

PREFACE

The safety of every employee, patient, student, visitor, and the environment is a top consideration in the NIH's ongoing efforts to provide, maintain, and operate safe, healthy, and attractive facilities. The safety and health of our workforce is essential to the success of our organization and the Institutes and Centers we support. Employees are encouraged to take every reasonable measure to ensure all operations and activities are carried out with appropriate safety precautions. The goal is simple: everyone comes home safe at the end of each day. Safe organizations understand resources spent on safety (classroom training, hands-on training, PPE, procurement of safety equipment such as machine guards, clear guidance, lessons-learned analyses, etc.) are worthwhile expenditures of resources, not merely costs on a balance sheet. Safe organizations realize that safety mishaps can be avoided through awareness and the establishment of a culture of safety so that this approach becomes embedded in our procedures, our thought processes and our approach to leadership. No job is to be regarded so urgent that time cannot be taken to do it in a safe manner or too expensive to adopt best management safety practices. Supervisors and employees should be asking themselves two basic questions when conducting an operation:

- 1) What can go wrong?
- 2) What can I do to minimize the risk?

If we continue to ask those questions and act upon them, we will be safe.

A safe workplace is the direct responsibility of all managers, supervisors, employees, and contractors. To achieve this objective, comprehensive safety and health policies are established – the details of which are presented in this manual. NIH employees are required to conduct their activities in accordance with the requirements stipulated in this manual. These policies and procedures provide the clear guidance required to achieve our safety goals. However, they are only going to achieve their full potential if supervisors and employees utilize them. So please take advantage of these documents and provide any feedback to the Division of Safety and Occupational Health (DOHS) at 301-496-2960 (attention: Technical Assistance Branch Chief).

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CHAPTER 1 – ADMINISTRATION

SECTION 1-1: PLAN OF THE MANUAL

A. Policy

This section presents information regarding the organization and distribution of the National Institutes of Health (NIH) Occupational Health and Safety Manual, as well as the responsibility for its maintenance.

B. Organization

The NIH Occupational Health and Safety Manual consists of chapters that represent major subject categories reflecting regulatory standards enforced by the Occupational Safety and Health Administration (OSHA). The chapters are further broken down into sections, each of which shall set forth NIH safety policies and procedures. Exhibits/Appendices are included in the manual as necessary to disseminate forms, examples, and additional detailed information.

C. Development and Maintenance

1. The Chief of the Technical Assistance Branch (TAB), Division of Occupational Health and Safety (DOHS), Office of Research Services is responsible for the development and maintenance of this manual.
2. Changes to the NIH Occupational Health and Safety Manual will be issued by TAB and approved by the NIH Occupational Health and Safety Committee.
3. Users of this manual are encouraged to submit proposed corrections, updates, and improvements to TAB for consideration.
4. It is TAB's standard practice to solicit input on proposed changes from affected parties prior to publishing a change to the manual.

C. Distribution

1. Compliance with policy guidelines and requirements outlined in the manual is the responsibility of each Institute. Appropriate distribution within each Institute shall be assured at the division level. Recipients should include those responsible for operations and maintenance requirements throughout the real property life cycle.
2. The manual will also be updated and posted on the Division of Occupational Health and Safety web site.

D. Effective Date

This manual is effective December 1, 2016.

E. Application of the NIH Health and Safety Manual

This safety program manual has been developed for employee protection using OSHA regulations and established best, safe practices as guidance and is applicable to all NIH employees. Exceptions may include specific workplace policies and procedures that are not mentioned or described in this manual. For example, specific hazard material training and hazard communication training are designed for a specific laboratory and are not discussed in detail within this manual.

While most of the regulatory guidance is taken from the OSHA General Industry Standards (29 CFR 1910), NIH retains the ability to modify regulatory statutes within the institute if the local standards are equal to, or more stringent than, the national standards.

Additionally, while comprehensive, this manual does not attempt to be an exhaustive recitation of all occupational safety and health programs an employee may encounter during his or her time at NIH. Several safety programs are extensive, “stand-alone” programs (e.g. Hazard Communication, Asbestos, and Thermal Stress). In these cases, a brief synopsis is provided in this safety manual and direction is provided on where to go to find more details about that particular program. In general, employees who wish, or who require more in-depth knowledge and familiarity with these safety program can find the complete programs on the Division of Occupational Health and Safety website.

SECTION 1-2: TRAINING

A. Policy

1. Employee training is the organization's most valuable accident prevention tool. Everyone needs training at one time or another. New employees need training to start off on the right foot. Existing employees may need periodic or remedial training; or additional training if they transition to a different position, classification or function.
2. Proper training is an essential component of accident prevention as employees learn to recognize and control hazards associated with their work and work areas. DOHS strategy is to provide services that help supervisors identify employees' training needs and establish a program that satisfies those needs. The ultimate goal is to reduce hazards through development of a well-informed workforce.
3. It is NIH policy to provide safety training for its workforce employees. The training that employees will attend depends on their function at NIH. All employees will complete general safety training in addition to attending the new employee orientation presentation. Each employee shall be provided with job specific training from his or her supervisor as appropriate. Employees working under more hazardous conditions may require additional training beyond that taught during new employee orientation or job specific training.

B. Procedures

1. Managers, supervisors, and employees all share responsibility for training. Responsibilities include providing resources and establishing a culture where training is expected, desired, and transparently integrated into the normal workflow.
2. Responsibility for training rests with both the supervisor and the employee. The two should work as a team; with the supervisor developing a training program with input and concurrence from the worker. It is important that the supervisor keep affected employees involved in the process, reminding them that they have the most at stake. The following paragraphs speak to the individual roles and responsibilities in achieving the safety training objectives.

C. Responsibilities

1. Division of Occupational Health and Safety (DOHS) shall:
 - a. With the assistance of supervisors, identify employees requiring safety training per the requirements of the training section of this manual, and ensure that this training (and any periodic refresher training) is provided according to the deadlines established.
 - b. Develop or coordinate employee safety training to fulfill requirements of the Safety Manual.
 - c. Assess the effectiveness of the training received, as demonstrated through post training examinations and observations of employees during facility safety assessments.

- d. Maintain an auditable system of employee training records, for the purpose of ensuring that employees who require training have received it and are up-to-date with periodic training.

2. Supervisors, Laboratory Managers, and other Managers

- a. The supervisor is responsible for everything an employee does or doesn't do, including issues associated with personnel safety. Safety training is primarily the supervisor's responsibility because the supervisor is the only person with direct management over the employee's activities. This means the supervisor is accountable when an improperly trained employee is hurt. It is the responsibility of the supervisor, with input from the employee, to determine the type and level of training appropriate for the particular work circumstances. A training program can then be devised that supports the safety program.

b. Supervisors shall:

- (1) Understand the requirements of the employee's safety training required by this section, so that they are able to identify the employees requiring applicable training and can properly evaluate the effectiveness of the training.
- (2) Ensure that employees under their purview receive safety training within the established time frames. Training includes safety briefings and job-specific safety training.
- (3) Provide ample opportunity for employee involvement in safety program activities, seek employee input as to the types of additional safety training they would benefit from receiving, and show good faith effort to obtain requested training for them.
- (4) Ensure that safety awareness information is provided, or reinforced whenever necessary or appropriate, and on a regular basis.
 - (a) The sessions should be appropriate to the nature of the operation and identified hazards. Examples would range from proper storage of personal protective equipment to proper use of tools.
 - (b) Employees are to be regularly requested to provide topics for these safety awareness sessions, and provided opportunities to research topics and lead discussions on safety topics they feel are pertinent to their job.
 - (c) The safety discussions are to include (when applicable) a review of the causes and lessons-learned from any accidents or near-misses that have recently occurred within the previous three months.

3. Employee

- a. Though the supervisor has liability for the employee's actions, the employee must accept primary responsibility for his or her own safety. As a condition of employment,

the employee must follow all safety policies and work practices established in the workplace. Procedures or circumstances recognized by the employee as a possible hazard must be corrected and/or reported to the supervisor. Most significantly, an injury, illness, or death will impact the employee involved far more than anyone else.

b. Employees shall:

- (1) Make suggestions to their supervisor, safety committee representative or management about changes that may improve employee safety.
- (2) Take Responsibility. Every individual is responsible to learn applicable safety procedures. Take advantage of the class time, practice sessions, and instructor's knowledge while in class. Use resources such as suggested follow-up reading materials, on-line help, quick reference cards, software manuals, and training manuals.
- (3) During training, ask questions, actively participate in discussions, and take notes.

D. Training Needs Assessment

1. Relevant training is determined from a combination of the hazards associated with the specific workplace and the tasks or activities performed. One of the most important considerations is who belongs to the organization and what do they do. With that information training needs can be identified.
2. Accounting for personnel comprising a department is an administrative task, which can be completed using existing information, such as the payroll database. Supervisors can use job descriptions as an administrative way to establish what personnel do, however job descriptions often leave out critical functions in the official statement. What an employee does may best be answered by a collaboration of the employee and supervisor listing appropriate tasks and functions from a real-life perspective.
3. The DOHS provides several options to assist supervisors in determining required training:
 - a. A matrix of OSHA required training for specific functions
 - b. Department-level categorized requirements for personnel
 - c. 29 CFR 1910 Occupational Safety and Health Act
 - d. Self-assessment survey.

E. Course Assignment and Frequency

1. Employees at NIH perform a diversity of jobs such as laboratory personnel, administrative positions, facility maintenance, etc. Each of these occupations carries its own unique set of health and safety risks, ranging from carpal tunnel syndrome from repetitive motion in an office setting, to exposure to dangerous chemicals or radioactive materials found in the

laboratory environment. The following paragraphs discuss general safety course assignments and their frequency.

2. All new employees will receive (within 5 days of assignment to facility) basic safety information about their assigned duties. At a minimum, this information will include:
 - a. Safety points of contact in assigned facilities.
 - b. Fire, medical and other emergency response procedures, nearest exits, and assembly points.
 - c. Procedures for reporting hazards, accidents, injuries, and illnesses.
 - d. Responsibilities under OSHA to follow NIH Safety Policies and Procedures.
3. Supervisor is responsible for providing new employees a safety orientation. Topics should include:
 - a. How safety is managed at NIH, including an introduction to safety policies and procedures and the NIH Safety Manual.
 - b. Occupational Medicine Services and basic emergency response procedures.
 - c. Procedures for reporting hazards without the fear of reprisal, including how and when to file a Report of Unsafe/Unhealthy Working Conditions.
 - d. Reporting procedures for accidents, injuries, illnesses.
 - e. Responsibilities under OSHA.
 - f. Explanation of their first-line supervisor's role in their safety training and oversight, including the expectation that the employee will receive job-specific safety training before being allowed to perform their job.
 - g. Overview of the facility's OSHA 300 Log, lessons-learned from injuries and illnesses occurring within the last year, and management goals and objectives to continuously improve the facility safety program.
 - h. Explanation of the safety committee, how it performs its mission and its importance to the safety program and recruitment of new volunteers.
4. Employees working in laboratories are provided annual training to advise them of hazards in and around their work environment; as well as work place controls and personal protective equipment (PPE) designed to mitigate hazards. Personnel working with or potentially exposed to human blood or other potentially infectious materials are provided additional training to highlight special work practice controls and PPE designed to mitigate and control their exposures to this material.
 - a. Laboratory safety training is refreshed on an annual basis. These classes are conducted

on-line. Minimum training requirements for laboratory personnel include:

- (1) Introduction to Laboratory Safety (physical, chemical and biological hazard recognition; and
 - (2) NIH Laboratory Safety (programs and policies of the NIH, HHS and OSHA).
- b. Young scientists working at NIH in the summer must complete the on-line Introduction to Laboratory Safety as well as an in-person class called “S.T.A.R.S. Learn by Doing”. The S.T.A.R.S. class is a hands-on version of Laboratory Safety which takes place in a lab and lecture environment in small groups allowing young scientists audible, visual and kinesthetic learning.
 - c. In accordance with the Bloodborne Pathogen standard, scientist and other occupations whose work involves blood, body fluids, tissues or any bloodborne pathogens must complete the Working Safely with HIV and other Bloodborne Pathogens for Non-Hospital Personnel course. This class also has a required annual refresher.

F. Safety Training Courses

In conjunction with IC safety specialist, the supervisor is responsible for determining appropriate safety classes relative to job function and responsibilities. Suggested training topics for non-research personnel are included in [Appendix A](#). Note: certain laboratory functions may involve hazards that warrant training listed in the appendix. For example, laser system operators who service equipment may be exposed to electrical hazards. As such, lockout/tagout training would be appropriate and necessary. Other training needs and requirements may be covered within each individual topic in this manual.

G. Training Documentation

1. It is essential that all training be adequately documented. Records will be maintained for all safety related meetings and training. Records related to Lab Safety Training and Bloodborne Pathogens Training will be maintained by the DOHS Community Health Branch. For all other training provided, the employee’s immediate supervisor is responsible for retaining appropriate training documentation.
2. Training Documentation should include:
 - a. For general safety instruction an attendance sheet will usually serve as adequate documentation.
 - b. For technical how-to safety training, an attendance sheet will not be adequate. Supervisors should "certify" the student has demonstrated competence in the subject matter. The following information is required when certifying employees as qualified to perform hazardous procedures and safe work practices. At a minimum, adequate documentation includes:

- (1) Trainees' and trainer's names;
- (2) Date of training;
- (3) Subject(s) being trained – procedures, practices, related policies, rules, etc.; and
- (4) Trainee statement of understanding and intent to comply.

APPENDIX A: Sample of Safety Training Courses

A. Asbestos Awareness

Required by: OSHA 29 CFR 1910.1001(j)(7)(i)-(iii)A-H.

Frequency: Initial with annual retraining.

Target Audience: Any employee who works in locations where they may be exposed to asbestos or coordinate projects that could disturb suspected asbestos-containing materials.

Class Description:

Training for employees who perform operations in an area which contains either Asbestos Containing Material (ACM) or Presumed Asbestos Containing Material (PACM) must include the following:

- Health effects of asbestos, locations of ACM and PACM in the building/facility;
- Recognition of ACM and PACM damage and deterioration; and
- Requirements in this standard relating to housekeeping proper response to fiber release episodes.

B. Confined Space Entry

Required by: OSHA 29 CFR 1910.146(g)(1), (2)(i)-(iv), (3), (4) & (k)(1)(i)-(iv).

Frequency: Initially upon employment, upon a change in assigned duties, upon a change in permit space operations presenting a hazard about which an employee has not previously been trained, whenever there are changes in the permitting procedures, or if there are inadequacies in the employee's knowledge or use of procedures.

Target Audience: Any employee whose job requires entry into confined spaces. Maintenance mechanics and electricians are among those with the potential for this exposure.

Class Description: Class covers the responsibilities and duties of authorized entrants, attendants, entry supervisors, and rescue and emergency services, evaluation of a Permit Required Confined Space, entry procedures, use of monitoring equipment, rescue procedures and equipment set-up, supplied air, SCBA and respirator use.

C. Electrical

Required by: OSHA 29 CFR 1910.332; OSHA 29 CFR 1910.269(a)(2); OSHA 29 CFR 1910.268(c).

Frequency: Initial with annual retraining.

Target Audience: Employees who may reasonably be expected to face risk of injury due to electric shock or other electrical hazards.

Class Description: Training includes skills and techniques necessary to:

- Distinguish exposed live parts from other parts of electric equipment.
- Determine the nominal voltage of exposed live parts, and specified in 1910.333(c) and the corresponding voltages to which the qualified person will be exposed.

D. Hearing Conservation

Required by: OSHA 29 CFR 1910.95(k)(1)-(3)(I)(iii).

Frequency: Initial with annual retraining.

Target Audience: Any employee who is occupationally exposed to greater than 85 dBA as an 8-hour time-weighted average exposure.

Class Description: Class covers the effects of noise on hearing, the purpose and use of hearing protectors, advantages of various types of protectors and their instructions on fitting, use, and care, as well as an explanation on the purpose of and importance of audiometric testing.

E. Ladder Safety

Required by: OSHA 29 CFR 1926.1060.

Frequency: Initial before assignment and as necessary thereafter.

Target Audience: Employees performing construction, servicing, and maintenance related activities (building, alteration, and/or repair, including painting and decorating) that use ladders or stairways (non-permanent structures use to access elevated areas/surfaces).

Class Description: The class will cover the nature of fall hazards related to the use of ladders, the proper construction, use, placement, and care in handling of all stairway and ladders, the maximum carrying capacities of ladders used, and the applicable regulatory standards.

F. Lockout/Tag out

Required by: OSHA 29 CFR 1910.147(a)(3)(ii), (4)(I)(D), (7)(i)(A)-(C), (ii)(A) - (C)(iv) & (8).

Frequency: Initial with retraining under conditions listed in 29 CFR 1910.147(c)(7)(iii)(a)-(c).

Target Audience: Any employee servicing or maintaining machines and equipment in which the unexpected energization or startup of the machine/equipment or release of stored energy could cause injury to employees.

Class Description: This class will ensure that the function (e.g. application, usage, and removal) and purpose of LO/TO control methods are understood.

G. Personal Protective Equipment

Required by: OSHA 1910.132(f).

Frequency: Initially when required to wear PPE and as necessary.

Target Audience: Any employee who is required to use personal protective equipment during employment.

Class Description: The employer shall provide training to each employee who is required to use PPE. Training must include the following:

- When PPE is necessary;
- What PPE is necessary;
- How to properly don, doff, adjust, and wear PPE;
- The limitations of the PPE; and
- The proper care, maintenance, inspection, useful life and disposal of the PPE.

H. Powered Industrial Trucks (Tow motors, Forklifts)

Required by: OSHA 29 CFR 1910.178(l).

Frequency: Initial with reevaluation every three years.

Target Audience: Operators of powered industrial trucks such as forklifts and/or tow motors. Operators must complete initial (full) training within 30 days of start date.

Class Description:

Training must include procedures for the safe operation of powered industrial trucks.

Training required should be based on:

- The operator's prior knowledge and skill;
- The types of powered industrial trucks the operator will operate in the workplace;
- The hazards present in the workplace; and
- The operator's demonstrated ability to operate a powered industrial truck safely.

Refresher training is required if:

- The operator is involved in an accident or a near-miss incident;
- The operator has been observed operating the vehicle in an unsafe manner;
- The operator has been determined during an evaluation to need additional training;
- There are changes in the workplace that could affect safe operation of the truck; and/or
- The operator is assigned to operate a different type of truck.

I. Respiratory Protection - All Other

Required by: OSHA 29 CFR 1910.134 (k)(1)(i)-(vii), (2), (3) & (5)(i)-(iii).

Frequency: Initial with annual retraining.

Target Audience: Individuals whose work assignment requires the use of respiratory protection.

Class Description: Class includes the following:

- Why the respirator is necessary and how improper fit, use, or maintenance can compromise the protective effect of the respirator;
- Limitations and capabilities of the respirator;
- Use in emergency situations;
- How to inspect, put on and remove, use and check the seals;
- Procedures for maintenance and storage; and
- Recognition of medical signs and symptoms that may limit or prevent effective use general requirements of this standard.

J. Hazard Communication –General

Required by: OSHA 29 CFR 1910.1200.

Frequency: Initial and when changing job duties.

Target Audience: All employees.

Class Description: This class covers a description of the right to know standard, recognition of hazard warning symbols (biohazard, radiation, etc.) how to obtain, use & understand safety data sheets (SDS), health effects (including reproductive risks), manufacturer labels, GHS, secondary container labeling requirements, personnel protective equipment, safe work practices and emergency procedures.

CHAPTER 2 – PROGRAM GENERAL OVERVIEW

SECTION 2-1: ASBESTOS GENERAL OVERVIEW

A. Policy

1. The NIH is committed to maintaining a safe work environment for its employees who are required to work in areas with friable asbestos. All NIH buildings constructed before 1980 are likely to contain asbestos. Additionally, some NIH personnel may operate or work around equipment that contains asbestos.
2. Over the years, asbestos has had many uses. Its primary use is as an insulator or fire retardant, but can also be used as a binder. Due to this versatility, asbestos can be found in many types of building materials and may also be present in brake pads, clutches, and other machinery. Even though the federal government placed a moratorium on the production of most asbestos products in the early 1970's, installation of these products continued through the late 1970's and even into the early 1980's.
3. No employee shall disturb, damage, or remove any asbestos-containing materials unless they have been trained in accordance with Maryland's Department of the Environment (MDE) asbestos worker requirement. The NIH will provide, training to federal employees who may disturb or work in an area which contains asbestos-contained materials (ACM) an asbestos awareness training course. Each such employee shall be so trained at least once a year.
4. Employees requiring more extensive knowledge of the NIH Asbestos Program may find information by contacting DOHS or on its website.

B. Procedures

1. Labeling Asbestos-Containing Materials

NIH shall attach (affix) warning labels to all raw materials, mixtures, scrap, waste, debris, and other products containing asbestos fibers, or to their containers, or to the entrances of areas where ACM are found, such as mechanical rooms, where they can clearly be seen by employees, occupants and visitors. Signs may be posted in lieu of labels so long as they contain required information:

DANGER!
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE

2. Personal Protective Equipment (PPE)

- a. When required due to exposure or policy, employees will be fitted with, trained in the use of, and issued a respirator. Training on the use and maintenance of respirators will be conducted by the TAB, DOHS as described in the NIH Respiratory Protection Program. Use and type of respirator requires that employees be cleared through the OMS Surveillance Program and the Respiratory Protection Program.
- b. Upon the request of an employee, the employer must provide a tight-fitting, powered, air-purifying respirator (PAPR) instead of any negative-pressure respirator.
- c. No employee may be assigned to tasks requiring the use of respirators if, based on their most recent medical examination, the examining physician determines that the employee will be unable to function normally using a respirator, or that the safety or health of the employee or other employees will be impaired by the use of a respirator. Such employees shall not be assigned to conduct asbestos related jobs.
- d. All NIH personnel entering a controlled area shall wear the appropriate PPE.

