilities to support scientific diving in polar regions.

4.2.4. Recommend new diving techniques or procedures to further scientific diving as a research tool in Antarctica.

4.3. Home Institution Diving Safety Officer: The home institution DSO oversees diving safety at the home institution, usually that of the principal investigator (PI), to which the scientific divers are affiliated. The home institution DSO acts in an advisory capacity to the OPP DSO, provides information on current scientific diver status under AAUS standards, and ensures that specialized training is provided to prepare individual divers for diving in Polar Regions. The home institution DSO certifies that the diver is current according to the most current version of AAUS standards.

4.4. Contractor Supervisor of Dive Services (SDS): The SDS is responsible for maintaining the OPP-owned dive equipment provided on-site, conducting diving pre-season orientations, orienting new science teams to conditions on-site, providing supervision and instruction on USAP techniques during local familiarization dives, and generally supporting all scientific diving activities. The SDS has the authority to suspend diving operations if in his or her opinion they are unsafe or unwise, pending review by the DSO. Other oversight duties, authorities, and responsibilities may be assigned this individual by the OPP DSO or the SOHO.

4.5. Principal Investigator (PI): Generally, the PI acts as the lead diver, unless that authority is assigned to another more experienced diver in the project. The PI is responsible for ensuring all divers meet this policy's requirements and the operational requirements of the project.

4.5.1. The PI is responsible for ensuring maintenance of all project-provided scuba equipment within 12 months of deployment to Antarctica and specifically for the following items (unless they are provided by OPP):

- Buoyancy compensator
- Dry suit

4.6. A project's lead diver is the person who has the diving experience, competency, responsibility, and reliability to conduct polar diving operations, and who has been designated responsible for managing the daily dive operations of the science team. The lead diver ensures that all divers in the team follow the procedures established in this policy and SOP.

4.7. Divers are the individuals having the experience, training, and authorization necessary to dive under the auspices of the OPP.

4.8. Tenders and surface support personnel are individuals who are trained to assist divers in their diving activities. They have no direct responsibility to intervene in diving operations. Tenders are assigned and trained by the SDS and/or project's PI or lead diver.

5. Scientific Diving Program Administration

5.1. The Diving Safety Officer (DSO) has been contracted to assist OPP by providing the technical expertise necessary to operate a scientific diving program in support of OPP's polar research mission.

5.2. Diving Eligibility. OPP-funded or sanctioned research projects or related educational outreach activities can request underwater diving privileges under the auspices of the OPP scientific diving program. Diving may be authorized if the dive project meets the definition of scientific diving (see below), the dive plan follows this policy and directed SOPs, the participating divers are authorized to dive, and the operational requirements of the dive project can be met within the resources available.

5.3. The OPP DSO will determine whether the dive plan and divers meet the requirements stipulated in this policy and SOP and can be authorized to dive. The NSF OPP Safety Officer and programs, operations, and logistics managers will determine whether the overall operational support requirements of the specific research project (including the underwater component) can be met within current resource constraints.

6. Diving Control

6.1. Diving Approval: Upon the recommendation of the SDS, the DSO determines whether a specific project's dive plan is consistent with the requirements of this policy and SOP, based on the information submitted by the PI, and if so, recommends approval the dive plan. Likewise, the DSO reviews each diver's credentials and recommends approval or disapproval of the diver, as appropriate.

6.2. All divers must meet the following criteria:

- Certified for one year, including rescue diver training
- 50 Open water dives
- 25 drysuit dives
- 10 drysuit dives within twelve months of Antarctic dive operations.
- Minimum AAUS depth certification (or equivalent experience) of 100 feet of sea water (fsw) for the McMurdo area and 60 fsw for Palmer and research vessels, with at least one dive to the diver's maximum certification depth within twelve-months of deployment to Antarctica.
- Current certification in first aid, CPR, and oxygen administration

6.3. Rebreather Diving: For diving using rebreathers, divers must meet these additional criteria:

6.3.1. Trained in the use of nitrox.

6.3.2. Certified for one year on a rebreather, with a minimum of 25 open-water rebreather dives and minimum of 25 hours underwater time.

6.3.3. Certified on the type of rebreather to be used.

6.3.4. A minimum of 10 open-water rebreather dives and a minimum of 10 hours underwater time on the rebreather to be used, while using a drysuit, in the past year.

6.4. Checkout Dives

6.4.1. Divers may be required to successfully complete checkout dives with a party designated by the OPP DSO before deployment.

6.4.2. Diving approval may be revoked for any diver who does not demonstrate proficiency during the in-situ familiarization dives conducted by the OPP DSO or SDS in the field.

6.5. Oversight of Diving Activities: The OPP DSO and the SDS have the authority to suspend the diving privileges of any divers or dive team if, in his or her opinion, the divers are conducting themselves in a manner that is unsafe or inconsistent with this policy and SOP. Temporarily suspended diving privileges can be reinstated by the OPP DSO, subject to review and ultimate approval by the OPP SOHO.

6.6. Consequences of Violating Regulations: Failure to comply with this policy and SOP may be cause for revocation or restriction of a diver's authorization to dive anywhere in the OPP's area of responsibility and authority.

7. Policies and Regulations

7.1. Diver Qualifications

7.1.1. In no case will individuals be allowed to dive under OPP auspices unless they are trained and proficient in the type of diving they plan to do and familiar with the equipment that they plan to use.

7.1.2. Each diver shall have experience or training in the following:

- The use of instruments and equipment appropriate to the diving activity to be conducted.
- Dive planning and emergency procedures.
- CPR, diver rescue techniques, oxygen administration, and diving-related first aid.
- Diving-related physics and physiology and the recognition of pressure-related injuries.
- Any supplemental qualifications the DSO may impose (e.g., the number of dry suit dives or other qualifications not required by AAUS).

7.2. Diver Health: No dive team member shall be permitted to dive for the duration of any known condition likely to adversely affect the safety and health of the diver or other dive team members.