SECTION 2-2: HAZARD COMMUNICATION GENERAL OVERVIEW

A. Policy

1. This procedure establishes the requirements for training, hazardous chemical labeling and safety data sheets. It applies to all areas where any hazardous chemical or extremely hazardous substance is received, stored, used, reacted, developed or produced.
2. As noted previously, this document provides a general overview of the Hazard Communication plan. The full plan may be found on the DOHS website.

B. Procedures

1. Supervisors and Managers:
 - a. Are responsible for preparing and updating as necessary, the chemical inventory including Safety Data Sheets (SDS) for each chemical. SDS may be “hard copies” or electronic files and shall be readily available for anyone to easily access.
 - b. Ensure employee training and appropriate and adequate Personal Protective Equipment (PPE) is available.
 - c. Ensure all chemical containers are correctly labeled to conform to the Global Harmonization System (GHS) for chemical identification. Use approved labels on hazardous chemical containers.
2. Employees will participate in the NIH HAZCOM program, wear PPE as required, request approval for the use of any new chemicals; and report to their supervisors, any discrepancies or inconsistencies in the use or inventory of chemicals in their possession.
3. Training:
 1. Initial training is provided to researchers and laboratory personnel through *Introduction to Laboratory Safety* and *Laboratory Safety at the NIH*, and followed by *Laboratory Safety Refresher* training (Online). Office of Research Facilities (ORF) personnel will receive the training through OSHA 30 Hr. training.
 2. Personnel may register for training at <https://www.safetytraining.nih.gov>. ORF personnel must contact the Safety Officer to register their employees for training.
 3. Supervisors are responsible for providing site specific training.

SECTION 2-3: THERMAL STRESS PROGRAM GENERAL OVERVIEW

A. Policy

1. The Thermal Stress Program has been developed to provide guidance and oversight for activities involving elevated or depressed temperatures during occupational activities at the National Institutes of Health (NIH) and applies to all NIH employees.
2. Employees requiring more extensive knowledge of the NIH Thermal Stress Program may find information by contacting DOHS or on its website.

B. Thermal Stress Overview

1. Thermal stress is a broad definition that covers personnel working in temperature extremes that can be hazardous to human health from excessive heat and cold conditions. It describes the physical and physiological reactions of the human body to temperatures that exceeds the human body's thermal threshold. While the framework to manage heat or cold stress is similar in scope, specific actions differ by temperature extreme. As such, the Thermal Stress program individually addresses excessive heat and excessive cold temperatures.
2. While thermal stress in outdoor occupations and activities is mostly weather and climate dependent, thermal stress inside buildings and structures is usually not. It is possible to have cold stress conditions inside a facility even on hot summer days. Conversely, it is also likely to have heat stress conditions inside certain areas even when it is cold and wintry outside.
3. The overarching intent of the Thermal Stress Program is to ensure a core body temperature of individuals as close to normal (typically within 1-2° Fahrenheit) while they are working in conditions that contribute to heat or cold exposures and stressors. The program functions by limiting the amount of work time an individual is exposed to extreme temperatures while completing specific types of work load (low, medium, high). Key elements of the program involve identifying sources of thermal stress and planning measures to reduce or eliminate heat load/cold exposures where possible.
4. Heat Stress Safety
 - a. Workers become overheated from two primary sources: 1) the environmental conditions in which they work and, 2) the internal heat generated by physical labor. Heat related illnesses occur when the body is not able to lose enough heat to balance the heat generated by physical work/external heat sources.
 - b. Thermal heat stress includes injuries or illnesses caused when a person is working in, or exposed to elevated temperature conditions directly affecting an individual's ability to function in a normal manner. Additionally, operations that require the use of PPE – especially those that necessitate the use of semipermeable or impermeable clothing – are likely to cause heat stress among exposed workers, even if ambient temperatures indicate that heat stress shouldn't be a concern.

- c. When workers are unexpectedly exposed to hot (especially hot and humid) work environments, they readily show signs of distress and discomfort (e.g., develop increased core temperatures and heart rates; complain of headache or nausea; and suffer other symptoms of heat-related illnesses). On repeated exposure to a hot environment, there is a marked adaptation in which the principal physiologic benefit appears to result from an increased sweating efficiency (earlier onset, greater sweat production, and lower electrolyte concentration) and a simultaneous stabilization of the circulation, such that, after daily heat exposure for 7-14 days, the individuals perform the work with a much lower core temperature and heart rate and a higher sweat rate (i.e., a reduced thermoregulatory strain) and with none of the distressing symptoms that were experienced.
- d. Failure to replace the water lost in sweat will slow or even prevent the development of the physiologic adaptations described. It is important to understand that heat acclimatization increases the sweating rate, therefore workers will have an increased water requirement during this time.
- e. Acclimatization is the result of beneficial physiological adaptations (e.g., increased sweating efficiency, etc.) that occur after gradual increased exposure to a hot environment. Employers should ensure that workers are acclimatized before they work in a hot environment.

5. Cold Stress Safety

- a. Anyone working in a cold environment may be at risk of cold stress. Some workers may be required to work outdoors in cold environments and for extended periods. Examples include (but are not limited to): snow cleanup crews, sanitation workers, police officers and emergency response personnel such as firefighters. Some people who work indoors may also be subject to cold stress. They include (but are not limited to): galley employees and anyone spending significant time in walk-in freezer/refrigerators; information technology employees working in rooms or spaces that are cooled significantly to keep computer hardware functioning; and employees working in warehouses lacking environmental controls. Cold stress can be encountered in these types of work environments. In general, a cold environment forces the body to work harder to maintain its optimum temperature. Whenever temperatures drop below “normal”, heat can leave the body more rapidly. Injury risk is elevated when heat leaves the body at a faster rate than that body’s metabolism can replace it. Cold stress occurs by driving down the skin temperature and eventually the internal body temperature (core temperature). This can cause significant health problems, and may cause tissue damage and possible death.
- b. What constitutes cold, and its effects on the human physiology can vary across different areas of the country. In regions that are unused to winter’s freezing conditions, near-freezing temperatures can be considered “extreme cold”. Just as with heat stress, acclimatization and dehydration are some factors in determining levels of cold stress.

C. Procedures

2. Supervisors

- a. Ensure that employees required to work under suspect thermal stress conditions are trained in the thermal stress program. Training materials may be requested from the Thermal Stress Program Manager.
- b. Provide personal protective equipment where appropriate.
- c. For heat stress conditions, ensure cool drinking water is provided where fountains are not available.
- d. Provide appropriate rest periods for employees when indicated. NIH utilizes guidance provided by the American Conference of Government Industrial Hygienists (ACGIH). Contact DOHS/Thermal Stress Program Manager for assistance in determining appropriate work/rest schedules.

2. Non-supervisory Employees:

- a. Comply with procedures as required by the Thermal Stress Program, and all other thermal stress related guidance and training as deemed appropriate by a supervisor.
- b. Use all personal protective equipment (PPE) as specified in prescribed training or required by a supervisor, Thermal Stress Program Manager, or Safety Officer.
- c. Maintain adequate fluid intake when working in heat stress area.
- d. Monitor physical condition as well as that of coworkers.

CHAPTER 3 – NIH SAFETY PROGRAMS

SECTION 3-1: LOCKOUT / TAGOUT OF HAZARDOUS ENERGY

A. Purpose

This program element establishes policy and prescribed procedures in accordance with OSHA standard CFR 29 Part 1910.147.

B. Scope

1. The focus of the lockout/tagout (LO/TO) program is equipment and machines. In the case of certain equipment or machines, additional LO/TO requirements may apply under other OSHA standards (i.e., cranes/hoists). The LO/TO program applies to all NIH employees that service or maintain covered machinery or equipment. Contractors are required to develop, implement, and maintain their own LO/TO program when conducting work for NIH.
2. The LO/TO program is applicable to tasks or situations requiring or involving:
 - a. Placement by an employee of any body part into or near a machine's point of operation or the danger zone associated with the machine's operation.
 - b. Constructing, installing, setting-up, cleaning, lubricating, adjusting, inspecting, modifying, maintaining, and/or servicing machines or equipment.
 - c. Clearing blocked or jammed equipment.
 - d. Removing or bypassing a guard or other safety device.
 - e. Working on or near electrical conductors, circuits or equipment which are or may be energized or where there is significant potential for electrical shock or other injuries from arcing, flash burns, electrical burns, or arc blast.
3. This LO/TO program does not apply to:
 - a. Work on cord and plug connected electric equipment when the plug is under the exclusive control of the employee performing the servicing or maintenance, and when unplugged contains no hazardous stored energy and cannot be unexpectedly energized or started up.
 - b. Minor tool changes and adjustments, and other minor servicing activities, which take place during normal production operations, provided that they are routine, repetitive, and integral to the use of the equipment for production and that the work is performed using alternative measures which provide effective protection.

- c. Installations under the exclusive control of electric utilities for the purpose of power generation, transmission, and distribution, included related equipment for communication or metering.
- d. Exposure to electrical hazards from work on, near, or with conductors or equipment that involves inspection or testing activities, or that involve energized work activities.
- e. Hot tap operation involving transmission and distribution systems for substances such as gas, steam, water, or petroleum products when they are performed on pressurized pipelines, provided that NIH demonstrates and documents that: 1) continuity of service is essential, and 2) shutdown of the system is impractical.
- f. Situations where procedures are followed and specialized equipment is used that will provide proven effective protection for employees.

C. Background

- 1. Lockout devices are designed to form a physical barrier between the equipment and its energy source thereby preventing operation. Some equipment, particularly older equipment, may not be designed to accommodate a lockout device. In such cases, warning tags, also referred to as tag out devices, are affixed to the equipment to alert people not to energize the equipment. Tag out devices, when used alone, do not physically prevent accidental start-up.
- 2. The terms “equipment” and “machines” have broad meanings in the context of this document and are used interchangeably. Equipment may include such things as air handlers (building HVAC systems), information technology networks, laser systems, elevators, steam or sewer lines, and other utilities. The term equipment may also be used in the more traditional fashion when referring to things like lathes, presses, drills, etc. While it is common to think of equipment and machines as having an electrical energy source, they may be associated with other types of energy sources including hydraulics, pneumatics, mechanical, gravity, thermal, chemical, fluids and gases, water under pressure, or steam. The terms “service” and “maintenance” are also used interchangeably for the purposes of this document.

D. Policy

- 1. Procedure Deviations – deviations from the requirements of this procedure shall only be permitted with the written approval of the supervisor.
- 2. Equipment Isolation – machines and equipment shall be physically isolated from sources of energy with an energy isolating device before performing servicing and/or maintenance activities to prevent the unexpected energization, start-up or release of stored energy in order to prevent injury to employees. Physical isolation requires that the positive control point be locked out and tagged out wherever possible.

3. Tag out – when the energy isolating device is not capable of being locked out, the machine or equipment shall be turned OFF and tagged out. When using only a tag out device to control the energy isolating device, employees shall take additional steps such as barricades, blocking of a controlling switch, removal of an isolating circuit element, or the posting of personnel to increase the overall level of safety equivalent to that of a lockout. If at all reasonable, the machine or equipment should be modified to accept a lockout device at the energy isolating device as soon as possible.
4. Machine Repair/Retrofit – whenever replacement or major repair, renovation or modification of a machine or equipment is performed, and whenever new machines or equipment are installed, energy isolating devices for such machine or equipment shall be designed to accept a lockout device.

E. Responsibilities

1. Managers are responsible for ensuring that adequate funds are available and budgeted for the purchase of all LO/TO materials and equipment for all authorized persons in their area of responsibility. 29 CFR 1910.147(c)(4)(ii) provides that: where LO/TO programs are used, the employer is required to implement an effective means of enforcing the program. Therefore, Management is responsible for identifying the employees affected by this policy, obtaining and coordinating the required training for the affected employees, and ensuring compliance with this safety policy through their auditing process.
2. Supervisors
 - a. Supervisors will ensure that affected employees are trained in the safe operation and performance of all relevant LO/TO duties, and will ensure that an adequate supply of LO/TO materials and equipment is maintained in inventory.
 - b. Supervisors shall issue locks to authorized personnel under their supervision on either a permanent or as-needed basis, and keep a record of such issuance. The locks shall be clearly identifiable, by a uniform means. The tags shall have color codes and writing identifying their use for either a mechanical or an electrical operation.
 - c. Supervisors must ensure that all annual periodic inspection documents are completed. Inspection documents must identify the machine or equipment inspected, the date of inspection and the name of the person performing the inspection. Supervisors must maintain inspection reports for one year. Random or unscheduled inspections may also be conducted.
3. Employees
 - a. It is the responsibility of each employee to report immediately any unsafe act or condition to his or her supervisor, including those related to LO/TO.
 - b. Employees shall immediately inform their supervisor if any shortcoming in the LO/TO program is observed.

- c. Employees shall not remove or otherwise modify any energy protective engineering feature or item during the performance of maintenance service. Employees shall not perform any service or maintenance without adequate LO/TO procedures in place.

4. Assigned Safety Officer

- a. The Safety Officer will provide assistance to managers, supervisors, or others as necessary on any matter concerning this safety policy and will assist in locating the required training. As support to the Safety Officer, the Division of Occupational Health and Safety (DOHS), and/or other approved health specialized sources or consultants shall be used to provide consultative assistance on LO/TO issues, as needed.
- b. The Safety Officer will work with managers and supervisors to ensure that all newly purchased LO/TO equipment and supplies comply with current safety regulations.
- c. At least annually, an audit will be completed of energy control procedures in cooperation with the Safety Officer and DOHS to ensure compliance and to correct any identified deficiencies.

F. Procedures

1. Three general and four specific supplemental LO/TO procedures are discussed below, below. The two general procedures, which address most tasks/equipment encountered at NIH, provide instructions for single-point lockouts and tag outs. These general procedures, depending on specific circumstances, may need to be modified by incorporating specific procedures related to:
 - a. Group LO/TO;
 - b. Work by outside contractors;
 - c. LO/TO during shift and personnel changes; and
 - d. Removal of another employee's lock.
2. Where multiple-point lockouts or tag outs are necessary, written equipment-specific procedures must be developed and implemented by authorized employees and their supervisors. All procedures, including the general procedures described below and equipment-specific procedures must include the following steps:
 - a. Communicate with affected employees and prepare for shut-down;
 - b. Shut down the machine/equipment;
 - c. Disconnect or isolate the machine from its hazardous energy source(s);
 - d. Apply the lockout or tag out device(s) to the energy-isolating device(s);

- e. Release, restrain, or otherwise render safe all potential hazardous stored or residual energy; and if the possibility exists for re-accumulation of hazardous energy, regularly verify during the service and maintenance that such energy has not re-accumulated to hazardous levels;
- f. Verify the isolation and de-energization of the machine; complete the service or maintenance required; and
- g. Communicate with affected employees and prepare for returning the machine to service.

Note: *Any equipment which is part of a larger system shall not be considered LO/TO – even if the larger system has been LO/TO (e.g. gear oil pump on a refrigeration unit).*

3. Lockout/Tagout Devices

To provide maximum employee protection, lockouts are recommended except in extreme cases where it can be demonstrated beyond any doubt that a lockout is not feasible.

- a. Locks – lockout devices shall be substantial enough to prevent removal without the use of excessive force or unusual techniques, such as with the use of bolt cutters or other metal cutting tools. Lockout devices shall be affixed in a manner that will hold the energy isolating devices in a "safe" or "off" position.
- b. Tags – when a Tag out device is used on an energy isolating device which is capable of being locked out, the Tag out device shall be attached at the same location that the Lockout device would have been attached. The employer shall demonstrate that the Tag out procedure will provide a level of safety equivalent to that obtained by using a Lockout procedure.
 - (1) RED & WHITE TAG for mechanical work.
 - (2) RED TAG for electrical work.
 - (3) An NIH-1417 DANGER-HOLD red tag shall be used to isolate electric circuits and equipment before repair or maintenance work is started. These tags are serialized and are in two (2) parts; Tag and Clearance Stub. Tag information shall also be entered into the log book.
 - (4) An NIH-1417-1 DANGER-HOLD red and white tag shall be used to isolate mechanical equipment before repair or maintenance work is started.
- c. The authorized person shall record the following information before placing all tags:
 - (1) Location: Use Building and Floor Number on the tag and stub.

- (2) Circuit or Equipment: Name and Facility Number (if applicable) of the motor, circuit feeder, controls, etc. being tagged out must be recorded on both the tag and stub.
- (3) Tagged Out for [Requestor]: The name of the person for whom the equipment is tagged out. This is the person who will be responsible for the stub.
- (4) All other workers assigned to the task shall be responsible for verifying that the tag has been properly placed.
- (5) Date and Time.
- (6) Clearance: Signature of designated official authorizing the tag placement.
- (7) Remarks: Brief description of the work to be performed and any other instruction or data that is relevant to the work.
- (8) Work Order/Request Number.
- (9) Tag Placed By: Name of authorized person. Both tag and stub shall be signed by the authorized person.

3. General Procedures

- a. [Appendix A](#) provides a flow-chart view of the LO/TO process, and [Appendix B](#) describes a typical LO/TO procedure.
- b. Single-Point Lockout

The following procedure is appropriate when servicing equipment that can be isolated from its hazardous energy source by the lockout of a single, readily identifiable isolation device, and there is no potential for re-accumulation /residual/stored energy after the equipment has been locked out. In this case, a supplemental, equipment-specific, written procedure is not required.

- (1) The authorized employee shall inform affected employees that service or maintenance is required on the equipment and that it must be shut down, locked out, and tagged.
- (2) If the equipment is operating, the authorized employee will shut it down using the normal shutdown procedure (i.e., depress the stop button, open the switch, close the valve, etc.).
- (3) The authorized employee will isolate the energy source (i.e., turn off the breaker; apply blind flanges on a pipe, etc.).

- (4) The authorized employee will lock out the energy-isolating device with their lock and attach a tag to the lock or hasp. The tag should have the name of the employee affixing the tag, and the date and time the tag was affixed.
- (5) The authorized employee will ensure that stored or residual energy (such as that in capacitors, springs, elevated machine members, rotating flywheels, hydraulic systems, and air, gas, steam, or water pressure) is dissipated or restrained by methods such as grounding, repositioning, blocking, or bleeding down.
- (6) The authorized employee will verify that the equipment is disconnected from the energy source. After confirming that no one is exposed to the hazardous energy source/machine, the authorized employee will verify that the equipment is isolated – and that residual or stored energy is dissipated/restrained – by activating the start button/switch or other operating control(s), or by testing the equipment with properly operating and/or calibrated equipment (i.e., voltmeter). Following testing/verification, the authorized employee will return the operating control(s) to the neutral ("off") position. Authorized employees must ensure the integrity of the LO/TO procedure following any extended absence.
- (7) When the equipment is ready to be returned to service, the authorized employee will check the equipment and the immediate area to ensure that nonessential items have been removed, that all components are operationally intact, and that all guards or other protective features are restored.
- (8) The authorized employee will check the work area to ensure that all personnel are safely positioned away from the equipment, and verify that the controls are in the neutral, off, or safe position.
- (9) The authorized employee will remove their lockout device and associated tag, re-energize the equipment, and notify affected employees that work is complete and the equipment is ready to return to service.
- (10) Removal of some forms of blocking devices may require re-energizing the machine before maintenance is complete (e.g., the equipment must be energized to test or position any of its components prior to return to normal service). If the lockout device or tag must be temporarily removed from the energy-isolating device, the authorized employee must follow the sequence of actions below:
 - (a) Clear the equipment of tools and materials and have all non-authorized employees leave the equipment area;
 - (b) Remove the lockout from the energy-isolating device;
 - (c) Energize the equipment and proceed with testing or positioning; and
 - (d) De-energize all systems and reapply the energy control measures. Continue service and/or maintenance activities.

c. Single-Point Tag out

- (1) A tag out device does not provide the authorized employee with the same protection as a lockout device. Rather than isolating the energy source, a tag is essentially a warning device. Therefore, in addition to the procedures below, the equipment must be under the direct and sole control of the authorized employee conducting the service or a second authorized employee must provide surveillance of the equipment during service; and, at least one additional, effective secondary precaution must be implemented (i.e., removal of operating handles, blocking of start switches, etc.). When these conditions are met, a supplemental, equipment-specific, written procedure is not required.
- (2) The following procedure is appropriate when servicing equipment that has a single, readily identifiable hazardous energy source control, and there is no potential for re-accumulation/residual/stored energy after the equipment has been tagged out.
 - (a) Follow the procedures described for a single-point lockout, except that a tag is applied rather than a lock and tag and a supplemental secondary precaution is implemented.
 - (b) Attach the lockout tag as close to the isolation device as possible using a tie wrap capable of withstanding at least fifty pounds of force.
 - (c) Use pliers or snips to remove tie wraps upon completion of service. Do not use a knife or razor.

d. Multiple-Point Lockout or Tag out

Equipment-specific, written procedures must be developed and implemented for equipment with multiple isolation points or that otherwise does not meet the conditions for single-point lockout or tag out. The written procedure must identify all the hazardous energy sources for the equipment item or process, and the technique(s) required to isolate each source. An authorized employee or their supervisor must develop the procedure. If developed by an authorized employee, their supervisor must approve the procedure.

e. Group Lockout or Tag out

This supplemental procedure is applicable when more than one employee will be simultaneously servicing the same piece of equipment. Equipment-specific, written procedures must be developed and implemented for a group lockout. The written procedure must identify all hazardous energy sources for the equipment item or process, and the technique(s) required to isolate each source. An authorized employee or their supervisor must develop the procedure. If developed by an authorized employee, their supervisor must approve the procedure. The general process that must be followed is described below and must be incorporated into the written, equipment-specific procedure.

- (1) An authorized employee, designated by the supervisor, shall inform affected employees that service or maintenance is required on the equipment and that it must be shutdown, locked out, and tagged.
- (2) The designated authorized employee will shut down the equipment using the normal shutdown procedures (i.e., activate the stop button, open the switch, close the valves, etc.). Specific shut-down operations should be described in the written procedure.
- (3) The designated authorized employee will isolate all sources of energy (i.e., turn off the breaker; apply blind flanges on a pipe, etc.). Specific energy sources and isolation operations should be described in the written procedure.
- (4) The designated authorized employee will attach a group lock and tag on each isolation point.
- (5) The designated authorized employee will place a copy of the procedure and the key to the group locks into a lockbox under the supervision of at least one other authorized employee or supervisor. The designated authorized employee will then place a hasp and tag on the lockbox and place their employee lock on the hasp.
- (6) The designated authorized employee will test the equipment to verify the effectiveness of the lockout device, if applicable. Specific test procedures should be described in the equipment-specific LO/TO procedure.
- (7) Each authorized employee should visually inspect the isolation of the equipment and when satisfied that it is correctly and safely isolated, place their lock on the hasp prior to beginning work. When an authorized employee completes their work, they are responsible for clearing their work area of tools and debris, replace removed guards and safety equipment and removing their lock from the lockbox.
- (8) When the equipment is ready to be returned to service the designated authorized employee should check the equipment and the immediate area to ensure that nonessential items have been removed, that all components are operationally intact, and that all guards or other protective features are restored.
- (9) The designated authorized employee will check the work area to ensure that all personnel are safely positioned away from the equipment.
- (10) The designated authorized employee will verify that the controls are in the neutral, off, or safe position.
- (11) All authorized employees will remove their locks from the lockbox.
- (12) The designated authorized employee will notify affected employees that work is completed and the equipment is ready to be returned to service

- (13) The designated authorized employee will remove their lock, the group locks, and associated tags, and then re-energize the equipment.

f. Contractors

- (1) Outside contractors or vendors performing service, maintenance, and/or construction work at NIH are required to have in place and follow their LO/TO Program. Project Officers are responsible for overseeing contractors to verify compliance with this requirement. Departments that hire and supervise contractors directly are responsible to verify compliance with this requirement (i.e., equipment or service maintenance contracts).

Note: *Other information may need to be exchanged at this time (e.g., Chemical Safety, Confined Space Program, etc.)*

- (2) When outside service personnel (e.g., independent contractors or service vendors) are to be engaged in a group lockout with NIH employees, NIH authorized employees will follow the NIH LO/TO Program for group lockouts and contractors will apply their locks to the lockbox hasp. Communication between/among groups must take place to ensure all affected and authorized employees are protected.

g. Shift or Personnel Changes

To maintain continuity in the protection provided for those involved in the LO/TO procedures, and for the orderly transfer of the LO/TO devices, the steps below are necessary during personnel or shifts changes.

- (1) Personnel Changes – the arriving authorized employee's lock and tag should be applied before the departing authorized employee's lock and tag are removed. The departing personnel will inform the arriving personnel of the status of the equipment and the work in progress.
- (2) Group Lockout Shift Changes – the lock and tag of at least one authorized employee on the arriving shift should be applied before the last crewmember of the departing crew removes their lock. The departing crew will inform the arriving crew of the status of the equipment and the work in progress.

h. Removal of Another Employee's Lock

When the authorized employee who applied the lockout devices and associated tags is not available to remove them, the devices may be removed by the authorized employee's supervisor in accordance with the process described below:

- (1) The authorized employee's supervisor must verify that the authorized employee who applied the lockout device(s) and associated tag(s) is not on duty and that

their work is no longer in progress by taking all reasonable efforts to contact the authorized employee to inform him/her that the devices need to be removed.

- (2) An authorized employee/supervisor returns the equipment to service and notifies the affected employees that service or maintenance is completed and the equipment is ready for use.
- (3) When the employee returns to work, the supervisor notifies him/her that their lock(s) and tag(s) were removed.

G. Equipment Specific Procedures

1. Particular servicing and/or maintenance work activities may be subject to the specific requirements of a written LO/TO procedure rather than those of the general LO/TO procedure. Written LO/TO procedures may be appropriate in accord with machine or equipment complexity, magnitude of encountered hazards, supervisory discretion, or other factors.
2. Additionally, and in particular, a written LO/TO procedure is required for a particular machine or equipment when any of the following elements exist.
 - a. The machine or equipment has potential for stored or residual energy or re-accumulation of stored energy after shutdown which could endanger employees.
 - b. The machine or equipment has more than one energy source.
 - c. The machine or equipment has only a single energy source, but it cannot be readily identified and isolated.
 - d. The isolation and locking out of the single energy source will not completely de-energize and deactivate the machine or equipment.
 - e. The machine or equipment is not isolated from that energy source and locked out during servicing or maintenance.
 - f. A single lockout device will not achieve a locked-out condition.
 - g. The lockout device is not under the exclusive control of the authorized employee performing the servicing or maintenance.
 - h. The servicing or maintenance does create hazards for other employees.
 - i. There have been past incidents involving the unexpected activation or re-energization of the machine or equipment during servicing or maintenance.
3. The written LO/TO procedure shall be drafted by one or more knowledgeable employees and approved by the supervisor. Such procedures shall include all elements of the LO/TO

procedure, be operationally particular in related actions to be taken, and specifically address the particular element(s) that cause or demand that the procedure be written.

4. For cases where the machine or equipment has potential for stored or residual energy or re-accumulation of stored energy after shutdown, the procedure shall address how such energy shall be relieved, disconnected, restrained, or otherwise rendered safe following the application of LO/TO devices to energy isolating devices. If there is a possibility of re-accumulation of stored energy to a hazardous level, verification of isolation shall be required to be continued until the servicing or maintenance is completed, or until the possibility of such accumulation no longer exists.
5. A single written LO/TO procedure is allowed for multiple machines or pieces of equipment that are similar in design, have the same type and magnitude of energy to be controlled, and have similar types of controls.
6. If machinery or equipment is altered in a manner that impacts its written LO/TO procedure, the procedure shall be revised accordingly. Written LO/TO procedures must be reviewed annually. Those authorized employees who are trained in and authorized to use a written LO/TO procedure must also be re-certified annually.

H. Training

1. Initial Training – management shall provide training to ensure that the purpose and function of the energy control program are understood by employees and that the knowledge and skills required for the safe application, usage, and removal of the energy controls are acquired by employees. The training shall include the following:
 - a. Each authorized employee shall receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for energy isolation and control.
 - b. Each affected employee shall be instructed in the purpose and use of the energy control procedure. Employees who exclusively perform functions related to normal production operations, and who perform servicing and/or maintenance under the protection of normal machine safeguarding, need only be trained as "affected" (rather than "authorized") employees even if Lockout/Tag out procedures are used.
 - c. All other employees whose work operations are or may be in an area where energy control procedures may be utilized, shall be instructed about the procedure, and about the prohibition relating to attempts to restart or reenergize machines or equipment which are locked out or tagged out.
2. Retraining – retraining of authorized and affected employees is required:
 - a. Annually;
 - b. Whenever there is a change in employee job assignments;

- c. Whenever a new hazard is introduced due to a change in machines, equipment or process;
- d. Whenever there is a change in the energy control LO/TO procedures; or
- e. Whenever a periodic inspection by the employer reveals inadequacies in the procedures or in the knowledge of the employees.

The retraining shall reestablish employee proficiency and introduce new or revised control methods and procedures, as necessary.

3. Training Evaluation

- a. Evaluation of the Lockout/Tag out training programs for "authorized", "affected", and "other" employees will be done by interviewing a representative sampling of selected employees. It will be used as a tool to:
 - (1) Verify that the training of authorized employees includes:
 - (2) The types and magnitude of energy found in the workplace;
 - (3) The means and methods of isolating and/or controlling energy; and
 - (4) The means of verification of effective energy control, and the purpose of the procedures to be used.

Additionally, the evaluation will:

- b. Verify that affected employees have been instructed in the purpose and use of the energy control procedures; and
- c. Verify that all other employees who may be affected by the energy control procedures are instructed about the procedure and the prohibition relating to attempts to restart or reenergize such machines or equipment.

When the employer's procedures permit the use of Lockout/Tag out, the training of authorized, affected, and other employees shall include the provisions of 29 CFR 1910.147(c)(7)(ii) and (d)(4)(iii).

4. Training Records

- a. Training records shall certify that employee training has been accomplished and is being kept up to date. The certification shall contain each employee name and dates of training.
- b. In-house and on-site related LO/TO training entries will be kept by the Training Management System located with DOHS.

I. Periodic Inspections and Reporting Requirements

1. Departments shall perform and document inspections at least annually to assure that each required written LO/TO procedure continues to be implemented properly in accord with the NIH Energy Control Program. The periodic inspection shall consist of three parts.
 - a. Each required written LO/TO procedure shall be reviewed by a designated knowledgeable employee. Any mistakes, deviations from Program requirements, or inadequacies identified in this review of the procedure shall be corrected.
 - b. The written LO/TO procedure shall then be reviewed with all employees authorized to perform the procedure. This review shall be performed by a designated authorized employee (the inspector) other than those authorized to perform the procedure being reviewed. The inspector shall ensure that each employee authorized to perform the procedure understands the procedure and is familiar with his or her responsibilities under the procedure.
 - c. The inspector shall observe a sampling of authorized employees performing the written procedure and shall discuss the implementation with all other authorized employees present. Any inadequacies or potential improvements identified relative to the procedure or its performance shall be noted and corrected.
2. Periodic inspection must be certified. Documentation must include the machine or equipment on which the energy control procedure was used, the date of the inspection, the employees included in the inspection, and the names of the knowledgeable and authorized employees performing the inspection.

I. References

1. United States Department of Labor, Occupational Safety and Health Administration. 29 CFR Part 1910.147, The Control of Hazardous Energy (Lockout/Tag out).

J. Definitions

Affected Employee: An employee whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout or tag out, or whose job requires him/her to work in an area in which such servicing or maintenance is being performed.

Authorized Employee: An authorized employee is one who:

- Locks out or tags out machines or equipment in order to perform servicing, maintenance or modification on that machine or equipment;
- Is authorized by line management to perform the work;
- Is qualified by training and experience to perform such work;

- Is able to identify the hazards associated with such work;
- Is responsible for determining whether or not a written procedure exists for the LO/TO activity; and
- For the case of a written procedure, is trained in the use of the written procedure.

Capable of Being Locked Out: An energy isolating device is capable of being locked out if it has a hasp or other means of attachment to which, or through which, a lock can be applied, or it has a locking mechanism built into it. Other energy isolating devices are capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy isolating device or permanently alter its energy control capability.

Employee: The term employee or personnel as related to the NIH Energy Control Program includes NIH employees, term and temporary employees, contract technicians, users, experimenters, students, experimental collaborators, visiting or guest scientists and engineers.

Energized: Connected to an energy source or containing residual or stored energy.

Energy Isolating Device: A mechanical device that physically prevents the transmission or release of energy, including but not limited to the following:

- Manually operated electrical circuit breaker;
- Disconnect switch;
- Manually operated switch by which the conductors of a circuit can be disconnected from all ungrounded supply conductors, and, in addition, no pole can be operated; and
- Line block device.

Push buttons, selector switches and other control circuit type devices are not energy isolating devices. An interlock system may not be considered as an energy isolating device with respect to LO/TO activities.

Energy Source: Any source of electrical, mechanical, hydraulic, pneumatic, chemical, thermal, or other energy.

Exclusive Control: As applied to the LO/TO exemption for working on cord and plug electrical equipment, exclusive control means that the plug is within sight and reach of the employee so as to preclude the possibility of its being plugged into an energy source.

Hot Tap: A procedure used in the repair, maintenance, and service activities that involves welding on a piece of equipment (pipelines, vessels, or tanks) under pressure, in order to install connections or appurtenances. It is commonly used to replace or add sections of pipeline without the interruption of service for air, gas, water, steam, and petrochemical distribution systems.

Job Lockbox: A container or device into which one or more keys from locks used in LO/TO activities are captured by all members of a work crew by the attachment of their own locks and tags.

Knowledgeable Employee: An employee who assesses the energy source(s) subject to LO/TO, and who writes the procedural steps for the lockout and tag out of the machine or equipment being assessed. This employee has sufficient understanding of the operation and configuration of the machine or equipment so as to fully identify and evaluate its associated hazards.

Lead Authorized Employee: A lead authorized employee is an authorized employee who performs or coordinates one or more LO/TO activities for multiple personnel involved in the servicing and/or maintenance of machines and equipment.

Lockout: The placement of a lockout device on an energy isolating device in accord with an established procedure, ensuring that the energy isolating device and the equipment being controlled cannot be operated until the lockout device is removed.

Lockout Device: A device that utilizes a positive means, such as a keyed lock, to hold an energy isolating device in a safe position and prevent the energizing of a machine or equipment. Included are blank flanges and bolted slip binds.

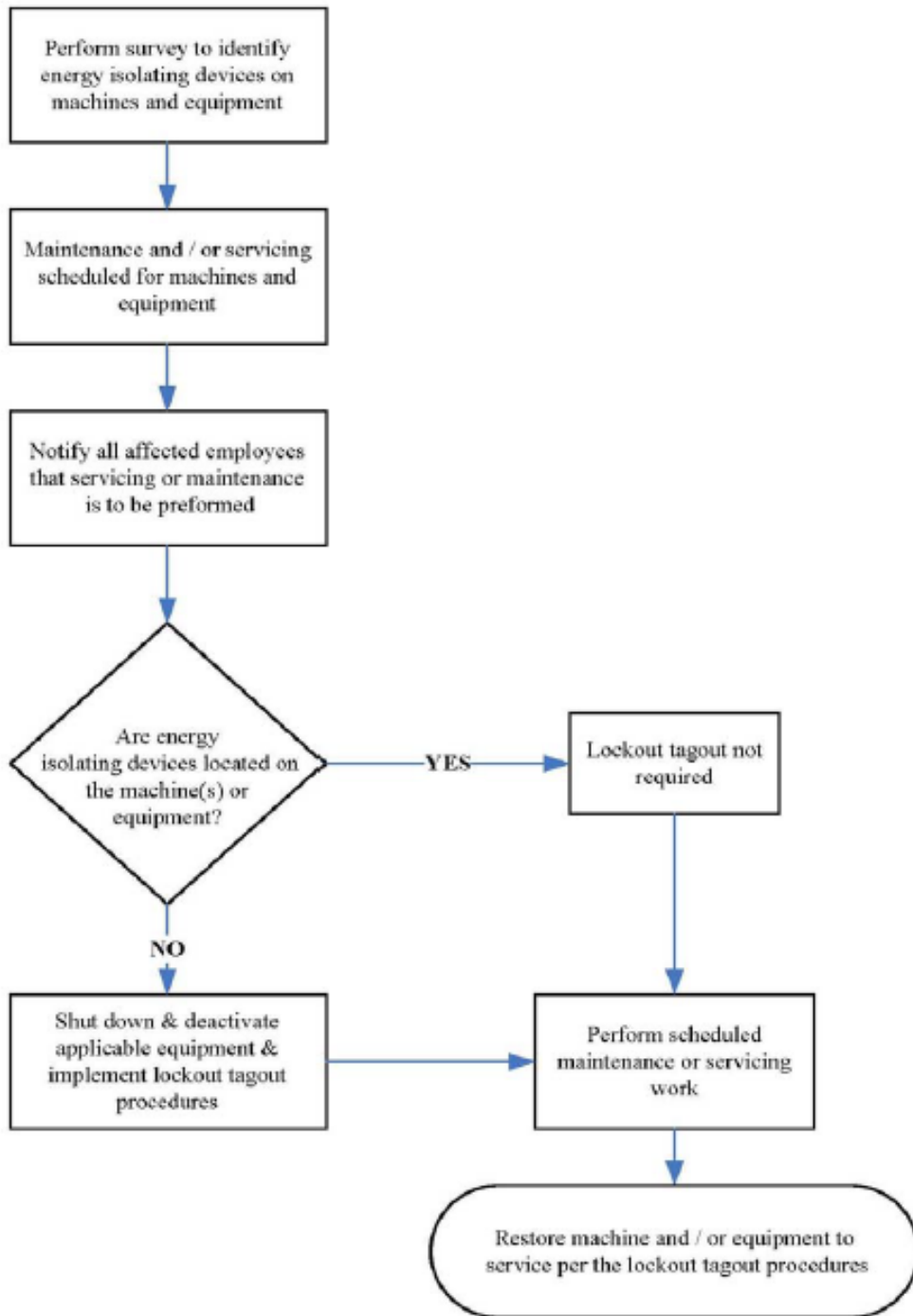
Servicing and/or Maintenance: This refers to workplace activities such as constructing, installing, setting up, adjusting, inspecting, modifying and maintaining and/or servicing machines or equipment. These activities include lubrication, cleaning or unjamming of machines or equipment and making adjustments or tool changes, where the employee may be exposed to the unexpected energizing or startup of the equipment or release of hazardous energy.

Supervised LO/TO: The placement of lockout and tag out devices on an energy isolating device by an employee or non-employee who has not completed the NIH course for LO/TO when under the direct supervision of a NIH authorized employee.

Tag out: The placement of a tag out device on an energy isolating device, in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tag out device is removed.

Tag out Device: A prominent warning device, such as a tag and means of attachment, which can be securely fastened to an energy isolating device in accordance with an established procedure, to indicate that the energy isolating device and the equipment being controlled may not be operated until the tag out device is removed.

Appendix A: Lockout Tag Out Flow Chart



Appendix B: NIH General LO/TO Procedure

Perform the following steps before initiating work activity.

NOTIFY - Notify affected employees, as necessary, of the impending shutdown.

PREPARE - Understand the type, magnitude, hazards, and means and methods of controlling the energy involved.

SHUTDOWN - Turn off or shutdown the machine or equipment using normal procedures.

ISOLATE - Locate and operate the energy operating device to isolate the machine or equipment from the energy source.

LOCKOUT and/or TAGOUT DEVICE APPLICATION - Apply RED lock and DANGER – DO NOT OPERATE tag to energy isolating device.

VERIFY – Check by conclusive test that the source of energy has been isolated and that the machine or equipment is inoperable. Perform work activity. When complete, perform the following steps for Return to Service.

CHECK EQUIPMENT - Remove nonessential items and ensure that machine or equipment components are operationally intact.

CHECK WORK AREA - Ensure that all employees are safely positioned or removed.

VERIFY - Verify that machine or equipment controls are in safe or off position.

REMOVE LOCKOUT and/or TAGOUT DEVICES - Locks and tags removed by employee(s) who placed them.

NOTIFY - As appropriate and before the machine or equipment is started, notify affected employees that locks and tags have been removed.

The LO/TO activity is now complete. Machine or equipment is ready for service.

SECTION 3-2: ELECTRICAL SAFETY – WORKING ON ENERGIZED ELECTRICAL CIRCUITS

A. Scope

The purpose for this procedure is to provide working guidelines that incorporate the best work practices developed by NFPA 70E and OSHA standards. This procedure applies *to working on or near* energized circuits or parts operating at 50 volts or more.

B. Policy

1. Live equipment to which personnel might be exposed must be placed into an electrically safe work condition following the Safety Manual Section 3-1 Lockout/Tag out of Hazardous Energy Procedure unless:
 - a. De-energizing the circuit or part introduces additional or increased hazard. Examples of hazards include interruption of life support equipment, deactivation of emergency alarm systems, shutdown of critical location ventilation equipment, or removal of illumination for an area;
 - b. The component is an integral part of a continuous process and would require that the entire process be shut down in order to work on the piece of equipment; or
 - c. Shutdown is infeasible due to equipment design or operational limitations, including the need to perform diagnostics and testing (e.g., start-up or troubleshooting) of electric circuits that can only be performed with the circuit energized.
2. Work on energized circuits or parts are only permitted through an Energized Electrical Work Permit signed by a first line or duty supervisor.

C. Responsibilities

1. The supervisor is responsible for:
 - a. Initial verification that employees assigned to working on energized parts and circuits meet the definition of a Qualified Person. Verification includes review of training and observation of their safe work practices, knowledge level and familiarity with the tools and equipment for performing energized electrical work, and documentation of appropriate training.;
 - b. Reviewing this program element instruction with Qualified Persons;
 - c. Ensuring Qualified Persons have received appropriate initial and refresher training;
 - d. Reviewing and signing the Energized Electrical Work Permit; and

- e. Providing appropriate personal protective equipment (PPE) and tools to the Qualified Persons.
2. The Qualified Person is responsible for:
- a. Understanding how to use special tools and special procedures for working on or around energized parts;
 - b. Knowing the approach boundaries for energized equipment;
 - c. Understanding special hazards associated with energized equipment;
 - d. Following applicable OSHA standards and policies;
 - e. Completing the Energized Electrical Work Permit and providing to supervisor for review prior to working;
 - f. Participating in a job briefing with the supervisor in charge of the task involving energized work. The briefing shall include hazards associated with the job (nature and magnitude of the energy), work procedures involved, special precautions, energy source controls, and PPE; and
 - g. Being familiar with the limitations, proper use, care, and maintenance of PPE.

D. Procedures

1. Requirements
- a. Only Qualified Persons shall work on energized conductors or equipment connected to energized systems.
 - b. When working on energized circuits or parts, no employee shall be assigned to work alone.
 - c. During the time that work is being performed on any exposed conductors or parts of equipment, a second employee (either a Qualified Person or an employee who is trained in electrical safety and arc flash; is familiar with safety related work practices pertaining to the specific job; and is certified in first aid and CPR) must be in close proximity at the work location to render immediate assistance in the event of an accident.