7.3. Solo Diver Prohibition: All dives conducted under OPP auspices shall be executed in such a manner as to ensure that every diver involved maintains constant, effective communication with at least one other certified scientific diver in the water, except as permitted in Section 7.8. This buddy diver system is established to provide mutual assistance, especially in the case of an emergency. Dives should be planned around the competency of the least experienced diver. If effective communication is lost within a buddy team, then all divers in the team shall ascend and reestablish contact.

7.4. Diving Under Ceilings

7.4.1. The dive access hole must be clearly marked by deploying a secured downline with flags and strobe lights, and the opening must be maintained to allow a normal exit from the water. If additional holes are required, they must be similarly marked and maintained.

7.4.2. Untethered diving is permitted provided a downline is deployed and divers adhere to the buddy system, and provided diving is conducted in clear water with adequate visibility to permit clearly seeing the access hole or its downline from anywhere the divers will be during the course of the dive.

7.4.3. The use of a tendered tether is required when visibility restricts the diver from clearly seeing the access hole or downline, when shallow water restricts the diver's ability to see the entry hole, or if a danger is present.

7.4.4. Divers must carry with them two independent regulators: a primary and a backup.

7.4.5. These regulators may be attached to the same or to separate air sources. Diver carried bailout will be of sufficient volume to allow for a normal ascent and safety stop from any point in the planned dive.

7.4.6. A buoyancy compensator in conjunction with a dry suit is not required when diving with a downline that reaches the bottom at a diveable depth.

7.4.7. There must be surface support personnel at the planned entry/exit point for all dives. Additionally, during periods of darkness, at least two lights powered by independent sources must be in the hole.

7.5. Dive Computers and Pressure Gauges: All members of the diving team shall use an OPP-issued dive computer and a submersible, cylinder pressure gauge on all cylinders carried. Divers shall read and acknowledge understanding of the computer's manual, and all dives shall be planned and conducted within the computer's no-decompression limits.

7.6. Depth Limits

7.6.1. The diving certification issued by the diver's home institution will authorize the holder to dive to, but not exceed, his or her authorization depth.

7.6.2. Individuals are authorized to dive to either their depth certification from their home institution or to a depth specified by the OPP DSO, whichever is shallower. Minimum depth certification for the McMurdo area is 100 fsw and for Palmer and research vessels is 60 fsw.

7.6.3. An OPP-authorized diver may only exceed his or her depth certification by one step under the following conditions:

- If supervised by a diver certified to a greater depth.
- If an emergency situation makes this necessary.

7.7. Staged Decompression. Dives that require staged decompression are not authorized.

7.8. Diver Recall: A method of recalling the divers must be available at each dive site and understood by all divers and tenders.

7.9. Tended Diving with Communications: Solo divers using surface-supplied, or tethered-scuba modes of diving may be deployed, provided the following requirements are met:

- A full-face mask or helmet is utilized
- The system has a positive, two-way, voice-communication link
- The system has a tether, air supply hose (if appropriate), and communication line
- The diver has received a dive plan authorization number from the OPP DSO for this mode of diving to be used.
- A stand-by diver who is able to enter the water expeditiously is present.

7.10. Special authorization by the OPP DSO is required for:

- Surface-supplied diving
- Tethered scuba diving
- Blue-water diving
- Rebreathers (see Rebreather Standards, above, and Rebreathers, below)
- Mixed gases/oxygen enriched air (Nitrox)

8. Diving Operations and Plans

8.1. Working versus Scientific Diving: The USAP DSO or designee shall be responsible for determining whether dive operations are to be conducted as OSHA subject working dives or OSHA exempt scientific dives based on review of the dive plan. Questions such as those listed below will be used to determine the type of dive. Any negative answers would require the task to be conducted as a working dive.

8.1.1. Can the tasks be accomplished using simple hand tools (e.g. small hammers, pliers, chisels, wrenches, cameras, measuring tapes, collection bags and jars)?

8.1.2. Do the tasks require the expertise of a scientist or scientist-in-training?

8.1.3. Can the tasks be accomplished with minimal physical exertion?

8.1.4. Are the tasks limited solely to the observation of natural phenomena or responses of natural systems and/or gathering of data for scientific analyses?

8.1.5. If any object is to be lifted or moved, is its weight underwater <100 pounds?

8.1.6. Will the tasks result in the advancement of science?

8.2. Pre-dive Information: Dive Plans. Before conducting any diving operations, the PI must provide the following information in POLAR ICE or other communication option, as appropriate:

- The names of participating divers, their qualifications, and their depth certifications.
- The name, telephone number, and relationship of the person to be contacted for each diver, in the event of an emergency.
- The approximate number of proposed dives.
- The locations of proposed dives.
- The estimated depths and bottom times anticipated.
- The proposed work, the equipment and/or boats to be employed, whether repetitive dives will be required, and details on any hazardous conditions anticipated.

8.3. Lead Diver. For each dive, one individual shall be designated as the lead diver. He or she shall be at the dive site during the diving operation. The lead diver shall be responsible for:

8.3.1. Coordinating diving with other known activities in the vicinity that may interfere with the diving operation.

8.3.2. Briefing the dive team members on:

- Dive objectives.
- Any unusual hazards or environmental conditions likely to affect the safety of the diving operation.
- Any modifications to diving emergency procedures necessitated by the specific diving operation.
- The need to report immediately any physical problems or adverse physiological effects, particularly symptoms of pressure-related injuries.

8.3.3. Planning the diving operation, which shall include considerations of the safety and health aspects of the following:

- Diving mode.
- Surface and underwater conditions and hazards.
- Breathing gas supply.
- Thermal protection.
- Dive equipment.
- Dive team assignment.
- Residual inert gas status of dive team members.
- Decompression schedule and altitude corrections.
- Emergency procedures.
- Hazardous marine life.
- Currents.

8.4. Surface Support: All dives conducted under the auspices of OPP shall be supported by personnel who shall remain on-site and at the surface during the course of the dive, and who are trained to support that specific type of diving activity. At a minimum, these personnel must be aware of emergency response procedures for the specific dive site, diver recall procedures, methods of extracting an unconscious diver from the water, and the location and use of the emergency oxygen kit.