2. Permits

When working on energized electrical conductors, equipment or circuit parts that are not placed in an electrically safe work condition, work to be performed shall be considered

energized electrical work and shall be performed by written permit only. A copy of the permit form is located in [Appendix C](#). This includes the Job Debriefing form that is completed and filed with the Permit.

3. Personnel Protective Equipment

- a. Employees working in areas where there are potential electrical hazards must be provided with and use personal protective equipment that is appropriate for the specific work to be performed.
- b. PPE must be maintained in a safe, reliable condition and be inspected for damage before each day's use and immediately following any incident that can reasonably be suspected of having caused damage.
- c. Insulating equipment shall be inspected for damage before each use and immediately following any incident that can reasonably be suspected of having caused damage. Insulating gloves shall be given an air test every 6-months. Electrical protective equipment shall be subjected to periodic electrical tests.
- d. Arc-rated, flame resistant clothing and other arc-related protective equipment shall be cleaned and cared according to manufacturer's guidelines.
- e. To determine the type of appropriate PPE:
 - (1) First identify the activity and associated Hazard Risk Category found in the first section of [Appendix B](#).
 - (2) Next, use the Hazard Risk Category to determine the appropriate PPE found in at the bottom of [Appendix B](#).

E. Training Requirements

1. Qualified Persons shall receive classroom or on-the-job type training stated in NFPA 70E 110.6 (A).
2. Employees shall be trained in methods of release of victims from contact with exposed energized circuits or parts.
3. Employees shall be instructed annually in the methods of first aid and CPR.
4. Training documentation is kept on a verification sheet as shown in [Appendix A](#).

F. Definitions

1. *Arc flash label* – Switchboards, panel boards, industrial control panels, and motor control centers located in manufacturing and commercial establishments (other than dwelling occupancies) must be field marked with a warning label if subject to examination, adjustment, service or maintenance while energized.
2. *Electrically Safe Work Condition* – A state in which the conductor, equipment or circuit part to be worked on or near has been disconnected from energized parts, locked/tagged out in accordance with the ORF Section 3-1 Lockout/Tag out of Hazardous Energy Procedure.
3. *Limited Approach Boundary* – A shock protection boundary to be crossed by only qualified persons at a distance from a live part. The limited approach boundary is the minimum distance from the energized item where unqualified personnel may safely stand. No untrained personnel may approach any closer to the energized item than this boundary. A qualified person must use the appropriate PPE and be trained to perform the required work to cross the limited approach boundary and enter the limited space. The limited approach boundary is indicated on the arc flash label.
4. *Qualified Person* – A person who has the skill and knowledge related to the construction and operation of the electrical equipment and its installation. This person must have received safety training on the hazards involved with electrical systems.
5. *Working near* – Means any activity inside a Limited Approach Boundary.

Appendix A: Employee Training Verification

Employee Name:

Supervisor Name Completing Review:

Training	Date
Arc Flash Safety	
OSHA 30 Hr. Outreach	
CPR	
First Aid	
Review of Working on Electrical Circuits SOP	

* Completed form must be signed and placed in employee's personnel file.

Appendix B: Hazard Risk Category Classifications

Hazard Risk Category Classifications			
Task (Assumes Equipment is Energized, and Work is Done Within the Flash Protection Boundary)	Hazard/Risk Category	V-rated Gloves	V-rated Tools
Panelboards rated 240V and below			
CB or fused switch operation with covers off	2	N	N
Work on energized parts, including voltage testing	2	Y	Y
Remove/install CBs or fused switches	2	Y	Y
Removal of bolted covers (to expose bare, energized parts)	2	N	N
Opening hinged covers (to expose bare, energized parts)	2	N	N
Panelboards or Switchboards rated >240V and up to 600V (with molded case or insulated case circuit breakers)			
CB or fused switch operation with covers off – less than or equal to 225 Amp	2	N	N
CB or fused switch operation with covers off – greater than 225 Amp	4	N	N
Work on energized parts, including voltage testing – less than or equal to 225 Amp	2*	Y	Y
Work on energized parts, including voltage testing – greater than 225 Amp	4	Y	Y
600V Class Motor Control Centers (MCCs)			
Reading a panel meter while operating a meter switch	2	N	N
CB or fused switch operation with enclosure doors open	4	N	N
Work on energized parts, including voltage testing	4	Y	Y
Work on control circuits with energized parts 120V or below, exposed	2	Y	Y
Work on control circuits with energized parts >120V exposed	4	Y	Y
Insertion or removal of individual starter “buckets” from MCC – Note 4	4	Y	N
Application of safety grounds, after voltage test	2*	Y	N
Removal of bolted covers (to expose bare, energized parts)	4	N	N
Opening hinged covers (to expose bare, energized parts)	4	N	N
600V Class Switchgear (with power circuit breakers or fused switches) – Notes 5 & 6			
Reading a panel meter while operating a meter switch	2	N	N
CB or fused switch operation with enclosure doors open	4	N	N
Work on energized parts, including voltage testing	4	Y	Y
Work on control circuits with energized parts 120V or below, exposed	2	Y	Y
Work on control circuits with energized parts >120V exposed	4	Y	Y
Insertion or removal (racking) of CBs from cubicles, doors open – if within arc flash boundary	4	N	N
Insertion or removal (racking) of CBs from cubicles, doors closed – if within arc flash boundary	4	N	N
Application of safety grounds, after voltage test	4	Y	N
Removal of bolted covers (to expose bare, energized parts)	4	N	N
Opening hinged covers (to expose bare, energized parts)	4	N	N
Other 600V Class Equipment (277V through 600V, nominal)			
Lighting or Small Power Transformers (600V, less than or equal to 225 Amp)			
Removal of bolted covers (to expose bare, energized parts)	2*	N	N
Opening hinged covers (to expose bare, energized parts)	2	N	N
Work on energized parts, including voltage testing	2*	Y	Y
Application of safety grounds, after voltage test	2*	Y	N
Revenue Meters (kW-hour, at primary voltage and current)			
Insertion or removal	2*	Y	N
Cable trough or tray cover removal or installation	2	N	N
Miscellaneous equipment cover removal or installation	2	N	N
Work on energized parts, including voltage testing	2*	Y	Y
Application of safety grounds, after voltage test	2*	Y	N
NEMA E2 (fused contactor) Motor Starters, 2.3kV through 7.2kV			
Reading a panel meter while operating a meter switch	2	N	N
Contactor operation with enclosure doors open	4	N	N
Work on energized parts, including voltage testing	4	Y	Y
Work on control circuits with energized parts 120V or below, exposed	2	Y	Y
Work on control circuits with energized parts >120V, exposed	4	Y	Y
Insertion or removal (racking) of starts from cubicles, doors open	4	N	N
Insertion or removal (racking) of starts from cubicles, doors closed	4	N	N
Application of safety grounds, after voltage test	4	Y	N
Removal of bolted covers (to expose bare, energized parts)	4	N	N
Opening hinged covers (to expose bare, energized parts)	4	N	N

Task (Assumes Equipment is Energized, and Work is Done Within the Flash Protection Boundary)	Hazard/Risk Category	V-rated Gloves	V-rated Tools
Metal Clad Switchgear, 1kV and above			
CB or fused switch operation with enclosure doors closed	2	N	N
Reading a panel meter while operating a meter switch	2	N	N
CB or fused switch operation with enclosure doors open	4	N	N
Work on energized parts, including voltage testing	4	Y	Y
Work on control circuits with energized parts 120V or below, exposed	2	Y	Y
Work on control circuits with energized parts >120V, exposed	4	Y	Y
Insertion or removal (racking) of CBs from cubicles, doors open	4	N	N
Insertion or removal (racking) of CBs from cubicles, doors closed	2	N	N
Application of safety grounds, after voltage test	4	Y	N
Removal of bolted covers (to expose bare, energized parts)	4	N	N
Opening hinged covers (to expose bare, energized parts)	4	N	N
Opening voltage transformer or control power transformer compartments	4	N	N
Other Equipment 1kV and above			
Metal Clad Load Interrupter Switches, Fused or Unfused			
Switch operation, doors closed	2	N	N
Work on energized parts, including voltage testing	4	Y	Y
Removal of bolted covers (to expose bare, energized parts)	4	N	N
Opening hinged covers (to expose bare, energized parts)	4	N	N
Outdoor disconnect switch operation (gang-operated, from grade)	2	N	N
Insulated cable examination, in manhole or other confined space	4	Y	N
Insulated cable examination, in open area	2	Y	N
Legend:			
V-rated Gloves are gloves rated and tested for the maximum line-to-line voltage upon which work will be done			
V-rated Tools are tools rated and tested for the maximum line-to-line voltage upon which work will be done			
2* means that a double-layer switching hood or Salisbury Model AS1000FS Hard Hat with face shield and chin cup used with 10 cal/cm ² AFHOOD 10 Nomex-Lenzing Balaclava/Racing hood and hearing protection are required for this task in addition to the other Hazard/Risk Category 2 requirements listed in the table below			
Y = yes (required)			
N = no (not required)			
Notes:			
5. 35kA short circuit current available, up to 0.5 second (30 cycle) fault clearing time			
6. For <25kA short circuit current available, the Hazard Risk Category required may be reduced by one number			
Personal Protective Clothing Characteristics			
Hazard/Risk Category	Clothing Description	APTV Rating Cal/cm ²	
0 Basic Work Clothing	Untreated cotton, wool, rayon, silk, or blend. Fabric long-sleeve shirt and pants (1 layer); Hearing protection; Safety glasses; Leather gloves	N/A	
1	Basic Work Clothing + FR* shirt and FR pants or FR coverall (1 layer)	4	
2	Basic Work Clothing + Cotton underwear + FR shirt and FR pants (1 or 2 layers); Voltage-rated gloves; Arc-flash rate face shield; Hearing protection; Safety glasses; Leather gloves	8	
3	Cotton underwear + FR shirt and FR pants + FR coverall, OR cotton underwear = 2 FR coveralls (2 or 3 layers); Voltage-rated gloves; Arc-flash rate face shield; Hearing protection; Safety glasses; Leather gloves	25	
4	Cotton underwear + FR shirt and FR pants + complete arc-flash suit (3 or more layers); Hearing protection; Safety glasses; Leather Gloves	40	
*FR = flame retardant			

Appendix C: Energized Electrical Work Permit

NIH Energized Electrical Work Permit		
To be completed by the electrically qualified person(s) doing the work		
Building:	Room/Area:	Work Order #: (If applicable)
Description of work to be done:		
Description of circuit/equipment:		
Justification for why equipment cannot be de-energized:		
Results of Shock Hazard Analysis (NFPA-70E 130.2)	Results of Arc Flash Hazard Analysis (NFPA 70E 130.3)	
Maximum Voltage: _____	Risk Category: _____ Flash Protection Boundary: _____ (ft.)	
Glove Voltage Rating: _____ <input type="checkbox"/> Inspect gloves before use, check certification date	<input type="checkbox"/> All-Natural Fiber Outerwear <input type="checkbox"/> Fire Retardant Clothing <input type="checkbox"/> Required Additional PPE: _____	
Limited Approach Boundary: _____ (ft.)	See Protective Clothing Characteristics: NFPA Table 130.7(c)(11), or Appendix B, above	
Restricted Approach Boundary: _____ (ft.)		
Prohibited Approach Boundary: _____ (ft.)		
Safety Checklist (Verify that proper controls are in place)		
<input type="checkbox"/> Workers must be trained, qualified, and have full knowledge of equipment. <input type="checkbox"/> Insulating tools and equipment required. <input type="checkbox"/> Remove all jewelry and metal apparel. <input type="checkbox"/> Means employed to restrict access of unqualified persons from the work area. <input type="checkbox"/> Documented job briefing, including discussion of any job-specific hazards (e.g. NFPA-70E 2004 Annex I). <input type="checkbox"/> See attachment for added information, special requirements, procedures, or written work plans.		
Electrically Qualified Person(s) that understand and agree to the above		
Printed or typed name(s):	Signature	Date
Supervisory review of the work to be performed while electrical energized		
Printed or typed name(s):	Signature	Date

Job Debriefing

Document job debriefing when energized work is performed and keep with the Energized Electrical Work Permit

Identify

- | | |
|---|--|
| <input type="checkbox"/> The hazards | <input type="checkbox"/> Any unusual work conditions |
| <input type="checkbox"/> The voltage levels involved | <input type="checkbox"/> Number of people needed to do the job |
| <input type="checkbox"/> Skills required | <input type="checkbox"/> The shock protection boundaries |
| <input type="checkbox"/> Any "foreign" (secondary) source | <input type="checkbox"/> The available incident energy |

Ask

- | | |
|---|--|
| <input type="checkbox"/> Are backfeeds of the circuits to be worked on, possible? | <input type="checkbox"/> Is a "standby" person required? |
|---|--|

Check

- | | |
|---|---|
| <input type="checkbox"/> Job plans | <input type="checkbox"/> Safety procedures |
| <input type="checkbox"/> Single-line diagrams and vendor prints | <input type="checkbox"/> Vendor information |

Know

- | | |
|--|---|
| <input type="checkbox"/> What the job is | <input type="checkbox"/> Who is in charge |
| <input type="checkbox"/> Who else needs to know – Communicate! | |

Think

- | | |
|---|--|
| <input type="checkbox"/> About the unexpected event...what if? | <input type="checkbox"/> Install and remove grounds |
| <input type="checkbox"/> Lock – Tag – Test – Try | <input type="checkbox"/> Install barriers and barricades |
| <input type="checkbox"/> Test for voltage – FIRST | <input type="checkbox"/> What else...? |
| <input type="checkbox"/> Use the right tools and equipment, including PPE | |

Prepare for an emergency

- | | |
|---|---|
| <input type="checkbox"/> Is the standby person CPR trained? | <input type="checkbox"/> What is the exact location? |
| <input type="checkbox"/> In the required emergency equipment available?
Where is it? _____ | <input type="checkbox"/> How is the equipment shut off in an emergency? |
| <input type="checkbox"/> Where is the nearest telephone? | <input type="checkbox"/> Are the emergency telephone numbers known? |
| <input type="checkbox"/> Where is the fire alarm? | <input type="checkbox"/> Where is the fire extinguisher? |
| <input type="checkbox"/> Is confined space rescue available? | <input type="checkbox"/> Are radio communications available? |

SECTION 3-3: PERMIT REQUIRED CONFINED SPACE (PRCS) ENTRY

A. Purpose

The purpose of the Permit Required Confined Space (PRCS) Entry process is to establish the procedures, requirements, and safeguards to lessen or eliminate hazards encountered when entering and working in confined spaces.

B. Applicability

This policy applies to all employees and NIH contractors performing work on NIH property who enter into a permit required confined space (PRCS).

C. Policy

The NIH is committed to maintaining a safe work environment for its employees who are required to enter and work in confined spaces. *No employee shall be sent on an assignment that potentially involves work in a confined space unless they have been properly trained, equipped, and authorized. All entrants, attendants and rescue responders must be appropriately trained prior to working in a confined space. No NIH employee is allowed to enter a PRCS without properly implementing this safety procedure. NIH confined space rescue personnel who are not part of the institute's Fire and Emergency Services department, must be appointed in writing as a designated rescue team member and have completed all of the requirements stated within this policy under the rescue team section below.*

D. Roles and Responsibilities

1. Management

- a. Provides the required training, which includes demonstration of skills and equipment needed for performance of confined space duties;
- b. Supplies necessary and adequate equipment (including PPE) for employees for confined space entry;
- c. Ensures that a permit is used for all PRCS work unless the space is to be temporarily reclassified, and that a copy of all entry permits completed by an NIH Entry Supervisor is submitted to the Division of Occupational Health and Safety immediately, or within 24 hours of the closing of the permit (the supervisor assigning the work shall be the management official that completes this activity); and
- d. Ensures that the original entry permit is maintained as a historical document associated with the work request requiring the work.

Note: *Supervisors assigning PRCS work must notify tasked employees of the location's PRCS status, and must provide tasked employees an understanding of the specific hazards causing the PRCS status.*

2. DOHS/TAB – Responsible for providing technical consultation regarding confined spaces and appointing a Confined Space Program Manager.
3. The Confined Space Program Manager is responsible for:
 - a. Maintaining a master inventory of identified confined spaces;
 - b. Updating the inventory at least once per year;
 - c. Reviewing received cancelled permits for “lessons learned” within 12 months of entry;
 - d. Ensuring training of personnel is conducted; and
 - e. Ensuring equipment is in compliance with standards.
4. Entry Supervisors:
 - a. Entry Supervisor is a qualified person authorized to approve entry permits and is responsible for ensuring their employees are properly trained for the confined spaces jobs they are assigned. This includes recognition of confined spaces and proper procedures for entry into confined spaces whenever necessary.
 - b. Responsibilities include:
 - (1) Determining if conditions are acceptable and requirements for entry have been completed before issuing an entry permit;
 - (2) Authorizing entry and overseeing entry operations;
 - (3) Terminating entry procedures as required;
 - (4) May serve as an attendant, once they receive appropriate training;
 - (5) Ensuring measures are in place to keep unauthorized personnel clear of the area;
 - (6) Checking the operation at least twice a shift to verify that conditions continue to meet permit requirements;
 - (7) Verifying that necessary information on chemical hazards is kept at the work site for the employees or rescue team;
 - (8) Ensuring a rescue team is available, that they are instructed in their rescue duties, and that a means of summoning the team is operational (e.g., an onsite team or a prearranged outside rescue service);
 - (9) Ensuring confined space monitoring is performed by personnel qualified and trained in entry procedures;

- (10) Verifying entry and monitoring equipment are available and personnel are qualified to operate the equipment;
- (11) Ensuring periodic atmospheric monitoring is done according to permit requirements;
- (12) Verifying that the rescue team has simulated a rescue in a confined space within the past twelve months;
- (13) Knowledge of the hazards that may be faced during entry, including the mode, signs or symptoms, and consequences;
- (14) Notifying all involved employees of the permit requirements (e.g., when working with a mixed group of workers and contractors);
- (15) Posting the entry permit in a conspicuous location near the job;
- (16) Renewing the entry permit or has it reissued as needed (a new entry permit is required every shift);
- (17) Determining the number of attendants required to perform the work;
- (18) Verifying the attendant knows how to communicate with the entrant(s) and knows how to obtain assistance;
- (19) Posting any required barriers and signs;
- (20) Remaining alert to changing conditions that might affect the conditions of the entry permit, (i.e., require additional atmospheric monitoring or changes in personal protective equipment);
- (21) Ensuring that personnel covered by the entry permit adhere to the permit's requirements;
- (22) Ensuring the permit is canceled when the work is done; and
- (23) Verifying the confined space is safely closed and all workers are cleared from the area.

5. Attendant:

- a. Must be knowledgeable of and be able to recognize potential confined space hazards;
- b. Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure;
- c. Maintains a sign-in/sign-out log with a count of all persons in the confined space and ensure all entrants sign in/sign-out;

- d. Maintains effective and continuous communication with personnel during confined space entry, work, and exit;
 - e. Monitors surrounding activities and conducts either continuous or periodic monitoring of the confined space to ensure the safety of personnel;
 - f. Orders personnel to evacuate the confined space if he/she:
 - (1) Must leave his/her work station without authorized relief;
 - (2) Notices changes in entrant behavior, possibly as a result of exposure to hazardous substances;
 - (3) Notices situations outside the confined space which could endanger entry personnel;
 - (4) Notices within the confined space a hazard which has not been previously recognized or taken into consideration;
 - (5) Observes conditions which are not allowed on the entry permit;
 - g. Immediately summon the Rescue Team if entrant(s) rescue becomes necessary; and
 - h. Keeps unauthorized persons out of the confined space, orders them out, or notifies authorized personnel of the unauthorized entry.
6. Entrant – employees who are granted permission to enter a confined space must:
- a. Read, acknowledge by signing, and observe the entry permit requirements;
 - b. Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure;
 - c. Communicate with the attendant as necessary to enable the attendant to monitor entrant status and to enable the attendant to alert entrants of the need to evacuate the space;
 - d. Alert the attendant whenever:
 - (1) The entrant recognizes any warning sign or symptom of exposure to a dangerous situation, or
 - (2) The entrant detects a prohibited condition;
 - e. Stay alert to the hazards that could be encountered in a confined space;
 - f. Properly use the protective equipment required by the permit; and
 - g. Immediately exit the confined space when:

- (1) Ordered to do so by the attendant;
- (2) Automatic alarms sound;
- (3) An entrant perceives he/she is in danger; and/or
- (4) An entrant notices physiological stress or changes in self or co-workers (e.g., dizziness, blurred vision, shortness of breath).

7. Rescue Team

- a. The purpose of the in-house confined space rescue team will be to respond to rescue situations within confined spaces within the team's designated NIH campus. It is the intent of this document to address the non-mandatory Appendix F document listed under the OSHA confined space standard (29CFR 190.146).
- b. The Rescue Team members shall comply with the following:
 - (1) Only confined spaces will be considered in their scope of rescue operations.
 - (2) Rescue services will only be provided to NIH employee personnel who enter confined spaces. Contractors must arrange rescue services in advance of entry.
 - (3) They will initiate the emergency response of the local fire departments by calling 9-1-1 prior to any rescue.
 - (4) Their function will be to provide rescue services, CPR, first aid and AED response until the local fire department responders arrive. Once the local fire department responders arrive, the in-house rescue team will become secondary responders and provide support to the local fire department who shall become the primary response team.
 - (5) They will check all rescue equipment monthly to ensure that it is in good working condition.
 - (6) They will recognize the team's physical limitations and place entry rescue personnel into their appropriate role on an as needed basis.
 - (7) Annually, the rescue team will evaluate the confined spaces on their designated campus that could be entered during a rescue, identify and evaluate the hazards of each confined space, and confirm that the current rescue plan for that space is up to date and accurate.

- (8) They will conduct group learning exercises every other month to include but not limited to:
- (a) Rigging;
 - (b) Knot tying;
 - (c) Hoisting;
 - (d) Confined space scenarios;
 - (e) Personal protective equipment checks;
 - (f) Equipment checks, reviews and possible hands on use; and
 - (g) Patient packaging/lifting.
- (9) They will conduct mock entry exercises in different confined space locations throughout their designated campus on a biannual basis. The aim of these exercises is to develop possible rescue scenarios and to familiarize the team with their rescue equipment. The mock exercises should include complete use of:
- (a) Personal protective equipment;
 - (b) Hoisting equipment;
 - (c) Multi-gas meter calibration, bump and use;
 - (d) Patient packaging;
 - (e) Radio communication and teamwork exercises; and
 - (f) When possible, use of supplied air equipment.
- (10) The in-house team will obtain an annual evaluation of their response efforts. In the case where they do not enter a space within a 1-year time period, a mock evacuation will be established, performed, evaluated and documented for that year by the certified training provider.
- (11) Training will be provided on an annual basis and will be compliant with the OSHA 1910.146 standard. During this training a yearly evaluation to be completed by the certified training provider will take place to ensure competency and suitability. Additionally, each identified rescuer must obtain and keep current CPR, first aid AED certification and blood borne pathogens training.
- (12) If it is determined that self-contained breathing apparatus's (SCBA) or Supplied Air Breathing Apparatus's (SABA) will be used for confined space rescue services, the following actions will need to take place:
- i. Each individual assigned to an SCBA or SABA will need to have an annual medical evaluation, annual fit testing and annual respirator training;

- ii. SCBA tanks will need a static pressure test, will need to be certified for a minimum of thirty minutes, and the source for SCBA tank recharges will need to be identified;
 - iii. Equipment will need to be checked on a monthly basis and replaced when necessary; and
 - iv. Employees will need to follow the requirements stated under the NIH respiratory protection program.
8. Host Employer or Project Officer's (PO) – responsibilities include:
- a. Inform contractor about confined space locations and share any information concerning host employee's experience with the space;
 - b. Inform the contractor that they must comply with all of the requirements of the OSHA standard, 29 CFR 1910.146; and
 - c. Coordinate entry operations when employees from more than one organization will be working in the space simultaneously. This is to prevent the various employees from endangering each other. For example: NIH and Contract employees working in a PRCS.
9. Contractor – responsibilities include:
- a. Provide a copy of their respective Confined Space program that details PRCS entry to the assigned NIH Project Officer. Before any work may begin, the contractor must ensure that their program meets or exceeds that of NIH. (It is suggested that the contractor work with their NIH Project Officer);
 - b. Ensure a mechanism for rescue – NIH personnel are not to be used as a rescue mechanism for contractors;
 - c. Obtain from the host employer any available information regarding PRCS hazards and entry operations;
 - d. Coordinate entry operations with the Project Officer, the host employer (and contractor), particularly when employees from both groups are working in or near confined spaces;
 - e. Inform the host employer of the contents of the permit program that will be used to comply with the OSHA standard; and
 - f. Advise the host employer, or the Project Officer, of any hazards encountered in the confined space. (This can be done either when the hazards arise, or at the debriefing

session.) Information regarding these hazards encountered for a specific space shall be provided to the confined space program manager.

E. Assessment and Evaluation of Confined Space Hazards

1. The Program Coordinator shall ensure a survey is conducted to identify confined spaces. This survey is conducted by following the standard *NIH Confined Space Evaluation Sheet* (located in [Appendix D](#) of this document). Site characterizations can be assisted by other available data (e.g., blueprints and job safety analyses, etc.). The purpose of the survey is to add its specific data to the inventory of locations that meet the definition of a confined space. This inventory is kept on the ORFDO website and shall be communicated to personnel involved in confined space entry, prior to entry.

The initial surveys shall include air monitoring to determine the air quality in the confined spaces:

- Flammable or explosive potential;
 - Oxygen deficiency; and
 - Presence of toxic or corrosive material.
2. The entry Supervisor should ensure that the site identification data matches existing conditions. If changes are observed, a re-evaluation of the hazards based on possible changes in activities, and/or other physical or environmental conditions, shall be conducted. Any permanent change in designation of a confined space will be reviewed by the Program Coordinator, prior to the change being made on the confined space website.
 3. In keeping with 29 CFR 1910.146(c)(7), a PRCS may be reclassified as a non-permit confined space, for as long as the non-atmospheric hazards have been eliminated. The basis for determining that all hazards in the permit space have been eliminated shall be shown on a copy of [Appendix C](#), *Reclassification of Permit-Required Confined Spaces to Non-Permit Required Confined Spaces Entry*. This certificate shall contain the date, location and description of the space, reason for reclassification, and signature of the Entry Supervisor or other authorized person making the determination. The certificate shall be made available to each employee entering the space.

Employees must maintain vigilance to see if hazards arise in a space that has been reclassified. If hazards arise, all persons shall exit the space. A re-evaluation of the space shall be done to determine if it must be returned to PRCS status.

Note: *Control of atmospheric hazards through forced air ventilation does not constitute elimination of the hazards, and therefore cannot be used as a means for reclassification.*

F. Hazard Assessment

A hazard assessment shall be completed prior to any entry into a confined space. The hazard assessment shall identify the sequence of work to be performed in the confined space, the

specific hazards known or anticipated, and the control measures to be implemented to eliminate or reduce each of the hazards to an acceptable level. No entry shall be permitted until the hazard assessment has been reviewed and discussed by all persons engaged in the activity. Personnel who enter confined spaces shall be informed of known or potential hazards associated with the confined spaces to be entered.

1. Atmospheric Hazards

Once a space has been identified as a confined space, the hazards that may be present within the confined space must be identified. Every confined space must be evaluated for hazards. The three types of atmospheric hazards are often the most difficult to identify since they may require assistance of a gas monitor for detection and identification.

Confined-space hazards can be grouped into the following categories:

a. Oxygen-Deficient Atmospheres

- (1) The normal atmosphere is composed of approximately 21% oxygen and 79% nitrogen. An atmosphere containing less than 19.5% oxygen shall be considered oxygen-deficient. The oxygen level inside a confined space may be decreased as the result of either consumption or displacement.
- (2) There are a number of processes that consume oxygen in a confined space. Oxygen is consumed during combustion of flammable materials, as in welding, cutting, or brazing. A subtler consumption of oxygen occurs during microbial action, as in the fermentation process. Oxygen can also be consumed during chemical reactions such as in the formation of rust on the exposed surfaces of a confined space. The number of people working in a confined space and the amount of physical activity can also influence oxygen consumption. Oxygen levels can also be reduced as the result of oxygen displacement by other gases.

b. Flammable Atmospheres

- (1) Flammable atmospheres are generally the result of flammable gases, vapors, dust mixed in certain concentrations with air, or an oxygen-enriched atmosphere. Oxygen-enriched atmospheres are those atmospheres that contain an oxygen concentration greater than 23.5%. An oxygen-enriched atmosphere will cause combustible materials such as clothing and hair to burn more vigorously, or even violently, when ignited.
- (2) Combustible gases or vapors can accumulate within a confined space when there is inadequate ventilation. Gases that are heavier than air will accumulate in the lower levels of a confined space. Lighter gases accumulate at the top; therefore, it is especially important that atmospheric tests be conducted at all levels in confined spaces.
- (3) The work being conducted in a confined space can generate a flammable atmosphere. Work such as spray painting, coating, or the use of flammable solvents for cleaning can result in the formation of an explosive atmosphere.

Welding or cutting with oxyacetylene equipment can also be the cause of an explosion in a confined space and shall not be allowed without a hot work permit. Oxygen and acetylene hoses may have small leaks that could generate an explosive atmosphere and, therefore, should be removed when not in use. The atmosphere shall be tested continuously while any hot work is being conducted within the confined space.

c. Toxic atmospheres

Toxic atmospheres may be present within a confined space as the result of one or more of the following:

- (1) When a product is stored in a confined space, the product can be absorbed by the walls, which give off toxic vapors by off-gassing, or during the cleaning of residual material.
- (2) The product can also produce toxic vapors that will remain in the atmosphere due to poor ventilation.
- (3) Toxic atmospheres can be generated as the result of work being conducted inside the confined space. Examples of such work include: welding or brazing with metals capable of producing toxic vapors, painting, scraping, sanding, etc. Many of the solvents used for cleaning and/or degreasing produce highly toxic vapors.
- (4) Toxic vapors/fumes produced by processes near the confined space may enter and accumulate in the confined space. For example, if the confined space is lower than the adjacent area and the toxic vapor/fume is heavier than air, the vapor/fume may "settle" into the confined space.

2. Mechanical and Physical Hazards

- a. Processes, such as rotating or moving mechanical parts within a confined space can create hazardous conditions within a confined space. All rotating or moving equipment such as pumps, process lines, electrical sources, etc., within a confined space must be identified.
- b. Physical factors such as heat, cold, noise, vibration, and fatigue can contribute to accidents. These factors must be evaluated for all confined spaces.
- c. Excavations could present the possibility of engulfment. Employees shall be protected from cave-ins by sloping, benching, or shoring systems when the depth of the excavation is more than four feet, in accordance with 29 CFR 1926.652. Air-monitoring may also be required.

G. Hazard Control

1. Typical controls include changes in the work processes and/or working environment with the following objectives:

- Controlling the health hazards by eliminating the responsible agents;
 - Reducing health hazards below harmful levels; and
 - Preventing the hazards from coming into contact with the workers.
2. The following order of precedence should be followed in reducing confined space risks:
- a. Engineering controls, such as ventilation to limit exposure to hazards;
 - b. Work practice controls, such as wetting of hazardous dusts, frequent cleaning; and/or
 - c. Personal protective equipment (PPE) use (i.e., air-purifying or supplied-air respirators).
3. Engineering Controls
- a. Engineering controls are those controls which eliminate or reduce the hazard through implementation of sound engineering practices.
 - b. Ventilation is one of the most common engineering controls used in confined spaces. When ventilation is used to remove atmospheric contaminants from the confined space, the space shall be ventilated until the atmosphere is within the acceptable ranges according to current acceptable standards. Ventilation shall be maintained during the occupancy if there is a potential for the atmospheric conditions to move out of the acceptable range.
 - c. When ventilation is not possible or feasible, alternate protective measures or methods to remove air contaminants and protect occupants shall be determined by the qualified person prior to authorizing entry. Conditions regarding continuous forced air ventilation should be used as follows:
 - (1) Employees shall not enter the space until the forced air ventilation has eliminated any hazardous atmosphere;
 - (2) Forced air ventilation shall be so directed as to ventilate the immediate areas where an employee is or will be present within the space;
 - (3) Continuous ventilation is maintained until all employees have left the space; and
 - (4) Air supply for forced air ventilation shall be from a clean source or Grade D air from a compressed source.
4. Work Practice (Administrative) Controls
- a. Work practice (administrative) controls include measures which eliminate or reduce the hazard through changes in the work practice (e.g., rotating workers, reducing the amount of worker exposure and housekeeping). Confined spaces should be cleaned/decontaminated of hazardous materials to the extent feasible before entry.

- b. Cleaning/decontamination should be the preferred method of reducing exposure to hazardous materials. Where administrative controls do not reduce the hazards to an acceptable level, personal protective equipment shall be worn by the entry personnel to provide appropriate protection against the hazards which may be present.

5. Personal Protective Equipment (PPE)

If the hazard cannot be eliminated or reduced to a safe level through engineering and/or work practice controls, PPE shall be used. A qualified person shall determine PPE needed by all personnel entering the confined space, including rescue teams. PPE which meet the specifications of applicable standards shall be selected in accordance with the requirements of the job to be performed.

6. Isolation and Lockout/Tag out Safeguards

- a. All energy sources which are potentially hazardous to confined space entrants shall be secured, relieved, disconnected and/or restrained before personnel are permitted to enter the confined space. Equipment systems or processes shall be locked out, or tagged out, or both prior to permitting entry into the confined space.
- b. The current lockout/tag out program, Section 3-1 of the document Lockout /Tagout of Hazardous Energy should be used as guidance. In confined spaces where complete isolation is not possible, other safe provisions should be made as practical. Special precautions should be taken when entering double walled, jacketed, or internally insulated confined spaces that may discharge hazardous material through the vessel's internal wall.
- c. Where there is a need to test, position or activate equipment by temporarily removing the lock or tag or both, Supervisors shall develop and implement procedures to control hazards to the occupants. Any removal of locks, tags, or other protective measures shall be done in accordance with Section 3-1 of the document.

7. Ingress/Egress Safeguards

- a. Means for safe entry and exit shall be provided for confined spaces. Each entry and exit point shall be evaluated to determine the most effective methods and equipment to be utilized to enable employees to safely enter and exit the confined space.
- b. Appropriate retrieval equipment or methods shall be used whenever a person enters a confined space. Use of retrieval equipment may be waived by the designated qualified person or Entry Supervisor if use of the equipment increases the overall risks of entry or does not contribute to the rescue. A mechanical device shall be available for retrieving personnel from vertical type confined spaces greater than five feet in depth.

8. Warning Signs and Symbols

All confined spaces that could be inadvertently entered should have signs identifying them as confined spaces. Signs should be maintained in a legible condition. The signs should

contain a warning that a permit is required before entry. Access to all confined spaces should be prominently marked. See signs below:



H. Atmospheric Monitoring

1. Initial Monitoring – atmospheric testing is required for two distinct purposes:
 - a. Evaluation of the hazards of the PRCS; and
 - b. Verification that acceptable conditions exist for entry into that space. If a person must go into the space to obtain the needed data, then Standard Confined Space Entry Procedures shall be followed (rescue team, attendant, entry supervisor, etc.).

Note: *Entering a space to conduct testing shall not occur without the proper personal protective equipment.*

- c. The analysis shall identify and evaluate any hazardous atmospheres that may exist or arise, so that appropriate permit entry procedures can be developed and acceptable entry conditions stipulated for that space.
- d. Initial evaluation, interpretation and development of the original data with location and NIH identification number, including basic entry procedures (see [Appendix D](#), NIH Confined Space Evaluation Sheet) should be done by or reviewed by the Assigned Safety Inspector or another technically qualified professional (e.g., OSHA consultation service, certified industrial hygienist, registered safety engineer, certified safety professional, etc.).
- e. A confined space that may contain a hazardous atmosphere shall be tested for residues of all identified or suspected contaminants. The confined space shall be listed on the Confined Space site with identified or suspected hazards and contaminants listed.
- f. Before entry into a confined space, a qualified person shall conduct testing for hazardous atmospheres. The internal atmosphere shall be tested with a calibrated, direct-reading instrument for the following, in the order given:
 - (1) Oxygen content;
 - (2) Flammable gases and vapors; and
 - (3) Potential toxic air contaminants.

2. Verification Testing

- a. A confined space that may contain a hazardous atmosphere shall be tested for residues of all identified or suspected contaminants. The confined space shall be listed on the ORF Confined Space site with identified or suspected hazards and contaminants listed.
- b. The evaluation testing should permit specified equipment to determine that residual concentrations at the time of testing and entry are within acceptable limits. Results of testing (e.g., actual concentration) shall be recorded on the permit. The atmosphere shall be periodically retested to verify that atmospheric conditions remain within acceptable entry parameters.
- c. Initial testing of atmospheric conditions and subsequent tests after a job has been stopped shall be done with the ventilation systems secured. If the confined space is vacated for any period of time, the atmosphere of the confined space shall be retested before re-entry is permitted. Further testing shall be conducted with ventilation systems turned on to ensure the contaminants are removed and that the ventilation system is not causing a hazardous condition.

3. Acceptable Limits

- a. The atmosphere of the confined spaces shall be considered within acceptable limits whenever the following conditions are maintained:
 - (1) Oxygen - 19.5% to 23.5%,
 - (2) Flammability - less than 10% of the Lower Explosive Limit (LEL); and
 - (3) Toxicity - less than recognized ACGIH exposure limits or other published exposure levels (e.g. OSHA PELs, NIOSH RELs) for each chemical tested.
- b. Whenever testing indicates a hazardous atmosphere (oxygen, flammability, and/or toxicity) that is not within acceptable limits, entry shall be prohibited until appropriate controls are implemented. If the source of the contaminant cannot be determined, precautions should be adequate to deal with the worst possible condition in the confined space. If there is the possibility that the confined space atmosphere can become unacceptable while the work is in progress, the atmosphere shall be constantly monitored and procedures and equipment shall be provided to allow the employees to quickly and safely exit the confined space. Also, as a precautionary measure, *the use of continuous forced air ventilation is mandatory whenever a hazardous atmosphere is detected or elevated temperature extremes exist. Do not reenter confined space until hazardous atmospheric conditions are brought under control.*

4. Example Testing Procedures

- a. Manhole and Utility Vault Test Procedures:

- (1) Insert the probe one foot below the cover and sample for flammable atmosphere. If less than 10% of the Lower Explosive Limit (LEL) is detected, according to the meter reading, remove the cover.
- (2) If water is found to be present after initial atmospheric testing and manhole cover is removed, lower a pump into the space and pump out the water.
- (3) Lower the probe by one-foot intervals to the entire depth of the manhole or vault and test the internal atmosphere for oxygen content, LEL and hydrogen sulfide.
- (4) Repeat the atmospheric testing for oxygen content, LEL, and hydrogen sulfide as determined by permit during entry.
- (5) If atmospheric hazards are the only concern, and atmospheric measurements satisfy the entry conditions, then the space can be entered only after a permit has been completed.

b. Storage Tanks and Chiller Vaults Test Procedures:

- (1) Drain contents of tank and isolate (lockout/tagout) supply lines, according to the Lockout/Tagout of Hazardous Energy SOP.
- (2) Open the cover enough to insert the probe and test for a flammable atmosphere. If less than 10% of the LEL is detected, remove the cover.
- (3) Lower the probe by one-foot intervals to the entire depth of the tank or vault and test the internal atmosphere for oxygen content, LEL and total hydrocarbons (fuel oil tanks only).
- (4) Open additional entry covers and repeat the atmospheric measurements.
- (5) If atmospheric measurements ranges are met, the entry conditions listed under atmospheric conditions are satisfied for entry, but monitoring shall continue during entry.

I. Monitoring Equipment and Calibration

1. Equipment Sensitivity and Specificity

The atmosphere of a confined space shall be analyzed using equipment of sufficient sensitivity and specificity. Testing equipment used in specialty areas should be listed or approved for use in such areas. This listing or approval should be from nationally recognized testing laboratories such as Underwriters Laboratories or Factory Mutual Systems.

2. Field Check

Field Check and Test Equipment before use as follows:

- a. Field check must be completed using approved calibration check gas;
- b. Field check results must be within the tolerances provided by the manufacture of the calibration gas;
- c. Field check of the confined space test equipment must occur before the monitor is used (for any purpose);
- d. If the unit fails a field check the unit must be calibrated immediately;
- e. Field check results must be documented; and
- f. Field check of the confined space test equipment shall be conducted in a fresh air area, away from potential sources of contaminants such as vehicle exhausts.

3. Calibration

Calibration shall be done, minimally once each year. Equipment that has been dropped, damaged or otherwise suspect should be removed from service until repaired and/or recalibrated. This calibration is to be conducted by a qualified individual or company that must provide documentation of the activity. If calibration is to be conducted by a NIH employee, that employee or their supervisor must be able to provide documentation of training.

J. Confined Space Permits

1. The Confined Space Entry Permit is the major tool in assuring safety during entry in confined spaces with known hazards or with unknown or potentially hazardous atmospheres. The entry permit process guides the entry supervisor and workers through a systematic evaluation of the space to be entered (see [Appendix B](#)).
2. The permit shall be used to establish appropriate conditions. Before each entry into a confined space, an entry permit shall be completed by an entry Supervisor, and the contents communicated to all employees involved in the operation, before being conspicuously posted near the work location. The NIH standard entry permit shall be used for all entries.
3. Entry Permits – A standard entry permit shall contain the following items (see [Appendix B](#)):
 - a. Permit space to be entered;
 - b. Purpose of the entry;
 - c. Date of the permit and the authorized duration of the entry permit;
 - d. Personnel, by name, currently serving as attendants;

- e. Name of authorized entrants within the permit space, and means of identifying authorized entrants inside the permit space (e.g., rosters or tracking systems);
- f. Individual, by name, currently serving as entry supervisor and signature or initials of the entry supervisor who originally authorized entry, if permit was reissued for a second shift;
- g. Hazards of the permit space to be entered;
- h. Acceptable entry conditions;
- i. Measures used to isolate the permit space and to eliminate or control permit space hazards before entry, e.g., lockout or tag out of equipment and procedures for purging, rendering inert, ventilating, and flushing permit spaces;
- j. Results of initial and periodic tests performed, accompanied by the names or initials of the testers, with date and time when tests were performed;
- k. Rescue and emergency services that can be summoned and the means,(e.g., equipment to use, phone numbers to call) for summoning those services;
- l. Equipment to be provided for compliance with this section, (e.g., PPE, testing, communications, alarm systems, and rescue);
- m. Communication procedures used by authorized entrants and attendants to maintain contact during the entry;
- n. Other information whose inclusion is necessary, given the circumstances of the particular confined space, in order to ensure employee safety; and
- o. Additional permits, such as for hot work, that has been issued to authorize work in the permit space.