8.5. Pre-Dive Checks: Each diver shall conduct a pre-dive functional check of his or her diving equipment in the presence of the dive buddy or tender. This functional check shall include, but not be limited to, confirming that:

- The cylinder valve positively opens and closes.
- The submersible pressure gauge works and registers the expected amount of air in the cylinder.
- The in-line shut-off valve on the primary regulator is in the open position.
- There is adequate air delivery and an absence of free flow (by inhaling but not exhaling on both primary and backup regulators).
- The dry suit inflator valve delivers air without free flow, and the dry suit exhaust valve vents air when open.
- If used, the buoyancy compensator inflator valve delivers air without free flow, and the exhaust valve vents air when open.
- Any other gear operates according to specifications or expectations.

8.6. Refusal to Dive: It is the diver's responsibility and duty to refuse to dive if in his or her judgment conditions are unfavorable, or if he or she would be violating the precepts of his or her training, USAP diving standards, or his or her home institution's diving manual.

8.7. Agreement to Dive: No dive team member shall be required to be exposed to hyperbaric conditions against his or her will, except when necessary to prevent or treat a pressure-related injury.

8.8. Terminating the Dive

8.8.1. A diver may terminate a dive at any time if he or she feels it would be unsafe to continue. Divers should begin terminating their dives by notifying their buddies of the termination, stopping work, and commencing ascent. Divers must be at their safety stops with no less than 20 cf of air (see Table 1) and must have exited the water with no less than 10 cf.

8.8.2. Examples of situations necessitating dive termination include:

- Environmental conditions that become unsafe.
- One or more divers becomes chilled.
- Cylinder gas volume approaches 20 cubic feet.
- Dive profiles approach required stage decompression.
- Equipment failure that immediately or potentially jeopardizes the safety of the diver.

Table 1: Minimum reserve pressures for selected cylinder configurations

Cylinder Type (Ft^3)	Pressure at 20 Ft^3 (psig)	Pressure at 10 Ft^3 (psig)
Single Steel 95.1	600	300
Single Steel 110	500	250

8.9. Equipment Requirements

8.9.1. A functional oxygen kit shall be present at the dive site for every dive, and all participating divers and tenders shall be trained in its use.

8.9.2. Each diver shall have a submersible pressure gauge that measures scuba cylinder pressure and can be monitored by the diver during the dive.

8.9.3. Each diver shall have the capability of achieving and maintaining positive buoyancy.

8.10. Post-Dive Safety Checks. After completing a dive, each diver shall report any physical problems, symptoms of decompression sickness, or equipment malfunctions to the lead diver, PI, and the SDS.

8.11. Emergencies - Deviation from Regulations: Any diver may deviate from the requirements in this policy and SOP to the extent necessary to prevent or minimize a situation that is likely to cause death, serious

physical harm, or major environmental damage. A written report of such actions must be submitted to the OPP SOHO, DSO and SDS within 48 hours explaining the circumstances and justifications for such action.

8.11.1. Potentially dangerous diving conditions must be communicated to the on-site divers as soon as possible.

9. Dive Record Requirements

9.1. Personal Diving Log: Each diver shall log every dive. Completed log sheets shall be submitted to the SDS or other approved representative, who will forward them to the DSO. If an emergency causes a diver to incur a staged decompression obligation, this shall be noted in the log. The log shall be in a form specified by OPP and shall include at least the following:

- Dive date.
- Names of diver and buddies.
- Total dive time.
- Maximum depth attained.
- Location of dive.
- Dive computer used.
- Regulator used.
- Mixed gas composition and tables, if used.
- Mode of diving (scuba, surface supply, rebreather).
- Safety stop depth and time.
- Any accidents, equipment failures, or dangerous incidents occurring during the dive.

9.2. Record Maintenance: The SDS and USAP shall maintain records for each authorized scientific diver, including these items for at least the specified period:

- Record of dive - one year, but five years if there has been a pressure-related injury.
- Pressure-related injury assessment - five years.
- Records of hospitalization - five years.
- Equipment inspection and testing records - current entry or tag, or until equipment is withdrawn from service.

9.3. Availability of Records: Institutional DSOs are required by AAUS standards to maintain certain permanent records. Divers must agree to the release of that information deemed necessary for the OPP DSO to make a reasonable safety and health judgement regarding the diver's qualifications to dive. Failure to provide sufficient information may result in the denial of the OPP diving authorization.

10. Dive Accident Reporting

10.1. The diving program has an official and valid interest in all diving incidents and accidents. Analysis of incidents is important so that causes can be determined and corrected to prevent future occurrences and/or injuries that may impact diving readiness and authorizations.

10.2. The SDS and/or McMurdo or Palmer Station medical personnel shall report to the DSO any diving-related injury or illness that requires any dive team member to use therapeutic surface oxygen, any barotrauma, or any episode of unconsciousness related to diving activity. The circumstances of the incident and the extent of any

injuries or illnesses shall be specified to the extent allowable by patient privacy regulations, taking into account the program's legitimate requirement to know the physical readiness of all divers to safely dive.

10.3. The DSO shall maintain these records, which shall also contain:

- A description of symptoms - including depth and time of onset.
- A description and results of treatment.
- A printout of the relevant dive computer profile(s).
- A dive history for the previous seven days.
- Any history of flying within those seven days.
- The SDS and the DSO shall prepare a report of any diving accident requiring recompression or resulting in a serious injury, e.g., decompression sickness or gas embolism, and shall notify the OPP SOHO and the diver's home institution DSO.
- Incidents that do not involve injuries, e.g., free-flows and other equipment malfunctions, shall be recorded in the dive log.

11. Diving Equipment

11.1. Mandated USAP Equipment: USAP provided scuba regulators and dive computers must be used by all USAP divers.

11.2. Equipment Maintenance

11.2.1. The PI is responsible for ensuring that all grantee-provided scuba equipment has been provided regular maintenance within the past 12 months.