K. Entry Procedures

1. Whenever entry into a confined space is needed, an Entry Supervisor or the person in charge of the job may initiate entry procedures. The confined space entry permit is reviewed and authorized by the Entry Supervisor. Entry into a confined space shall follow the standard entry procedure. The following are requirements for standard entry:
 - a. Verification of training to establish personnel proficiency in the duties required;
 - b. Atmospheric testing for entry; and
 - c. Atmospheric monitoring during the entry.
2. Before an employee enters the space, the internal atmosphere shall be tested with a calibrated, direct-reading instrument. If a hazardous atmosphere is detected during entry:

- a. The space shall be evaluated to determine how the hazardous atmosphere developed; and
 - b. Measures shall be implemented to protect employees before any subsequent entry takes place.
3. Notification of the NIH Fire Department or Poolesville in house rescue team
- a. The NIH fire department or their alternate designee is the only entity that may enter a PRCS to conduct rescue on the Bethesda campus. The Poolesville in house rescue team is the only entity that may enter a PRCS to conduct rescue on the Poolesville campus. To this end, specific actions are required by the Entry Supervisor:
 - b. When contacting the Poolesville in house rescue team:
 - (1) Ensure a properly working radio is available onsite for communication with the rescue team members and individuals conducting the confined space entry.
 - (2) Provide the following information to the rescue point of contact:
 - (a) Entry Supervisor name;
 - (b) Name of contact that will be onsite (attendant);
 - (c) Location of PRCS; and
 - (d) Hazards associated with the PRCS.
 - (3) Ensure that the confined space rescue trailer which houses the rescue equipment is moved within close proximity of the entry location prior to entry in order to minimize response time.
 - c. When contacting the NIH Fire Department on the Bethesda campus
 - (1) Ensure a properly working radio is available onsite for communication with the fire department through the central call system.
 - (2) Call the NIH Fire Department Watch Officer at the fire house (301-496-2372).
 - (3) Provide the following information to the officer on duty:
 - (a) Entry Supervisor name;
 - (b) Name of contact that will be onsite (attendant);
 - (c) Location of PRCS;
 - (d) Hazards associated with the PRCS;
 - (e) Equipment to be used for entry;
 - (f) Type of work to be completed in PRCS; and
 - (g) Expected duration (the end time will be necessary).

- (4) The Fire Department will work within their Emergency Communication System to log calls and communications that are traded between themselves and ORF.
 - (5) Ensure that any message from the NIH fire department or other designated confined space rescue service is noted on the permit. This message should only be a notification that the fire department is not onsite and is unable to respond in a timely manner. The notification will state that the entry must be suspended until further notice. If this notice is received the entrant(s) must immediately vacate the space. Failure to honor the fire department request will result in disciplinary action.
 - (a) Once the notice is received, a call must be placed to the officer on duty noting the receipt of the call and the time of the entry termination.
 - (b) Re-entry into the space may begin after notification from the fire department. This notification must initiate atmosphere monitoring to verify the conditions of the space.
 - (c) If the current shift ends before notice from the fire department is received a new permit is required and the old permit must be closed by the entry supervisor.
4. Entry shall be allowed only when all requirements of the permit are met; specifically, all identified hazards are tested for presence and severity, and it is reviewed and signed by an Entry Supervisor.
 5. Example of Confined Space Entry Procedures:
 - a. Erect barriers to protect workers from external hazards, such as pedestrian and vehicular traffic.
 - b. Perform a site evaluation of the area and initiate the preparation of the confined space entry permit ([Appendix B](#)). Any special conditions that may impact the entry or operation (e.g. noticeable steam leak, water runoff, etc.) shall be evaluated during the site assessment, and controlled before entry.
 - c. Isolate (lockout/tagout) appropriate utility/energy systems, if applicable, according to the Lockout/Tagout of Hazardous Energy SOP.
 - d. An Alternative Entry Procedure specified by OSHA is to be used for permit spaces when the only hazard is an actual or potential hazardous atmosphere, and continuous forced air ventilation is sufficient to maintain the permit space for entry for the duration of that permitted entry (per 29 CFR 1019.146(c)(5)). See [Appendix A](#). This does not change information on the master inventory of confined spaces.
 6. Opening a Confined Space

Any conditions making it unsafe to remove an entrance cover shall be eliminated before the cover is removed. When entrance covers are removed, the opening shall be promptly guarded by a railing, temporary cover, or other temporary barrier that will prevent anyone from falling through the opening. This barrier or cover shall protect each employee working in the space from foreign objects entering the space. If it is in a traffic area, adequate traffic safety barriers shall be erected.

L. Duration of Entry Permit

1. Permit Issuance and Expiration

An issued permit is only valid for one shift or until the end of a current shift (a maximum time of eight hours or the shift change, whichever comes first). Before each re-entry into the confined space, or entry of new shift workers, the following conditions shall be met:

- a. Atmospheric testing shall be conducted and the results shall be within acceptable limits. If atmospheric test results are not within acceptable limits, precautions to protect entrants against the hazards shall be addressed on the permit and put in place before reentry.
- b. New Entry Supervisor shall verify that all precautions and other measures called for on the permit are still in effect. Finally, only operations or work originally approved on the permit shall be conducted in the confined space.

2. Permit Re-issuance

A new permit shall be issued whenever changing work conditions or work activities introduce new hazards into the confined space. The Entry Supervisor shall retain each cancelled entry permit for at least one year to facilitate the review of the confined space entry program. Any problems encountered during an entry operation shall be noted on the pertinent permit so that appropriate revisions to the confined space permit program can be made. Copies of all cancelled entry permits will be forwarded to the program coordinator.

3. Canceling a Permit

The Entry supervisor must close each permit by signing their name on the document in the appropriate place. Once this is completed the permit is no longer valid, and only serves as a historical record. The permit must be returned to the supervisor requesting the work. A copy of the permit must be submitted (mail or faxed (301-402-0313): Attention, Confined Space Program Manager) to DOHS immediately, or within 24 hours of closing.

M. Review of a Canceled PRCS Permit

1. All canceled permits used for permit-required confined space entry must be kept with the supervisor assigning the work to be completed. The Entry Supervisor is required to ensure that a copy of the permit is forward to the Confined Space Manager for review. The Confined Space Manager must complete a technical review of each permit within 1 year of

cancelation and provide this feedback to the documented entry supervisor. This review must be used to provide feedback to employees who complete PRCS work.

2. As part of the review, it must include:
 - a. Compliance of the permit to the NIH confined space program;
 - b. Review of information on the permit in relation to the previously identified hazards of the specific location; and
 - c. Failures of the confined space program not previously identified, but critical to ensuring the safety of employees.

N. Reclassification of a Confined Space

1. Reclassification of a permit required confined space is a mechanism to allow continuity of work once identified hazards are abated. It is critical that a thorough review of the hazards associated with PRCS location occurs and that the event is documented. [Appendix C](#) is the means to properly document the reclassification of a PRCS.
2. The following steps must occur before the space is deemed reclassified and entry begins:
 - a. Identify the hazard analysis worksheet for the space and document how each of the hazards is eliminated for the period of work.
 - b. If the permit space poses no actual or potential atmospheric hazards and if all hazards within the space are eliminated without entry into the space, the permit space may be reclassified as a non-permit confined space for as long as the non-atmospheric hazards remain eliminated.

Note: Control of atmospheric hazards through forced air ventilation does not constitute elimination of the hazards.

- c. An individual trained to complete and document the reclassification must use [Appendix C](#) appropriately before the entry. Contact the Confined Space Program Manager about training for reclassification.
- d. If it is necessary to enter the permit space to eliminate hazards, such entry shall be performed as a permitted entry as defined by this program. Testing and inspection during that permitted entry that demonstrates the elimination of all hazards can be used as documentation to support the reclassification certificate.
- e. If hazards arise within the reclassified space that the work must be terminated immediately. The entry supervisor must reevaluate the space and determine whether it must be reclassified as a permit space.
- f. The reclassification certificate must be onsite during work to be completed.

- g. The reclassification certificate must be returned to the supervisor requesting the work.
- h. The supervisor is required to ensure that a copy of the reclassification worksheet is forwarded to the Confined Space Program Manager (DOHS) for immediate review.

O. Training

1. Training shall be provided to each affected employee:
 - a. Before the employee is first assigned duties under this program;
 - b. Before there is a change in assigned duties within the program;
 - c. Whenever there is a change in permit space operations that presents a hazard for which an employee has not been trained;
 - d. Whenever the employer has reason to believe either that there are deviations from the permit space entry procedures, or inadequacies in the employee's knowledge/procedure application have occurred; and
 - e. The training shall establish employee proficiency in the duties required by the confined space program. It shall also introduce updates for continued program compliance.
2. General Training
 - a. All employees who will enter confined spaces shall be trained in entry procedures. Personnel responsible for supervising, planning, entering or participating in confined space entry and rescue shall be adequately trained in their functional duties prior to any confined space entry.
 - b. Training shall include, at a minimum:
 - (1) Explanation of the general hazards associated with confined spaces;
 - (2) Discussion of specific confined space hazards associated with the facility, location or operation;
 - (3) Reason for, proper use, and limitations of PPE and other safety equipment required for entry into confined spaces;
 - (4) Explanation of permits and other procedural requirements for conducting a confined space entry;
 - (5) A clear understanding how to respond to emergencies;
 - (6) Duties and responsibilities as a member of the confined space entry team; and

- (7) Description of how to recognize symptoms of overexposure to probable air contaminants in themselves and co-workers, and method(s) for alerting attendants.
 - c. Refresher training should be conducted as needed to maintain employee competence in entry procedures and precautions.
3. Specific Training
- a. Training for Atmospheric Monitoring Personnel
 - Proper use of the equipment;
 - Knowledge of calibration;
 - Knowledge of sampling strategies and techniques; and
 - Knowledge of applicable PELs, TLVs, LELs, UELs, etc.
 - b. Training for Attendants
 - Procedures for summoning rescue or other emergency services;
 - Proper utilization of equipment used for monitoring and equipment for communicating with entry and emergency/rescue personnel; and
 - Perform non-entry rescue.
 - c. Training for Emergency Response Personnel
 - Rescue plan and procedures developed for each type of confined space that is anticipated to be encountered;
 - Use of emergency rescue equipment;
 - First aid and CPR techniques; and
 - Work location and confined space configuration to minimize response time.
 - d. Verification of Training
 - Periodic assessment of the effectiveness of employee training should be conducted by a qualified person cleared by the assigned Safety Officer. Training sessions should be repeated as often as necessary to maintain an acceptable level of personnel competence.
 - Certification of training shall be available for inspection authorized personnel whenever necessary. This shall be facilitated through the entry supervisors, or the assigned Safety Office.

P. Emergency Response

1. Personnel on the Bethesda campus will rely on rescue personal from the NIH Fire Department, in the event of an emergency during a confined space entry. Personnel on the Poolesville campus will rely on the in-house confined space rescue team. Prior to entry, notice must be provided to the NIH Fire Department or the Poolesville confined space

rescue team of the location, entry time, and number of personnel entering the confined space.

- a. A plan of action should be written with provisions to conduct a timely rescue for individuals in a confined space should an emergency arise. All workers should be familiar with basic first aid procedures.
- b. All employees completing Confined Space Awareness training must understand the hierarchy of rescue as it relates to confined spaces. Self-rescue is the most effective and primary means of escaping a potentially hazardous situation in a PRCS. Non-entry rescue is the intermediate step to rescuing an individual in a PRCS. Entry rescue is last means for rescuing an individual in a PRCS.

2. Self-Rescue

- a. Self-rescue is the most effective way for an individual to escape a hazardous situation, injury or any other emergency condition that develops while in a PRCS or confined space (CS).
- b. Self-rescue is exclusively the evacuation of an individual using their own “power”. Any assistance other than communication would change the rescue to non-entry or entry rescue.

3. Non-Entry Rescue/No-Entry Rescue

- a. Retrieval systems shall be used whenever an authorized person enters a permit space, except when equipment increases the overall risk of entry or the equipment would not contribute to the rescue of the entrant. Retrieval systems shall have a chest or full body harness and a retrieval line attached at the center of the back near shoulder level or above the head.
- b. If harnesses are not feasible or create a greater hazard, wristlets may be used in lieu of the harness. The retrieval line shall be firmly fastened outside the space so that rescue can begin as soon as necessary. A mechanical device shall be available to retrieve personnel from vertical confined spaces more than five feet deep.
- c. Rescue procedures may require withdrawal of an injured or unconscious person. Careful planning must be given to the relationship between the internal structure, the exit opening, and the worker. If the worker is above the opening, the system must include a rescue arrangement operated from outside the confined space, if possible, by which the employee can be withdrawn and removed without added injury.

4. Entry Rescue

The NIH fire department or their alternate designee is the only entity that may enter a PRCS to conduct rescue on the Bethesda campus.

Q. References

1. 29 CFR 1910.146, Permit-required Confined Spaces
2. DHHS (NIOSH) Publication No. 87-113, Working with Confined Spaces
3. Rekus, John F. Complete Confined Spaces Handbook. Lewis Publishers, Washington, DC. 1994.

R. Definitions

Acceptable entry conditions – means the conditions that must exist in a permit space to allow entry and to ensure that permit-required confined space entry operations can safely be conducted.

Air Mover – A device used to force, draw or exhaust gases through a specific assembly in order to move them from one location to another.

Alternative Entry Procedures – These alternative entry procedures specified by OSHA are to be used for permit spaces where the only hazard is an actual or potential hazardous atmosphere, continuous forced air ventilation is sufficient to maintain the permit space for entry.

Attendant – A specially trained individual stationed outside of a confined who monitors the authorized entrant inside, and who performs all attendant duties assigned in the permit space program.

Confined space – A space that is large enough and so configured that an employee can bodily enter and perform assigned work; has limited or restricted means for entry and exit; and is not designed for continuous employee occupancy. Identified confined spaces at NIH may include: manholes, vaults, tanks, pits, voids, wells, sumps, boilers, hoppers, stacks, large pipes, tank trucks, sewers, ducts, plenum chambers, ovens, chill boxes, walk-in freezers and refrigerators which lack independent supply air ventilation.

Contractor – A person who agrees to furnish materials or perform services at a specified price, with a defined format, and certain specifications.

Entrant – A person who is trained and authorized to enter a confined space.

Entry Supervisor (ES) – May be drawn from the following personnel: work leader, team leader, shift head, supervisor or other personnel who meet the requirements. Such an individual is responsible for enforcing work practices necessary to assure continued employee safety. They must be adequately trained in the duties and responsibilities of an ES; know the hazards of the confined spaces, verify that all tests have been conducted and that all procedures and equipment are in place before endorsing a permit, verify that rescue services are available and the means for summoning them are operable. Supervisors are to remove unauthorized individuals who enter the confined space, and update new entry supervisor about any changes with confined space.

Entry Permit – An approval document issued by an Entry Supervisor that is required before entry can be made into any PRCS (See [Appendix B](#)). The permit that authorizes entrance into a confined space and contains hazard assessment information, i.e. identification of the space; purpose of the entry; date and duration of the permit; a list of authorized entrants; names of current attendants and the entry supervisor; a list of hazards in the permit space; a list of measures to isolate the permit space and eliminate or control the hazards; acceptable entry conditions; the results of tests initiated by the person(s) performing the test; standby rescue and retrieval equipment; communication procedures for attendants and entrants; any required equipment (such as respirators, communication, alarms, etc.); any other necessary information; and any additional permits (such as for hot work, lockout/tagout, trenching/shoring, fire watch, etc.).

Hazardous atmosphere – Any atmosphere that presents a potential for death, injury, or illness due to the presence of flammable gases or vapors, oxygen deficiency or enrichment, or toxic substances.

Non-Permit Confined Space – A confined space that does not contain, nor has the potential to contain, any hazard capable of causing death or serious physical harm. Examples of non-permit required confined spaces might include certain air plenums and pipe chases, attics, and some building crawl spaces.

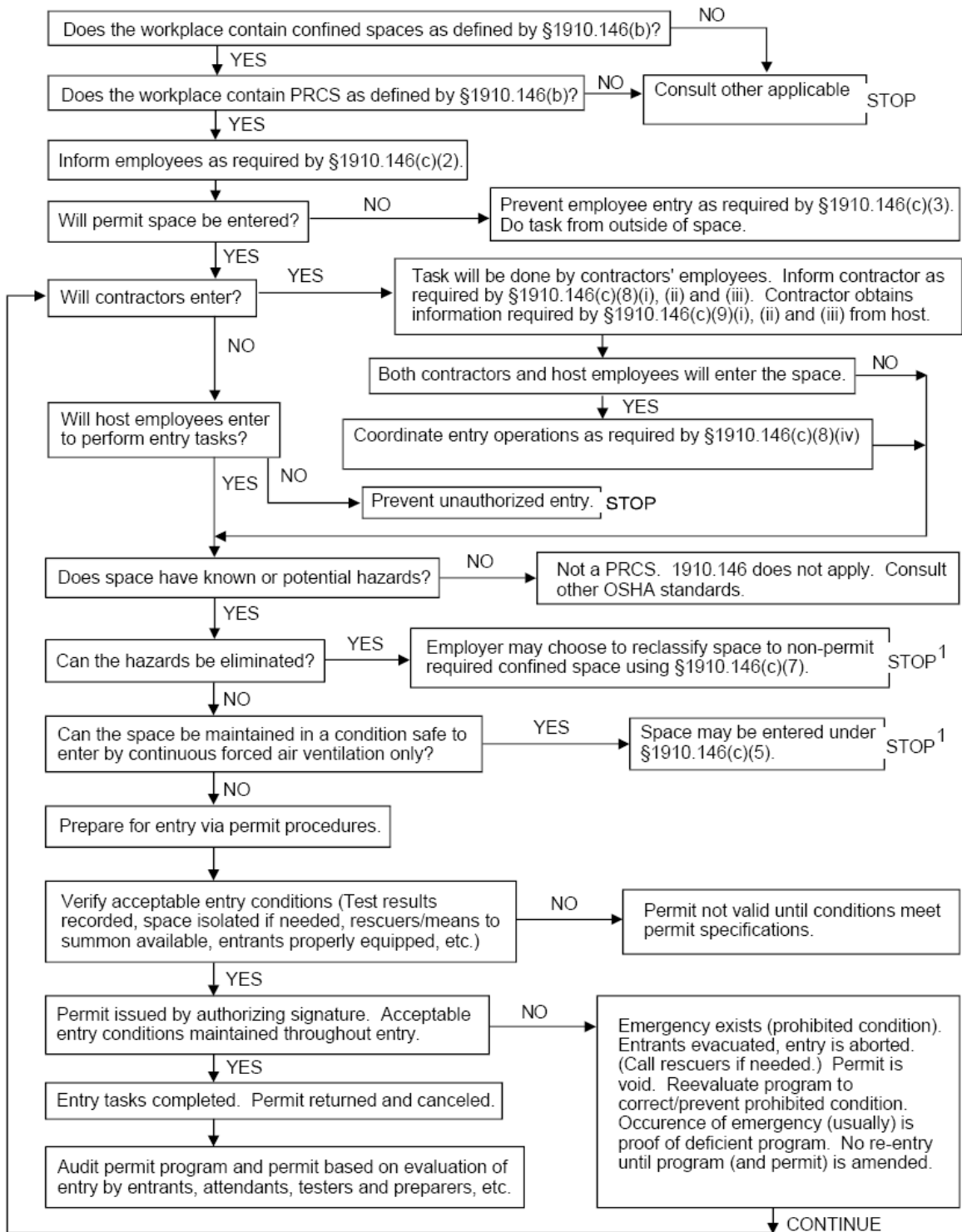
Permit-Required Confined Space (PRCS) – A confined space that is potentially hazardous. A permit-required confined space has one or more of the following characteristics:

- Contains or has a potential to contain a hazardous atmosphere;
- Contains a material that has the potential for engulfing an entrant;
- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly-converging walls or by a floor that slopes downward and tapers to a smaller cross-section; or
- Contains any other recognized serious safety or health hazard. Examples of serious safety or health hazards might include:
 - Fall hazards
 - Unguarded machinery
 - Extreme heat or cold
 - Steam pipes or chemical lines
 - Hazardous noise levels
 - Electrical hazards
 - Presence of asbestos
 - Hazardous levels of dust (e.g. in feed mills)

Reclassification – A space designated by the employer as a permit-required confined space may be reclassified as a non-permit confined space under the procedures defined under Paragraph N, above. [Appendix C](#), provides additional information on reclassifying a Permit Required Confined Space.

Testing – The process by which the hazard or hazards of a confined space are assessed and identified.

Appendix A: Permit Required Confined Space Decision Flow Chart



¹ Spaces may have to be evacuated and re-evaluated if hazards arise during entry.

Appendix B: Confined Space Entry Permit (This permit must be retained by NIH for at least one year)

1. Location and Description of Space to be entered:
2. Purpose of Entry:
3. Authorized Duration of Permit: Date: _____ Start Time: _____ Completion Time: _____ Date: _____ Start Time: _____ Completion Time: _____

4. AUTHORIZED PERSONNEL

ATTENDANTS			ENTRANTS		
Name (Last, First, MI)	Time In	Time Out	Name (Last, First, MI)	Time In	Time Out

5. AUTHORIZED BY ENTRY SUPERVISORS

NAME (Print or Type)	SIGNATURE	DATE	START TIME/CANCEL TIME

6. PROBABLE HAZARDS

ATMOSPHERE	PHYSICAL
<input type="checkbox"/> Oxygen (less than 19.5% or greater than 23.5%) <input type="checkbox"/> Flammable Gases or Vapors (greater than 10% LEL) <input type="checkbox"/> Presence of toxics <input type="checkbox"/> Corrosive materials	<input type="checkbox"/> Engulfment <input type="checkbox"/> Mechanical Hazards <input type="checkbox"/> Electrical Shock <input type="checkbox"/> Temperature Extremes <input type="checkbox"/> Explosion Proof Lighting <input type="checkbox"/> Other

7. ACCEPTABLE ENTRY CONDITIONS

ISOLATION METHODS	VENTILATION METHODS
<input type="checkbox"/> Blank/Blind Lines <input type="checkbox"/> Purge/Clean <input type="checkbox"/> Inerting <input type="checkbox"/> Barriers/Shields <input type="checkbox"/> Double Block and Bleed	<input type="checkbox"/> Mechanical <input type="checkbox"/> Natural Ventilation
PREPARATIONS	COMMUNICATION METHODS
<input type="checkbox"/> Notification of service interruption to affected areas <input type="checkbox"/> Electrical Lockout/Tag out <input type="checkbox"/> Atmospheric <input type="checkbox"/> Other	<input type="checkbox"/> Visual <input type="checkbox"/> Voice <input type="checkbox"/> Tug Rope <input type="checkbox"/> Radio <input type="checkbox"/> Other:

8. PERSONNEL AWARENESS

<input type="checkbox"/> Pre-Entry Briefing on Specific Hazards, Work to be performed, Control Methods, and Emergency <input type="checkbox"/> Signs Posted as Required <input type="checkbox"/> Pedestrian and Vehicle Barriers <input type="checkbox"/> Other:

Appendix C: Reclassification of Permit Required Confined Space Entry To Non-Permit Confined Space Entry

Date: _____ Building: _____ Room #: _____

Description of Space: _____

Instructions: Check off each box as it relates to reclassification. Add additional information as necessary.

1. Potential of hazard atmosphere eliminated. Forced Air Ventilation does NOT qualify. Yes No
 Breathing Grade Air
 Natural Ventilated Air
 Other method: _____

2. Potential for engulfment eliminated. Have all engulfment issues been eliminated? Yes No
 How was this done? _____

3. Energy sources and electrical hazards. Have all energy sources been locked out/tagged out where applicable, and all other electrical hazards been eliminated? Yes No
 How was this done? _____

4. Machine guarding. Are all machine guards in place, and/or the entrant(s) protected from moving parts? Yes No
 How was this done? _____

5. Have all access and/or internal configuration hazards have been mitigated (including fall hazards)? Yes No
 Check each box as is applicable:
 Reconfiguration of entrance design
 Use of chair harness
 Use of fall protection equipment
 Other: _____

6. Lighting. Is there adequate lighting, or a means to create adequate lighting? Yes No
 How is this done? _____

If any of the above statements are checked "No", then a full confined space permit must be completed.

7. Are there any other recognized safety hazards that should be controlled/eliminated? Yes No

Hazard	Does it exist?	Is it mitigated?
Radiation		
Sharp objects		
Enclosures		
Asbestos		
Noise		
Other:		

If any hazard exists and cannot be mitigated, then a full confined space permit must be completed.

Signature: Entry Supervisor / Other Authorized

Name: _____

Appendix D: NIH Confined Space Evaluation Sheet

1.) Identifier No: _____

2.) NIH Identifier: _____

3.) Space Description: _____

4.) Space Determination:

- a. Permit-Required Confined Space (Go to Section 5 - Hazard Evaluation)
- b. Confined Space Only (Go to Section 6 - Justification)
- c. Not a Confined Space (Go to Section 7 - Comments)

5.) HAZARD EVALUATION

a.) Atmospheric Hazards

- | | |
|---|--|
| 1. <input type="checkbox"/> Oxygen Deficiency | 12. <input type="checkbox"/> Lab hood exhaust |
| 2. <input type="checkbox"/> Oxygen Enrichment | 13. <input type="checkbox"/> Freon |
| 3. <input type="checkbox"/> Explosive Gas/Vapor | 14. <input type="checkbox"/> Inaccessible space |
| 4. <input type="checkbox"/> Explosive Dust | 15. <input type="checkbox"/> Natural Gas |
| 5. <input type="checkbox"/> Carbon Monoxide | 16. <input type="checkbox"/> Sewage |
| 6. <input type="checkbox"/> Total Hydrocarbons | 17. <input type="checkbox"/> Biohazard area |
| 7. <input type="checkbox"/> Hydrogen Sulfide | 18. <input type="checkbox"/> Sodium hydroxide 50% |
| 8. <input type="checkbox"/> Sulfur Dioxide | 19. <input type="checkbox"/> Pump Lubricants |
| 9. <input type="checkbox"/> Ammonia | 20. <input type="checkbox"/> Water treatment chemicals |
| 10. <input type="checkbox"/> Nitrogen Dioxide | 21. <input type="checkbox"/> Combustion emission/exhaust |
| 11. <input type="checkbox"/> Nitrogen Oxides | 22. <input type="checkbox"/> Chlorine gas |
| | 23. <input type="checkbox"/> Other: _____ |

b.) Physical Hazards

- | | |
|--|--|
| 1. <input type="checkbox"/> Engulfment | 9. <input type="checkbox"/> Pinch Points |
| 2. <input type="checkbox"/> Corrosives | 10. <input type="checkbox"/> Anima/Insect |
| 3. <input type="checkbox"/> Biological | 11. <input type="checkbox"/> Biohazard |
| 4. <input type="checkbox"/> Lighting/Visibility | 12. <input type="checkbox"/> Electrical/Shock |
| 5. <input type="checkbox"/> Slip/Trip/Fall | 13. <input type="checkbox"/> Restrictive workspace |
| 6. <input type="checkbox"/> Steam/Heat Stress | 14. <input type="checkbox"/> Access through another elevator pit |
| 7. <input type="checkbox"/> Entanglement | 15. <input type="checkbox"/> Standing water |
| 8. <input type="checkbox"/> Mechanical Equipment | 16. <input type="checkbox"/> Other: _____ |

6.) Justification

- 1. Does not contain or have the potential to contain a hazardous atmosphere.
- 2. Does not contain a material that has the potential for engulfing an entrant.
- 3. Does not have an internal configuration with inwardly converging walls.
- 4. Does not have internal configuration which slopes or tapers to a smaller cross-section.
- 5. Does not contain any other recognized serious safety or health hazard.

7.) Comments

Completed By: _____ Date: _____

SECTION 3-4: EXCAVATION AND TRENCHING

A. Purpose, Policy and Background

1. The primary hazard associated with excavation and trenching activities is cave-in. A cave-in may result in entrapment. Other hazards associated with excavations include falls, falling loads, mobile equipment, water accumulation, hazardous atmospheres (heavier-than-air vapor concentrations), and access and egress obstructions.
2. Only employees who have been trained in excavation and trenching procedures are permitted to work in excavations or trenches.

B. Responsibilities

1. Supervisors
 - a. The supervisor has ultimate responsibility for the safety of the employees and general public affected by the excavation. This includes evaluation of the work to be performed, approval of the means for protection that will be used by the employees, and the deployment of measures to safeguard the general public from trenching and excavation hazards (if applicable).
 - b. Supervisors are responsible for compliance with the OSHA excavation and trenching standard. The supervisor may delegate the following responsibilities to the competent person; however the supervisor is ultimately responsible for employee safety. The responsibilities related to trenching and shoring activities include:
 - (1) Ensuring that site specific health and safety practices related to trenching and shoring are communicated and understood through documented training;
 - (2) Establishing safe, site-specific procedures for equipment maintenance to comply with elements of this program;
 - (3) Ensuring that each job is analyzed for potential hazards and controls. A hazard analyses must be completed for all job classifications that perform trenching and shoring activities;
 - (4) Ensuring that each job is reviewed by the designated competent person before the trenching and shoring work commences; and
 - (5) Ensuring that at the end of the work day and/or upon completion of the project, the site is properly secured to prevent unauthorized access, or excavations/trenches are refilled/restored to their original condition.
2. Employees
 - a. Employees are responsible for working in accordance with the provisions of this policy. No employee should enter an excavation until authorized by the competent person.

- b. Additionally, no employee shall enter an excavation without proper trenching and excavation training. Employees are responsible for following the requirements of the excavation and trenching program by:
 - (1) Asking questions of their supervisors when concerned about an unknown or potentially hazardous situation, condition or substance;
 - (2) Reporting all unsafe conditions, practices or equipment either to their supervisor, or to the Safety Officer;
 - (3) Performing work in accordance with the approved job hazard analysis and applicable OSHA standards;
 - (4) Keeping informed about conditions that may impact their health and safety; and
 - (5) Participating in training programs as required.

3. Competent Person

- a. Only persons receiving special training may be qualified as a competent person. The competent person must be on site at all times that employees are in the excavation and shall have the authority to stop work if hazardous conditions are detected.
- b. The competent person must:
 - (1) Be knowledgeable in the OSHA excavation and trenching standard, and other programs that may apply (e.g. Hazard Communication, Confined Space, Respiratory Protection);
 - (2) Be capable of recognizing hazardous conditions;
 - (3) Perform and document daily inspections; and know when inspections should be performed.
- c. The individual must assure that the location of underground installations or utilities have been properly located; and ensure the use of adequate protective systems, work methods and personal protective equipment (PPE) on the excavation site.

C. Procedures

1. Protection of the Public

- a. Excavations must be isolated from public access by a substantial physical barrier. Barricades, lighting and posting shall be installed as appropriate prior to the start of excavation operations. Guardrails, fences, or barricades should be installed around excavations adjacent to walkways, roads, paths or other traffic areas. All temporary excavations of this type shall be backfilled as soon as possible.
- b. Use of barricade tape alone is not considered a sufficient method of isolation when the excavation is unattended. Warning lights or other illumination shall be used as necessary for the safety of the public at night. Wells, holes, pits, and similar excavations must be effectively barricaded or covered

and posted. Walkways or bridges used by the general public to cross excavations must be equipped with standard guardrails that conform to OSHA fall protection standards for guardrails and handrails.

2. Soil Classification

- a. The competent person in charge of the excavation shall be responsible for determining the soil type. All previously disturbed soil is automatically considered Type B or C soil. Because most excavations on NIH property will be conducted in order to repair/replace existing pipelines or equipment (i.e. the soil has been previously disturbed), excavations shall be made to meet the requirements for Type B or C soils only, as appropriate. Soil may be considered Type C by default and no additional tests required.
- b. To classify soil as type B the competent person shall conduct visual tests, as well as qualitative and quantitative tests as described in 29 CFR 1926 Subpart P, Appendix A. Definitions and explanations of all soil types are also found in 29 CFR 1926 Subpart P, Appendix A.

3. Site Safety

- a. Employees shall not be allowed to work on sloped or benched areas of excavations located above other employees, unless those employees at the lower level are adequately protected.
- b. Structural ramps and runways associated with the excavation project shall be engineered by a person qualified in structural design and constructed to design specifications.
- c. If excavation work is within 25 feet of a roadway, employees must be protected by reflective vests in addition to roadway barricades.
- d. Employees may not be under loads being handled by lifting or excavation equipment.
- e. Employees must stand away from any vehicle being loaded or unloaded.
- f. Employees working in excavations which have, or have the potential of having a hazardous atmosphere (e.g. oxygen deficiency, toxic or flammable gases) shall be entered under procedures outlined in the "Permit Required" Confined Space Entry Policy. These procedures shall include atmospheric testing, mechanical ventilation, lifelines, respirators, and emergency rescue preparation, as needed for the specific work conditions.
- g. Welding operations have the potential of creating a hazardous atmosphere in an excavation. The competent person shall ensure that additional safety factors are incorporated into any welding operation by completing a "HOT WORK PERMIT" and checklist. This form shall be signed by the workers and the Competent Person and/or supervisor, and attached to the excavation permit form.
- h. Employees may not work in an excavation in which water has accumulated unless control devices are activated and employees are equipped with harnesses and lifelines.
- i. All materials and equipment must be kept at least two (2) feet from the edge of the excavation.

- j. In excavations greater than 4 feet in depth a method to protect people entering the excavation from cave-in must be employed. Acceptable protective methods include sloping, benching, shielding and shoring.
- k. All equipment, materials, supplies, buildings, roadways, trees, utility vaults, boulders, etc. that could present a hazard to employees working in the excavation must be removed or supported as necessary to protect employees.

D. Training

- 1. Competent Person - For the purposes of this policy, the "competent person" must have a minimum of eight (8) hours (formal) initial training in the hazards of excavation and trenching operations and two (2) hours of annual training thereafter.
- 2. Workers - All workers involved with excavation and trenching operations must have a minimum of two (2) hours annual training.

E. Program Management

- 1. Prior to beginning any trenching operation, all surrounding hazards must be evaluated, including the location of trees, large rocks, buildings, and sidewalks. These items should either be removed or made safe.
- 2. Prior to digging, the location of underground utilities including telephone, electrical, sewer, water, tanks, etc., must be estimated and identified/marked. The appropriate utility companies must be identified prior to digging. The competent person shall ensure that appropriate measures are taken to protect the underground installations, and safeguard employees from potential hazards associated with the installation.
- 3. Excavations less than four (4) feet in depth that have been determined by the competent person to be safe from cave-in, are not required to be protected. At depths greater than four (4) feet, all walls and faces of excavations to which employees are exposed, must be guarded by a shoring system, sloping of the ground, or other equivalent means.
- 4. All excavations that are four (4) feet or greater in depth must have adequate means of egress, including steps or ladders; these must be provided at no more than 25 feet of travel distance.
- 5. All slopes shall be excavated to the angle of repose.
- 6. All excavations shall be sloped at an angle not steeper than 34 degrees from the horizontal as defined in 29 CFR 1926.652 (b). Steeper slopes may be used if proactive systems, as defined in 29 CFR 1926.652 (b)(2), (b)(3), or (b)(4).
- 7. A registered professional engineer, as described in 29 CFR 1926 (b)(4), may design excavations different from those noted in item 6 above if appropriate documentation is provided and maintained as described in 29 CFR 1926.652(b)(4) (ii).

8. Manufacturer designed support systems may be used if that use is in accordance with the manufacturer's tabulated data. Any uses deviating from that tabulated data must be in writing from the manufacturer and be present on the jobsite.
9. The removal of support systems at the end of an excavation project shall be performed in a manner that will not jeopardize the safety of the workers. The removal of supports shall begin at the bottom of the excavation and progress upward simultaneously with backfilling operations.

F. Inspections – The competent person must conduct inspections of the entire excavation site:

1. Daily and before the start of each shift.
2. As dictated by the work being done in the trench.
3. After every rain storm.
4. When fissures, tension cracks, sloughing, undercutting, water seepage, bulging at the bottom, or other similar conditions occur.
5. When there is a change in the size, location, or placement of the spoil pile.
6. When there is any indication of change or movement in adjacent structures.

G. References

1. US Department of Labor, Occupational Safety and Health Standard, 29 CFR 1926 Subpart P, Excavations.

H. Definitions

Angle Of Repose - The greatest angle above the horizontal plane at which a material lie without sliding.

Benching System - A method of protecting employees from cave-in by excavating the sides of an excavation to form one or a series of horizontal steps with near-vertical surfaces between the levels.

Competent Person - One who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them. The competent person must have had specific training in, and be knowledgeable of the OSHA standard.

Excavation- Any man-made cut, cavity, trench, or depression in earth's surface formed by earth removal.

Shield System - A structure (permanent or portable) designed to withstand a cave-in. These structures can be pre-manufactured or job-built in accordance with 29 CFR 1926.652(c)(3) or (c)(4). These systems are often referred to as "trench boxes" or "trench shields".

Shoring System - A mechanical or timber structure designed to prevent cave-in of an excavation.

Sloping System - A method of preventing cave-in by forming sides inclined at an angle away from the excavation. The angle of incline varies with soil type.

Trench - A narrow excavation made below the surface of the ground in which the depth is greater than the width and the width does not exceed 15 feet.

NOTE: For the purposes of this policy and OSHA requirements, the same requirements apply to all excavations, including trenches.

SECTION 3-5: FALL PROTECTION PLAN

A. Purpose, and Background

1. The NIH is committed to maintaining a safe work environment for its employees who are required to work at elevated heights. *No employee shall be sent on a job that potentially involves work at elevated heights unless they have been properly trained, equipped, and authorized.*
2. The purpose of this standard is to establish the procedures, requirements, and safeguards to lessen or eliminate hazards encountered when working at elevated heights.
3. This standard applies to all employees and NIH contractors performing work on NIH property who work at elevated heights.

B. Policy

1. The Fall Protection Program is a system of requirements documented after the identification of work practices or locations demanding that an individual work at elevated heights. A Site-specific Fall Protection Plan is the yielded document that appropriately documents the necessary program elements.
2. Implementation and Inspection
 - a. Implementation of the site-specific fall protection plan begins with providing or ensuring the completion of appropriate training for employees or contractors involved with the plan.
 - b. Installation (set-up) and use of all equipment specified in the plan may only occur through a properly trained individual, and must follow manufacturer guidance. After installation, each piece of equipment must be inspected by a competent person before it can be used.
 - (1) Any piece of equipment failing inspection must be tagged out of service, removed from use (for fixed equipment a means of blocking entry to the equipment is adequate), and documented appropriately.
 - (2) Failed equipment may only be repaired for use by the original manufacturer or a person who is entitled by the manufacturer to complete such repairs. A new inspection of all equipment must occur before use is allowed.
 - (3) Failed equipment may only be replaced by either an identical piece or by a similar model meeting all the original requirements specified in the plan.
3. Upon completion of the task all equipment must be removed from the area immediately and stored appropriately.

C. Responsibilities

1. Management responsibilities include:
 - a. Provide all required trainings; and

- b. Supply necessary and adequate equipment for employees.
2. Assigned Safety Officer responsibilities include:
 - a. Function as the Fall Protection Program Manager; and
 - b. Assist in identifying work areas and projects at NIH where fall hazard analyses must be completed.
 3. Host Employer or Project Officer (PO) responsibilities include:
 - a. Inform the contractor that they must comply with the Fall Protection Program (FPP). If they have their own program, it must comply with all the requirements of the relevant OSHA standards, and the Army Corp of Engineers EM-385 safety manual; and
 - b. Coordinate operations when employees from more than one organization will be working at elevated heights.
 4. Employee responsibilities include:
 - a. Following the FPP at all times; and
 - b. Reporting all hazards and dangerous situations to their management.
 5. Contractor responsibilities include:
 - a. Obtain from the host employer any available information regarding the FPP;
 - b. Ensure that all contracted employees are properly trained and maintain the appropriate equipment necessary for working at elevated heights; and
 - c. Ensure that all appropriate equipment is available to employees and in good working order.

D. Procedures

1. Evaluation and Assessment of Elevated Surfaces/Working at Heights – identification and evaluation – personnel will ensure that a thorough investigation for fall hazards is conducted for each new task, project, or assignment that involves working at elevated heights. Working at elevated heights may involve tasks utilizing ladders, scaffolding, roof work, etc. (Section 21 A.01 of the EM 385 manual identifies specific areas and job tasks that require fall protection.) The initial survey should include the following topic areas to adequately define the potential hazards:
 - a. Describe the fall hazard (include reasons for an exposure to a fall);
 - b. Maximum potential fall distance;
 - c. Obstructions in the fall path;
 - d. Method of access to the fall hazard workplace;

- e. Perceived severity of the fall from the specified height; and
 - f. Likelihood of the fall to occur.
2. Hazard Assessment – personnel will ensure that a written hazard assessment is completed to document the risk invoked by the fall hazard. The hazard assessment must be reviewed by the Supervisor for accuracy and completeness. The hazard assessment must thoroughly describe the fall hazard, the work to be completed while at height, and the specifics of the area where the work is to be completed. Operations that the hazard assessment determines has an immediate danger to life or health must not be allowed unless suitable control measures for reducing the risk are documented and implemented.
3. Hazard Control – the hierarchy of control measures for fall hazards are:
- a. Elimination – removing the need to work at heights.
 - b. Engineering Controls – a control measure that removes that hazard by providing a barrier between the worker and the potential fall. The most effective types are simple covers for all open areas where falls may occur and fall restraint systems or positioning devices that do not allow the worker to fall (also known as fall prevention devices). Other common examples include:
 - (1) Guard rails – a system of temporary or permanent barriers – not to be crossed – that ensure that a person is not able to reach the potential fall area. Guard rails must meet specific design requirements and maintain certification tags.
 - (2) Work platforms or scaffolding – a constructed, enclosed structure designed to bring the worker up to the level of the work. Scaffolding must be designed and constructed by a qualified individual who has documented evidence of appropriate training.
 - c. Personal Protective Equipment (PPE) – to be used only as the last measure in ensuring the safety of workers. PPE is a means (through equipment) to ensure that a worker will be arrested from falling before major incidents can occur that would catastrophically compromise the health of the worker. Types of PPE are varied and may be used together to form primary, secondary, and tertiary systems. Examples of PPE include: personal fall arrest systems, safety nets, and ladder climbing safety devices.
4. Site-Specific Fall Protection Plan
- a. A Site-Specific Fall Protection Plan is the documentation that appropriately identifies and records the necessary elements of the fall protection plan for a specific location, job or work area. The key elements of the plan are:
 - (1) A description of the task to be performed;
 - (2) A description of the location where the task is performed (if a single task may be completed in multiple areas, it is necessary to identify those locations in one site-specific fall protection plan);

- (3) Training requirements for individuals completing the task and for individuals involved in the selection of controls for the plan;
 - (4) The hazard assessment and risk analysis documents;
 - (5) As discussed below, a detailed description of the control measure(s) to be used:
 - (a) Sections 21.E-K of the EM385.1.1: detail the specific requirements for each type of fall protection system. These specifications are required for the selected types of systems documented in the respective fall protection plan.
 - (b) Sections 22.B-P of the EM385.1.1: detail the specific requirements for various types of scaffolding and elevated work surfaces. These specifications are required for the selected types of work surfaces documented in the respective fall protection plan.
 - (c) Section 24.B of the EM385.1.1: detail the specific requirements for various types of ladders. These specifications are required for the selected types of ladders in the respective fall protection plan.
 - (d) The use of Controlled Access Zone as a fall protection method is prohibited. Safety Monitoring Systems (spotters) may only be used in conjunction with other fall protection systems.
 - (6) Fall protection device documentation (model numbers, lot numbers, maintenance procedures and checklists); and
 - (7) Rescue plans and procedures.
- b. Upon completion of the plan a competent person identified to review a site-specific fall protection plan must review and approve before identified tasks may begin.
 - c. Approved site-specific fall protection plans may be used by Project Officers to document a scope of work for potentially contracted work. Once approved as part of the contract this plan is to be used as the checklist to ensure work is completed properly.
5. Emergency Response – personnel will rely on rescue personnel from the NIH Fire Department in the event of an emergency involving injury to employees or contractors. These emergency services are accessible by dialing 911 from any campus telephone. The NIH Fire/Rescue Emergency Services telephone number is 911 on the NIH exchange or (301) 496-2372 on outside lines. Dial 9-911 from an outside line for Montgomery County response.
6. Incident/Accident Investigation
- a. Any incident or event that involves injury to employees or contractors must be investigated by the Safety Officer or their designee.
 - b. Any documents created during the accident investigation less medical documents must be reviewed and maintained appropriately.