11.2.2. USAP issued equipment will be maintained by SDS or designee.

11.2.3. All equipment shall be maintained according to manufacturer's specifications

11.3. Equipment Inspection

11.3.1. All inspections, tests, maintenance, and record keeping referred to in this section must be performed by the SDS or other approved individual.

11.3.2. Any equipment that fails inspection criteria shall be removed from service until it can be brought into compliance.

11.4. Equipment Records: Each equipment modification, repair, test, calibration, or maintenance service shall be logged for the equipment listed below. The logs shall include the date and nature of work performed, serial/identification number of the item, and the name of the person performing the work.

Compressors	Submersible pressure gauges
Regulators	Depth gauges
Scuba cylinders	Cylinder valves
Diving helmets	Dive computers

Gas control panels filtration systems	Air storage cylinders Air

11.5. Breathing Masks and Helmets: Breathing masks and helmets shall have:

- A non-return valve at the attachment point between helmet or mask hose, which shall close readily and positively.
- An exhaust valve.
- A minimum ventilation rate capable of maintaining the diver at the diving depth.

11.6. Rebreathers

11.6.1. Only those models of rebreathers specifically approved by the DSO shall be used.

11.6.2. Current service records of the rebreather must be submitted to the DSO.

11.6.3. Divers must carry sufficient bailout, configured in a way to make it available to self or buddy, to allow egress from the water from any point in the planned dive.

11.6.4. Oxygen partial pressures shall not exceed 1.4 atmospheres at depths greater than 30 fsw, or 1.6 at depths less than 30 fsw.

11.6.5. All dives will be within the no-decompression limits of the unit.

11.6.6. CO2 scrubbers will only be used for a maximum of one-half the manufacturer's recommended time limit.

11.7. Scuba Air Cylinders

11.7.1. Shall be designed, constructed and maintained in accordance with provisions of the applicable Unfired Pressure Vessel Safety Orders.

11.7.2. Must be hydrostatically tested in accordance with Department of Transportation (DOT) standards.

11.7.3. Must have an internal visual inspection before they are issued for use, and thereafter at intervals not to exceed 12 months, or sooner if they are suspected of having internal moisture.

11.8. Cylinder valves shall be functionally tested at intervals not to exceed 12 months.

11.9. Backpacks and weight systems shall be regularly examined by the persons using them. When used in open water, all weight systems and scuba backpacks worn by the diver shall be equipped with quick release devices designed to permit jettisoning of the gear. The quick release device must operate easily with a single motion from either hand.

11.10. Pressure Gauges shall be inspected and tested annually, and thereafter as necessary.

11.11. First Aid Supplies: Both oxygen and a first-aid kit adequate for the diving operation shall be available at the dive location. When used in a hyperbaric chamber or bell, the first-aid kit shall be suitable for use under hyperbaric conditions.

11.12. Underwater Tools: Hand-held electrical tools and equipment used under water shall be specifically approved for this purpose, and they shall not be supplied with power until requested by the diver.

11.13. The use of specialized equipment, such as listed here, must be approved by the USAP DSO:

- Lift bags
- Underwater power tools
- Air lifts
- Come-alongs
- Underwater propulsion vehicles (scooters)
- Any equipment connected to the surface with an air-line or load line

11.14. Oxygen cylinder filling for rebreathers requires special training from the diving supervisors.

12. Breathing Air Standards

12.1. Breathing air for scuba shall meet Compressed Gas Association (CGA) Grade E air quality standards.

12.2. Compressor Systems

12.2.1. Low pressure compressors used to supply breathing air shall be equipped with a volume cylinder, with a check valve on the inlet side, a pressure gauge, a relief valve, and a drain valve.

12.2.2. Compressed air systems over 500 psi shall have slow-opening shut-off valves.

12.2.3. All air compressor intakes shall be located away from areas containing exhaust or other contaminants.

12.3. Compressor Operation and Test Records

12.3.1. Gas analysis and air tests shall be performed on breathing air compressors by the SDS or other approved representative at regular intervals of not more than 100 hours of operation or 6 months, whichever occurs first. The results of these tests shall be entered in a formal log and be maintained by the SDS.

12.3.2. A log shall be maintained by the SDS or other approved representative showing any operation, repair, overhaul, filter maintenance, or temperature adjustment for each compressor.

12.4. Oxygen Safety

12.4.1. Equipment used with oxygen or mixtures containing over forty percent (40%) oxygen by volume shall be designed and maintained for oxygen service.

12.4.2. Components (except umbilical) exposed to oxygen or mixtures containing over forty percent (40%) oxygen by volume shall be cleaned of flammable materials before being placed in service.

12.4.3. Oxygen systems over 125 psig shall have slow-opening shut-off valves.

13. Construction or O&M Diving

13.1. Background: Though not as frequently executed as scientific diving, there are occasions where O&M or even construction diving is required. This type of diving presents additional hazards as compared to scientific diving, such as underwater welding, crane hazards, electrical hazards, and pressure differentials that create sucking forces, among others. Many of these hazards require lockout/tag-out procedures.

13.2. Procedures

13.2.1. Compliance is required with all requirements in 29 CFR 1910.410.

- Commercial SCUBA air diving with one diver in the water requires a minimum of three dive-team members: a designated person-in-charge (DPIC) (see 29 CFR 1910.410(c)), a standby diver (see 29 CFR 1910.424(c)(1)), and a line-tended diver (see 29 CFR 1910.424(c)(2)). Commercial SCUBA diving with two divers in the water requires a minimum of four dive-team members: a DPIC (see 29 CFR 1910.410(c)), a standby diver (see 29 CFR 1910.424(c)(1)), and two divers (see 29 CFR 1910.424(c)(2)).
- Commercial surface-supplied air diving to 100 feet with one diver in the water requires a minimum of three dive-team members: a DPIC (see 29 CFR 1910.410(c)), and a diver "who shall be continuously tended [by a tender other than the DPIC] while in the water" (see 29 CFR 1910.425(c)(1)). For surface-supplied air diving that is 100 feet or less and does not involve planned decompression, a standby diver is not a specified requirement for every dive. We operate with a three-person team: One DPIC (Diving Supervisor), one suited standby diver, and one working diver.

13.2.2. All administrative steps required for scientific diving shall also be complied with for O&M and construction diving, to include submission of a dive plan to the OPP Diving Safety Officer for review and acceptance before the dive. A job hazard analysis (JHA) shall be completed for each working dive and shall be reviewed by the dive supervisor on-site before the dive. All members of the dive team shall sign the JHA, indicating they understand the hazards and the controls that will be utilized to mitigate risk. For emergent diving needed asap due to severe risk to life, life critical property, or severe environmental loss, a JHA shall be developed and provided to the local safety office, the NSF Rep, and NSF Station Manager for awareness. If none of those parties are available, the Dive Log, JHA, and short justification statement shall be emailed to the NSF OPP Diving Safety Officer as soon as reasonably possible after the dive for an after- action review.

13.2.3. Safety training, as required by OSHA for specific activities, such as welding and lockout/tag-out, shall be provided to dive team members as needed, and it shall be documented. In addition, the divers must have experience performing similar types of underwater work in the past, e.g., welding.

14. Definitions

American Academy of Underwater Sciences (AAUS): The national association of scientific diving scientists, diving technicians, and diving safety officers that is generally responsible for setting standards for scientific diving.

Buddy diver: Second member of the dive team.

Certified diver: A diver who holds a current certification from an AAUS scientific diving program or nationally recognized certifying agency.

Closed-circuit rebreather: A type of scuba equipment that recirculates all of the exhaled breathing gas.

Cylinder: A pressure vessel for storage of gases.

Decompression sickness (DCS): A condition with a variety of symptoms that may result from gas and bubbles in the tissues of divers after pressure reduction. DCS can be caused by exceeding no-decompression limits or exceeding the prescribed rate of ascent.

Depth: The dive log should denote the maximum depth of the dive.

Depth Certification: The depth to which a diver is certified to dive.

Dive: A descent into the water, an underwater activity utilizing compressed gas, an ascent, and return to the surface.

Dive computer: An electronic device for tracking depth and time and computing inert gas uptake and off-gassing.

Dive site: The physical location of a dive.

Dive table: A profile or set of profiles of depth-time relationships, including their ascent rates, for particular breathing mixtures, to be followed after a specific depth-time exposure or exposures. (Synonymous with Decompression Table.)

Dive team: Divers and support individuals who are exposed to or control the exposure of others to hyperbaric conditions.

Diver: An individual in the water who uses an apparatus that supplies breathing gas at ambient pressure.

Diving mode: A type of diving requiring specific equipment, procedures, and techniques; for example, scuba, surface-supplied air, or mixed gas.

Dive Safety Manager: A contract position within the OPP Safety and Occupational Health (SOH) office that advises OPP on diving related matters. Colloquially known as the OPP DSO to align with the science diving community nomenclature.

Diving Safety Officer (DSO): Individual with scientific diving expertise responsible for advising their institutions on scientific diving matters, authorizing dive plans, and authorizing divers to dive under institutional auspices.

Dry suit: An exposure suit with airtight seals at the neck and wrists, which allows the introduction and exhaust of compressed air through valves and keeps the diver dry during the dive.

Hyperbaric: A condition defined by pressure greater than one atmosphere at sea level.

Lead diver: A certified scientific diver with the experience and training to lead the diving operation.

Mixed-gas diving: A diving mode in which the diver is supplied in the water with a breathing gas other than air.

No-decompression limits: The maximum depth and time parameters of a decompression algorithm for which staged decompression is not required.

Open water: Water not covered by a ceiling, ice or otherwise.

Principal investigator (PI): The scientist in charge of a science project, usually the senior scientist.

Pressure-related injury: An injury resulting from pressure disequilibrium within the body as the result of hyperbaric exposure. Examples include decompression sickness, pneumothorax, mediastinal emphysema, air embolism, subcutaneous emphysema, and barotrauma.

Recompression chamber: A pressure vessel for treating pressure-related dive accidents, such as cerebral arterial gas embolism (CAGE) and DCS. (Synonymous with Hyperbaric Chamber).

Regulator: A device for delivering air from high pressure to ambient pressure, usually for breathing purposes.

Scientific diving: All diving performed by individuals necessary to and part of a scientific research or educational activity, in conjunction with a project or study under the jurisdiction of any public, private, or educational institution or similarly recognized organization, department, or group. To further clarify, OPP requires that:

- The underwater diving activity is an integral and essential part of the project.
- The project is a scientific, research, or educational activity consistent with OPP's mission to foster research and education in the sciences and engineering,
- The specific tasks that the diver performs under water are observational or involved in data gathering, rather than tasks usually associated with commercial diving; and;
- The work products of the diving activity are available to the public for review or examination.

Scientist: An individual who dives to conduct scientific operations which require specific knowledge and expertise in which the individual is fully qualified.

Scientist-in-Training: An individual who dives to conduct scientific operations which require specific knowledge and expertise, but whose science activities and diving are conducted under the direct or indirect supervision of a Scientist.

SCUBA diving (scuba): A diving mode independent of surface supply in which the diver uses an open-circuit, self-contained, underwater breathing apparatus.

Supervisor of Dive Service (SDS)s: Individual with scientific diving expertise and logistical responsibilities, employed by the USAP Antarctic support contractor. He or she coordinates closely with the USAP DSO and safety and health officer to manage the USAP scientific diving program.

Surface-supplied diving: A diving mode in which the diver in the water is supplied from the surface with compressed gas for breathing, either from an air bank or from a compressor with volume cylinder.

Tender: A qualified person on the surface who is responsible for assisting and communicating with divers during a dive by various means, including a tether.

Tether: A line attached to a diver(s) to prevent their becoming lost underwater or under ice due to poor visibility or swift current. This is also a means of diver-to-surface communication.

Total Dive Time: Time from leaving surface to arriving back on surface. This is the time recorded in the USAP dive logs.

U.S. Antarctic Program (USAP): An organization of the U.S. government made up of scientists and support personnel who carry out research that can only be done or best be done in Antarctica. The program comprises research by scientists selected from universities and other research institutions and operations and support by a contractor and other agencies of the U.S. Government. The National Science Foundation (the U.S. Government agency that promotes the progress of science) funds and manages the program through its Directorate for Geosciences, Office of Polar Programs.

Working dives: Commercial diving as defined by OSHA under 29 CFR 1910, Subpart T, which involves tasks such as inspection of pipelines and outfalls, underwater welding, lifting heavy objects, and diving in contaminated water.

Section 18: Research Safety

1. Purpose and Scope

The purpose of this section is to ensure that the risk of serious injury or fatality is mitigated in all grantee field work. Field work in the polar regions is inherently risky, and includes risks associated with varying environmental conditions and remote settings that are often far from medical support. This policy is intended to provide a framework by which work conducted in the polar regions can be conducted safely. In this section, the term *grantee* refers to all Principal Investigators (PIs) and their deploying research teams, including specialized staff (i.e. Mountaineers), students and volunteers that are supported by NSF OPP funding and traveling to the Antarctic or Arctic regions to conduct work, and the term *field* refers to all locations and camps including the major stations, vessels, fixed traverse routes, and local airfield complexes that *grantees* are working in.

This policy also applies to any researchers funded by other agencies or participants who are working at field sites in the polar regions. Examples include but are not limited to NASA, NOAA, DoD and other independent contractors supporting field activities.

Safety risk management is the identification, assessment, and mitigation of risk, and providing an analysis of risks or hazards and how to reduce or avoid them, or what level of risk to accept. This includes training, collaboration, and support involving various stakeholders with a variety of skills and experience. This is an iterative process and should be an integral part of field planning, with hazards identified at the proposal stage, during the planning of the project, continued throughout field work, with follow up afterward to highlight any lessons that can be applied in the future.

The PI and their institution are legally responsible for the safety of team members conducting field work on the grant. The *NSF Grant General Conditions (GC-1)* provides specific language regarding responsibility, liability, compliance with applicable federal laws and permit requirements. Researchers should utilize the resources offered by their institutions for risk management in laboratory and field settings and to comply with regulations in areas such as transporting materials, chemical hygiene, and occupational health and safety.

Because of the risks and logistical challenges of working in the polar regions, the Office of Polar Programs strives to provide researchers with the tools and knowledge needed to work effectively in the Arctic and Antarctic. For example, NSF hosts workshops and webinars to support managing risk relevant to physical field safety, such as glacier travel and crevasse rescue. For work on ice sheets, NSF has imagery analysis performed for field site and traverse route selection through agreements with the Cold Regions Research and Engineering Lab (CRREL) and the Polar Geospatial Center (PGC). The NSF research support contractors also address field risk management when working with research teams and provide risk assessments, training, and emergency management. Together, PIs, contractors, NSF, and other stakeholders are expected to collaborate to ensure that polar field science is as safe as possible.

2. General Requirements

In line with the *NSF Proposal and Awards Policies and Procedures Guide*, the *NSF Office of Polar Programs (OPP) Safety and Health Policy*, and the *NSF (OPP) Code of Conduct*, the grantee academic institution assumes all risk and responsibility for institutional personnel conduct under the grant. Additionally, polar support contractors offer resources, equipment, and training to minimize, mitigate or manage risk so that researcher teams can effectively conduct research in extreme environments. NSF OPP expects safety to be a top priority for all individuals participating in federally funded research.

1) **Research Risk Reviews:** Meetings held annually by support contractors and the NSF OPP Safety Officer or designee to review risk management efforts for high-risk science projects.
2) **Proposal Reviews:** Prior to award, research proposals are reviewed for risk exposure and mitigation recommendations by both the NSF OPP Safety Officer or designee and the contractor field or safety office. An environmental review also occurs at the proposal stage. When possible, high-risk activities should be identified at the proposal stage so that resources can be available for field activities. Examples are listed below.
    - **Technical Positions:** Bear Guard, Mountaineer, Field Guide
    - **Equipment:** Firearms, cold weather clothing, personal protective equipment, explosives
    - **Training:** Firearms, glacier travel, crevasse rescue
3) **Risk Assessment:** Science Project Risk Assessments and Pre-Season Field Planning meetings are collaborative discussions held during the planning stage and documented in Science Project Plans. The PI and as many team members as possible are encouraged to attend.
4) **Training:** Grantee academic institutions are responsible for providing training for awarded researchers. Research teams should also make use of training offered by support contractors to prepare for success in the field as well as training that may be required for some locations. PIs can request funds for technical training with third party vendors in their grant proposals.

5) **Resources:** Support contractors offer risk management tools through their websites and publications to assist research field teams with planning for fieldwork and to establish protocols such as emergency contacts, and expectations for behavior.
6) **Equipment:** Support contractors provide field equipment such as communications, tents, medical kits, telemedicine and mental health support, and other gear, as well as an orientation for use of this equipment.
7) **Emergency Cold Weather (ECW) Gear:** The USAP issues limited amounts of ECW gear to all participants. The Arctic provides ECW to contractor employees and Distinguished Visitors (DVs). Researchers should include the cost of cold weather gear or other special equipment in their grant budget. Researchers should ensure their field teams are properly equipped and are encouraged to request funds to make fieldwork more inclusive by enabling the purchase of special equipment for people of different shapes and sizes.
8) **Reporting Incidents:** Near Miss and Incident reporting is essential to improving field risk management in the polar programs through lessons learned and best practices among peers. Sharing field mishaps is a service to the community by helping others avoid similar circumstances. Arctic incidents or near misses should be reported via the Arctic Gateway website (https://battellearcticgateway.org/). Antarctic incidents and near misses should be sent to USAP-EINF-DL-Grantee@usap.gov. Reporting can also be completed without retribution, through the support contractor, the Chief Scientist or the NSF Representative, or confidentially by directly contacting the NSF OPP Safety Team opp-safety@nsf.gov.
9) **Site Visits:** When feasible, NSF OPP staff and contractor safety and risk management staff visit field research sites to assess how risk management initiatives are being incorporated into research activities.
10) **Process Improvement Cycle:** Support contractors solicit feedback from researchers via training evaluations and end-of-season out brief interviews to explore areas for improvement. This feedback is used to continuously develop processes, procedures, training materials, supplies, and equipment needs.

Risk management is based on decision-making processes that consider all levels of risk tolerance on the field teams, respectful communication, and planning, so that risk and hazard can be identified and managed, proving a solid foundation for successful science. Concerns regarding the appropriateness of risk management initiatives and safety regulations are bound to arise between grantees, contractors, and federal employees working in the extreme environments of the Arctic and Antarctic. NSF OPP expects that everyone involved with federally funded research will actively engage in a collaborative culture of safety and prioritize a collective and continuous commitment to emphasize safety over competing goals. If a safety requirement identified through a federal standard or policy directive cannot be met or is not feasible, the research team can apply for a waiver or variance described in paragraph 7 in the overview of this policy.

References

NSF Office of Polar Programs

- NSF Grant General Conditions (GC-1)
- Proposal and Awards Policies and Procedures Guide
- Safety and Health Policy
- Code of Conduct

- Principles for Conducting Research in the Arctic

Stakeholders

- Polar Geospatial Center
- Cold Regions Research and Engineering Laboratory

USAP

- Field Manual Continental Version
- Field Manual Peninsula Version
- Basic Field First Aid
- Stay Healthy at Altitude
- Participant Guide
- Glacier and Crevasse Traverse Manual

Arctic

- Greenland Guide
- Summit Station Guide
- Pituffik Space Base Guide
- Toolik Field Station Handbook
- Supporting a Culture of Safety in Arctic Science
- CRREL Imagery Request SOP
- Battelle Arctic Gateway: Risk Management
- Battelle Arctic Gateway: Training

Section 19: Chemical Hygiene Plan

This section is held for future development.

Appendix A: List of Acronyms

AAUS: American Academy of Underwater Sciences
ABM: Activity Based Manager
AHA: Activity Hazard Analysis
AHJ: Authority Having Jurisdiction
ANSI: American National Standards Institute
ATV: All-Terrain Vehicle
BOI: Board of Investigation
CAGE: Cerebral Arterial Gas Embolism
CFR: Code of Federal Regulations
CGA: Compressed Gas Association
CO2: Carbon Dioxide
CO: Contracting Officer
COR: Contracting Officer's Representative
CPR: Cardiopulmonary Resuscitation
dBA: A-weighted decibels (an expression of the relative loudness of sounds, as perceived by the human ear)
DCS: Decompression Sickness
DHHS: Department of Health and Human Services
DOD: Department of Defense
DOT: Department of Transportation
DSO: Diving Safety Officer
FAR: Federal Acquisition Regulations
FOIA: Freedom of Information Act
FOPS: Falling Object Protective Structures
GFCI: Ground Fault Circuit Interrupter
GPS: Global Positioning System
ICC: International Code Council
IDLH: Imminently Dangerous to Life and Health
IFC: International Fire Code
LEL: Lower Explosive Limit
LFL: Lower Flammable Limit
NEC: National Electrical Code
NFPA: National Fire Protection Association
NIOSH: National Institute for Occupational Safety and Health
NRC: Nuclear Regulatory Commission
NSF: National Science Foundation
O&M: Operations and Maintenance
OPP: Office of Polar Programs
OSH: Occupational Safety & Health
OSHA: Occupational Safety & Health Administration
PEL: Permissible Exposure Limit
PESH: Polar Environment, Safety & Health
PFD: Personal Flotation Device
PI: Principal Investigator
PPE: Personal Protective Equipment

ppm: Parts per million
RAC: Risk Assessment Code
SAE: Society of Automotive Engineers
SDCB: Scientific Diving Control Board
SDS: Safety Data Sheet
SME: Subject Matter Expert
SOH: Safety & Occupational Health
SOHO: Safety & Occupational Health Officer
SOP: Standard Operating Procedure
STS: Standard Threshold Shift
T-Event: Technical Event (third-party organization deploying to Antarctica to repair a science project's equipment)
TLV: Threshold Limit Values
USACE: U.S. Army Corps of Engineers
USAP: United States Antarctic Program
UL: Underwriters Laboratories (an independent, not-for-profit testing laboratory)
UV: Ultraviolet (in referring to radiation)

Appendix B: FORM 2000.10-2

Fire Prevention Checklist for Administrative Occupancies

Instructions: An occupant appointed by the supervisor completes the checklist monthly for each building. Maintain in file for one year. Corrective actions should be noted on reverse side.

Section: _____ Date: _____

1. Are emergency phone numbers posted? _____

2. Are hallways and stairs free of obstructions? _____

3. Areas near heating appliances free of combustibles? _____

4. Are fire extinguishers visually inspected and operating instructions attached? _____

5. Do all electrical fixtures and appliances appear to be in a safe condition? _____

6. Are extension cords UL or CE listed? _____

7. Are extension cords overloaded? (No more than three items may be plugged into a non-circuit breaker protected extension cord.) _____

8. Are appliances located on a noncombustible base and unplugged if not in use? _____

9. Are exit lights and emergency illumination operational? _____

10. Are exits and exit doors free of obstructions and unlocked during hours of operation? _____

11. Is the building fire alarm system operational? _____

12. Are transformers unplugged if attached equipment is not in use? _____

_____
Printed name of inspecting person

_____
Signature of inspecting person

Appendix C: FORM 2000.10-3

Confined Space Entry Permit

Instructions: A confined space entry permit can be in whatever format desired, but the information listed on this form must be included, at a minimum. This permit may be used in lieu of a contractor-developed form.

Location of space _____

Description of space _____

Employee authorizing entry _____Date_____

Purpose of authorization _____

Entry authorized from (time) _____ to _____Date_____

Authorized entrants _____

_____

Authorized attendant(s) _____

_____

SPACE HAZARDS AND CONTROLS

Identification of gas meter used and calibration date: _____

Asphyxiation: oxygen deficiency ☐ chemical ☐ engulfment ☐

Flammable/explosive: dust ☐ chemical ☐ (specify)_____

Toxic: chemical ☐ (specify)_____

Unauthorized activation: mechanical _____electrical _____

The confined space shall be isolated or potential hazards controlled by:

Depressurization ☐ Purging and cleaning pipe ☐ Lockout/tagout ☐

Blanking/capping pipe ☐ Other ☐ (specify)_____

Rescue services/equipment are available: on-site ☐ outside ☐

Communication equipment/procedures to be used:

The following personal protective equipment have been assigned to, and shall be worn by, entrants:

Hot work [may]/[shall not] be conducted in this space.

If hot work is permitted, the following controls shall be utilized:

TESTING AND MONITORING

The space has an oxygen content of _____and is [safe]/[unsafe]

The space has been monitored and contains the following concentration of
toxic hazards:
carbon monoxide_____
hydrogen sulfide _____
other (specify) _____

The space has been tested and contains the following percentages of lower flammable limit of flammable/explosive chemicals (specify):

Monitoring will be conducted: continuously ☐ or at intervals ☐

AUTHORIZATION: All actions and conditions necessary for safe entry to, work in, and exit from the confined space have been performed. Entry is permitted on the date and time, and for the duration, specified above.

_____
(Signature of individual authorizing entry)

CANCELLATION: All entrants have exited the confined space and this permit is canceled.

_____ Time _____
(Signature of individual authorizing entry)

Appendix D: FORM 2000.10-4

Activity Hazard Analysis

Instructions: Contractors may develop and use their own Activity Hazard Analysis form, provided it contains the information listed below, at a minimum. Otherwise, this form may be used.

1. Contract No.	2. Project	3. Facility
4. Date	5. Location	6. Estimated Start Date
7. PRINCIPAL STEPS	8. POTENTIAL HAZARDS	9. RECOMMENDED CONTROLS
10. EQUIPMENT TO BE USED	11. INSPECTION REQUIREMENTS	12. TRAINING REQUIREMENTS
Risk assessment code (RAC) based on probability of an incident occurring and severity of loss if one occurs (Low-Med-High):		
13. Contractor (Signature & Date)		
14.If RAC medium or high, signature of NSF representative on site, or if none, appropriate NSF program manager/ABM remote: _____		15. NSF ABM: (Signature & Date)

Appendix E: FORM 2000.10-5

Safety Requirement Waiver/Variance Request Form

National Science Foundation/Office of Polar Programs

Safety Requirement Waiver/Variance Request Form

Waiver Information

PROJECT: Click here to enter text. DATE: Click here to enter a date.

SUBJECT: Click here to enter text.

1. SAFETY REQUIREMENT AND/OR CODE REQUIREMENTS TO BE WAIVED:
Click here to enter text.

2. SAFETY REQUIREMENT/STANDARD/CODE REFERENCES:
Click here to enter text.

3. DEFINE WHETHER A TEMPORARY OR PERMANENT VARIANCE IS BEING REQUESTED:

- EXPLAIN WHAT LENGTH OF TIME IS REQUIRED AND WHY;
- IS THE REQUEST A WAIVER OF REQUIRMENT, A DELAY OF IMPLEMENTATION OR A SUGGESTION OF AN ALTERNATIVE SOLUTION?

Click here to enter text.

4. RATIONALE FOR WAIVING THE SAFETY REQUIREMENT/STANDARD/ CODE

A. GIVE A COMPLETE EXPLANATION DEFINING THE NECESSITY OF THE VARIANCE:

- AN EXPLANATION OF THE CURRENT OR PROPOSED CONDITION;
- WHY IT DOES NOT CONFORM WITH THE RULE;
- WHAT WOULD BE NECESSARY TO COMPLY WITH THE RULE;
- BACKGROUND INFORMATION ABOUT THE CONDITION;
- HOW IT HAS AFFECTED LIFE, HEALTH AND SAFETY

Click here to enter text.

B. PROVIDE DEFINITIVE INFORMATION AS TO WHY THE VARIANCE CAN BE GRANTED WITH NO ADDITIONAL OR UNDUE THREAT TO THE HEALTH AND SAFETY OF THE PUBLIC, SUCH AS:

- OPERATIONAL HISTORY;
- HISTORY OF SIMILAR CONDITIONS;
- EXPERT TESTIMONY; OR,
- AN ALTERNATIVE SOLUTION TO PROTECT THE PUBLIC.

Click here to enter text.

5. RECOMMENDED ALTERNATIVE MEANS TO ACHIEVE EQUIIVALENT PROTECTION

- PROCESS, PROCEDURE, or equipment TO BE IMPLEMENTED;

Click here to enter text.

6. HAZARD ANALYSIS EVIDENCING RISK MITIGATION AND IDENTIFICATION OF RESIDUAL RISK :

- NEED TO IDENTIFY RISK IN CURRENT STATE;
- NEED TO IDENTIFY RISK AFTER IMPLEMENTATION;
- NEED TO IDENTIFY RESIDUAL RISK AFTER IMPLEMENTATION

Click here to enter text.

7. COST ESTIMATE
    - INCLUDE ALL COSTS ASSOCIATED (PLANNING,PROCUREMENT, SHIPPING, INSTALLATION, O&M, OTHER)
    - PLEASE ADD A NOTE ABOUT LIFE EXPECTANCY IF EQUIPMENT/REPAIR INCLUDED

Click here to enter text.

Peer Review and Recommendation

PEER REVIEW COMMENTS:

Click here to enter text

Click here to enter text. Click here to enter a date.
Reviewer Electronic Signature *Date*

RECOMMENDATION: ☐ CONCUR ☐ DO NOT CONCUR

National Science Foundation (NSF) Approval

NSF COMMENTS:
Click here to enter text.

Click here to enter text. Click here to enter a date.
NSF OPP Safety Officer *Date*

Name: Click here to enter text. Title: Click here to enter text.