E. Training

1. All employees that are exposed to fall hazards must be provided training. They should be provided the opportunity to acquire the understanding, knowledge, and skills necessary for the safe performance of their duties at elevated heights and utilizing various types of PPE for fall hazards.
2. Training should be provided to each employee:
 - a. Before the employee is first assigned duties or tasks under this program;
 - b. Every two years (biennially);
 - c. Whenever there are changes in the workplace and/or types of fall protection systems or equipment to be used which renders training obsolete or inadequate; whenever the employer has reason to believe either that there are deviations from the fall protection procedures; or whenever inadequacies in the employee's knowledge or use of fall protection equipment and or procedures are discovered.
3. The training shall be administered by a qualified person and should establish employee proficiency in the duties required by the fall protection program. It should also introduce updates for continued program compliance.
4. General Training
 - a. All employees who will work at elevated heights should be trained in proper fall protection procedures.
 - b. Training should include:
 - (1) The nature of fall hazards in the work area and how to recognize them;
 - (2) The correct procedures for erecting, using, dismantling, maintaining, and storing fall protection equipment;
 - (3) The application limits, free fall distance, total fall distance and clearance requirements of fall protection systems and equipment;
 - (4) Rescue equipment and procedures; and
 - (5) Hands-on training and practical demonstrations.
 - c. Refresher training should be conducted as needed to maintain employee competence or every two years (whichever is shorter).
5. Specific Training
 - a. Scaffolding
 - (1) A competent person must train personnel involved with the following scaffolding actions:

- (a) Erecting;
 - (b) Disassembling;
 - (c) Moving;
 - (d) Operating or using;
 - (e) Repairing or maintaining; and
 - (f) Inspecting.
- (2) Training proficiencies and certifications for the competent person must be documented.
- (3) A qualified person must train personnel who perform work while on a scaffold.

F. References

1. US Department of Labor, Occupational Safety and Health Standard, 29 CFR 1910, General Industry (multiple sections on fall protection related topics.)
2. US Department of Labor, Occupational Safety and Health Standard, 29 CFR 1926, Construction Industry
3. ANSI/ASSE Z359.1-2007 - Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components
4. ANSI/ASSE Z359.2-2007 - Minimum Requirements for a Comprehensive Managed Fall Protection Program
5. ANSI/ASSE Z359.3-2007 - Safety Requirements for Positioning and Travel Restraint Systems
6. ANSI/ASSE Z359.4-2007 - Safety Requirements for Assisted-Rescue and Self-Rescue Systems, Subsystems and Components
7. ANSI/ASSE A10.8-2001 - Scaffolding Safety Requirements
8. ANSI A14.1-2007 American National Standard for Ladders- Wood Safety Requirements
9. ANSI A14.2-2007 American National Standard for Ladders- Portable Metal – Safety Requirements
10. ANSI A14.3-2002 American National Standard for Ladders– Fixed – Safety Requirements
11. ANSI A14.4-2002 American National Standard Safety Requirements for Job Made Wooden Ladders
12. ANSI A14.5-2007 American National Standard for Ladders Portable Reinforced Plastic
13. ANSI A14.7-2000 American National Standard for Mobile Ladder Stands and Mobile Ladder Stand Platforms
14. U.S. Army Corps of Engineers, Safety and Health Requirements Manual. (EM-385-1-1).

G. Definitions

Contractor – A person who agrees to furnish materials or perform services at a specified price, with a defined format, and certain specifications.

Competent Person - one who is capable of identifying existing and predictable hazards in the working environment or working conditions that are dangerous to personnel and who has authorization to take prompt corrective measures to eliminate them.

Elevated height – working at heights of six feet (during construction work), four feet (during general industry work) or ten feet (while on scaffolding) or more above the lower level. As a reminder, there is NO truly “safe” working height. Falls from any height, including falls on the same level, may cause injuries.

SECTION 3-6: LADDER SAFETY

A. Purpose, Policy and Background

1. Ladders are for climbing and should only be used for that purpose. They are designed for single-person use. Extension, straight, and fixed ladders are to be used for gaining access to different elevations, not used as work platforms. No ladder is intended for use in a horizontal position nor are they to be tied together to achieve a greater length. They are not to be used for levering, bracing, or any other purpose which might weaken their structure.
2. It is NIH policy to decrease, and eventually discontinue, the use of portable wood and metal ladders. Only ladders constructed of fiberglass shall be used by employees.

B. Procedures

1. This instruction contains requirements for minimizing hazards and establishing work practices and procedures to protect employees from the hazards associated with the use of portable and extension ladders.
2. Ladder Selection – the following are safety guidelines designed to minimize the hazards associated with ladder use:
 - a. Select ladders based on anticipated usage and rated load capacity.
 - b. Load ratings, safe working height, and other safety information must be posted on the ladder by the manufacturer. This information must be legible at all times and replaced if it becomes worn or defaced.
 - c. Inspect ladders for deterioration or damage before each use. Do not use ladders that appear to be damaged or defective in any way.
 - d. Do not use portable metal ladders when working near live electrical parts, or within ten feet of high voltage electrical lines.
3. Use and Limitations
 - a. Ladders must be inspected before initial use at each work shift in addition to receiving periodic inspection by a competent person. Additional inspection shall occur after an occurrence that could affect the ladder's safe use. All defective ladders (weakened, broken, or with missing steps, etc.) must be tagged, removed from service and reported to the supervisor immediately. [Appendix A](#) provides the ladder inspection checklist that shall be used when evaluating ladders.
 - b. Ladders must be strong enough for the intended use. Verify weight capabilities and/or check with the supervisor if the strength is questionable. See [Appendix B](#) for ladder classifications and ratings.
 - c. Ladder shall not be tied or fastened together to provide longer sections unless they are specifically designed for such use.

- d. Ladders in storage must be supported, protected from damage and kept out of traffic areas. Store fiberglass ladders out of direct sunlight and secured in place.
- e. Repairs made to a ladder must meet the original manufacturer's specifications and the ladder must be approved for use by the departmental supervisor prior to use.
- f. Only use fiberglass ladders near energized equipment or electrical wiring. Metal ladders shall NEVER be used near electrical equipment.
- g. Users are to face the ladder and to use both hands when ascending or descending. Try to keep "three points of contact" at all time when ascending or descending a ladder. Hold the ladder with one hand while working and to keep your body weight centered between the rails. Do not lean to the side in a way that your body's center of gravity is outside of the ladder rails; reposition the ladder instead. Use a hanger or tool holder for the tools required for the job.
- h. In erecting a ladder, the base of a straight ladder shall be placed at an angle such that the distance between the bottom of the ladder and the supporting structure is one fourth of the length of the ladder. This means the base of the ladder is out 1 foot for every 4 feet of height. [Appendix C](#) illustrates this point. Both side rails need to rest secure against the support.
- i. Extension, straight, and fixed ladders are to be used for access to various elevations and they must extend three (3) feet above the landing surface for ease in mounting and dismounting. If this is not possible, a grab rail must be put in place to assist in mounting and dismounting the ladder. This is also shown in [Appendix C](#).
- j. Portable ladders must be firmly placed, held, tied or secured to prevent slipping or falling.
- k. A ladder is not to be used near a door unless the door is open, locked, or guarded. For ladder use in a traffic area, barricades or guards need to be put in place. All access points to the ladder must be kept clear of tools, materials or debris.
- l. The top or top step of a ladder shall not be used to stand upon. Do not go higher than the 2nd step from the top on a step ladder. Do not climb straight ladders higher than the third step from the top. Keep the end of the ladder at "belt buckle" level.
- m. The cross bracing on the rear section of the step ladder shall not be used for climbing unless the ladders are designed and provided with steps for climbing on both front and rear sections.
- n. Stepladders and step stools are designed to be worked from, they are not to be used as straight ladders. They are provided where a minor elevation is needed. They should not exceed 20 feet in height and should be secured or held by another worker if they are greater than 10 feet in height. They must be unfolded and locked in place before use.
- o. Keep ladders dry at all times.
- p. Do not leave placed ladders unattended. Do not use ladders during strong wind except in an emergency, and only when tied securely.

4. Transportation and Storage

- a. Ladders should be secured while being transported in or on a vehicle. Do not have a passenger sit, stand, kneel or otherwise support a ladder to “secure” it while transporting.
- b. Get assistance when carrying large ladders to the work area.
- c. Store ladders in a sheltered area where they will not fall unexpectedly, and will not block access to hallways and fire exits.
- d. Straight and extension ladders should be stored horizontally on racks or hooks with support points at the top, middle and bottom of the ladder to prevent sagging and warping.

C. Training

1. Employees will be trained to recognize hazards in the use of a ladder and to understand the procedures for ladder use. Emphasis will be on the following:
 - a. Fall hazards in the work area.
 - b. The correct procedure for erecting, maintaining and disassembling the fall protection systems.
 - c. Proper construction, use, placement and care in handling ladder.
 - d. The maximum intended load-carrying capacities of the ladder used.
2. Retraining shall be provided as necessary so that the employees maintain the understanding and knowledge acquired through compliance with the Ladder Safety Standard.

D. References

1. 29 CFR 1910.23, Ladders
2. 29 CFR 1926.1053, Ladders

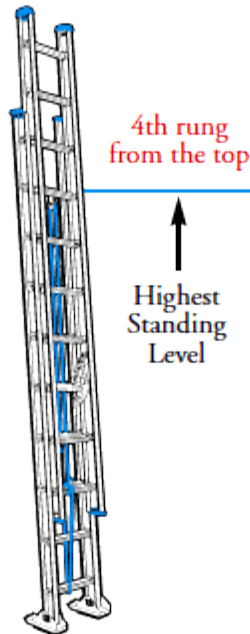
Appendix A – Ladder Inspection Checklist (for up to 4 ladders)

Building Group Number:				
Name of Inspector:				
Ladder Number				
Type of Ladder: (E – Extension, S – Step)				
Construction of Ladder: (W – Wood, M – Metal, F – Fiberglass)				
General Inspection Items (enter “NA” if item does not apply) If “Y” is entered for any items below, ladder must be taken out of service, and repaired prior to re-use.	Y/N	Y/ N	Y/N	Y/N
1. Loose steps or rungs (considered loose if they can be moved at all with the hand)?				
2. Loose nails, screws, bolts, or other metal parts?				
3. Cracked, spilt, or broken uprights, braces, or rungs?				
4. Splinters/Slivers on uprights, rungs, or steps?				
5. Damaged or worn non-slip bases?				
6. Wobbly (from side strain)?				
7. Loose or bent hinge spreaders?				
8. Stop on hinge spreaders broken?				
9. Loose hinges?				
10. Broken, split, or worn steps?				
11. Loose, broken, or missing extension locks?				
12. Defective locks that do not seat properly while extended?				
13. Worn or rotted rope?				
Use of Ladders Evaluation			Yes	No
1. Are all ladders maintained in good condition, joints between steps and side rails tight, all hardware and fittings securely attached, and moveable parts operating freely without binding or undue play?				
2. Are non-slip safety feet provided on each metal or rung ladder, and are ladder rungs and steps free of grease and oil?				
3. Are employees prohibited from placing a ladder in front of doors opening toward the ladder unless the door is blocked open, locked, or guarded?				
4. Are employees prohibited from placing ladders on boxes, barrels, or other unstable bases to obtain additional height?				
5. Are employees required to face the ladder when ascending or descending?				
6. Are employees prohibited from using ladders that are broken, have missing steps, rungs, or cleats, broken side rails, or other faulty equipment?				
7. Are employees instructed not to use the top step of ordinary stepladders as a step?				
8. When portable rung ladders are used to gain access to elevated platforms, roofs, etc., does the ladder always extend at least 3 feet (0.9144 meters) above the elevated surface?				
9. Are employees required to secure the base of a portable rung or cleat type ladder to prevent slipping, or otherwise lash or hold it in place?				
10. Are portable metal ladders legibly marked with signs reading "CAUTION - Do Not Use Near Electrical Equipment" or equivalent wording?				
11. Are employees prohibited from using ladders as guys, braces, skids, gin poles, or for other than their intended purposes?				
12. Are employees instructed to only adjust extension ladders while standing at a base (not while standing on the ladder or from a position above the ladder)?				
13. Are metal ladders inspected for damage?				
14. Are the rungs of ladders uniformly spaced at 12 inches (30.48 centimeters) center to center?				
15. Are all manufacturer labels and stickers legible?				

Appendix B – Ladder Classifications

Ladder Duty Ratings

Type IAA (Extra Heavy Duty)	375 pounds
Type IA (Extra Heavy Duty)	300 pounds
Type I (Heavy Duty)	250 pounds
Type II (Medium Duty)	225 pounds
Type III (Light Duty)	200 pounds

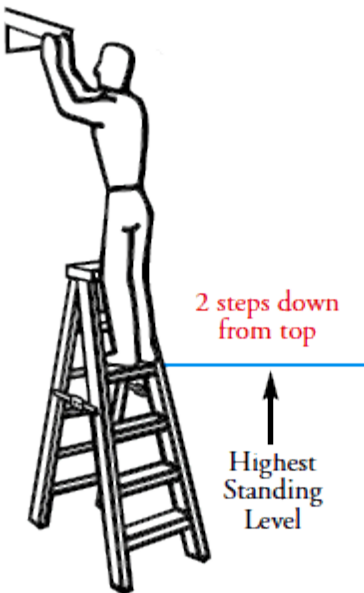


EXTENSION LADDERS

Height To Top Support Point	Use This Size Extension Ladder*	Maximum Working Ladder Length**	Highest Standing Level (Approx.)
9' max.	16'	13'	9' 2"
9' to 13'	20'	17'	13' 1"
13' to 17'	24'	21'	16' 11"
17' to 21'	28'	25'	20' 10"
21' to 25'	32'	29'	24' 8"
25' to 28'	36'	32'	27' 7"
28' to 31'	40'	35'	30' 6"

* Reflects section overlap, ladder angle, and 3' potential extension above roof line.

** The maximum working length is less than total ladder length because of overlap of extension ladder sections.



STEPLADDERS

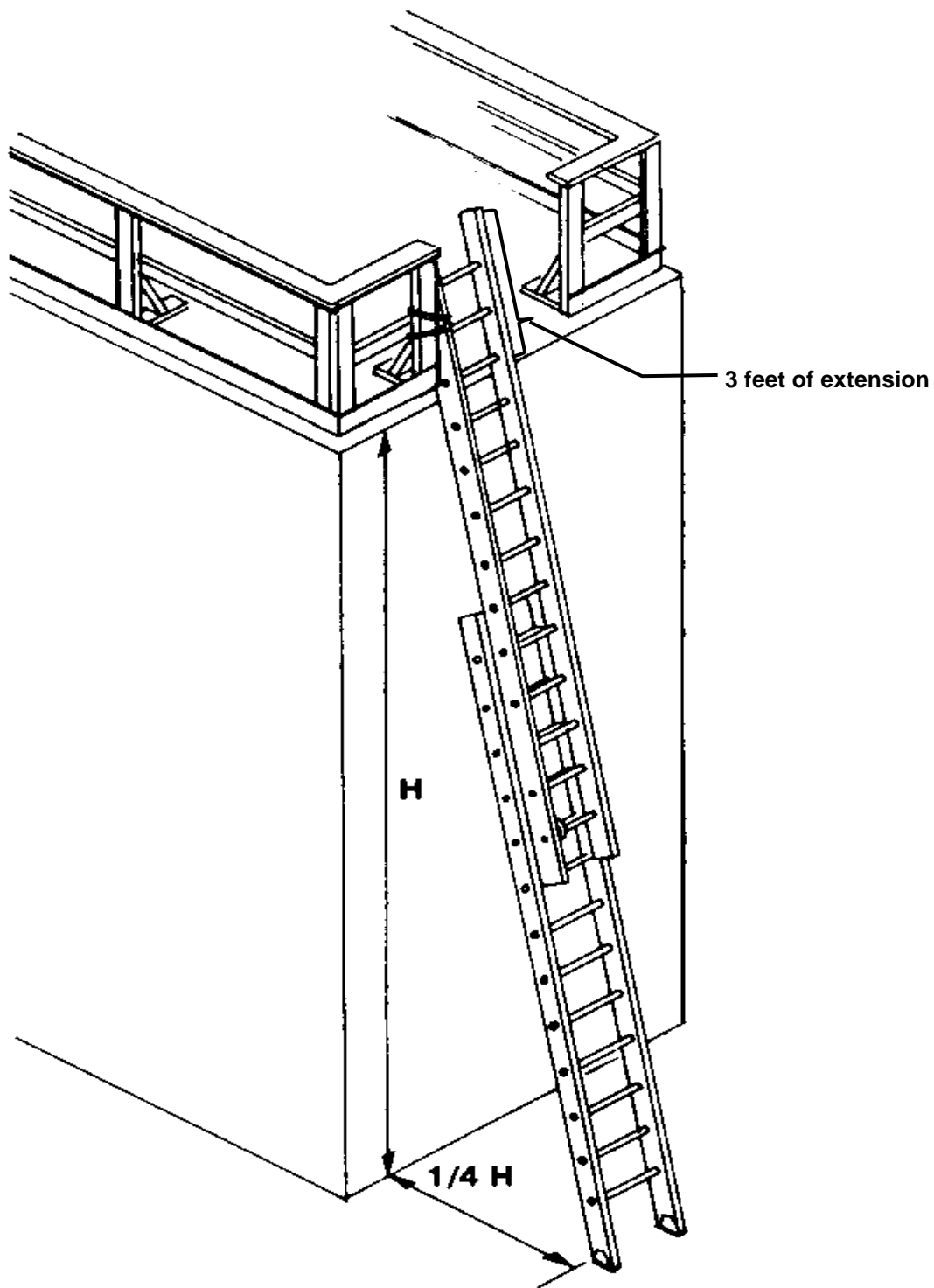
Max. Height You Want to Reach*	Use This Size Stepladder	Highest Standing Level (Approx.)**
7'	3'	11"
8'	4'	1' 11"
9'	5'	2' 10"
10'	6'	3' 10"
11'	7'	4' 9"
12'	8'	5' 8"
14'	10'	7' 7"
16'	12'	9' 6"
18'	14'	11' 5"
20'	16'	13' 4"

* Assumes a 5' 9" person with a vertical 12" reach.

** Two steps down from the top.

Appendix C: Proper Ladder Set-up

A simple rule for setting up a ladder at the proper angle is to place the base a distance from the vertical wall equal to one-fourth the working length of the ladder. For every 4 feet of height, the base of the ladder should be 1 foot out from the top support.



SECTION 3-7: SCAFFOLD SAFETY

A. Purpose, Policy and Background

Scaffolds shall be erected, moved, dismantled, or altered only under the supervision of a competent person and will have guardrails and toe boards installed. When scaffolding hazards exist that cannot be eliminated, then engineering practices, administrative practices, safe work practices, Personal Protective Equipment (PPE), and proper training regarding scaffolds will be implemented. These measures will be implemented to minimize those hazards to ensure the safety of employees and the public.

B. Procedures

1. This instruction contains requirements for minimizing hazards and establishing work practices and procedures to protect employees from the hazards associated with the use of fixed location and mobile scaffolding.

2. Scaffold Selection

Personnel are likely to utilize two types of scaffolding- mobile platforms and fixed location scaffolding. If other types of scaffolding (e.g., suspended scaffolding or custom-made scaffolding) are required for a project, then the supervisor should contact the Department of Occupational Health and Safety (DOHS) for additional guidance.

3. Use and Limitations

- a. Safe scaffold erection and use is important in minimizing and controlling associated hazards. Scaffold work practices and rules should be based on:

- (1) Sound design;
- (2) Selecting the right scaffold for the job;
- (3) Assigning personnel;
- (4) Fall protection;
- (5) Guidelines for proper erection;
- (6) Guidelines for use;
- (7) Guidelines for alteration and dismantling;
- (8) Inspections; and
- (9) Maintenance and storage.

- b. The following specific practices shall be used for the erection and use of scaffolds on all projects.

- (1) For scaffold installations on the exterior of buildings, approval of the Site Selection Committee is required prior to the installation. The Department of the Fire Marshall (DFM) reviews site selection requests as part of this committee to determine the impact on fire department access, access to fire hydrants and fire department Siamese connections, and exterior exit discharges.

- (2) For scaffold installations on the interior of buildings approval of the DFM is required prior to the installation. The DFM will review proposed interior scaffold installation to determine the impact on egress routes and on fire protection systems installed in the building.
- (3) The footing or anchorage for scaffolds shall be sound, rigid, and capable of carrying the maximum intended load without settling or displacement. The scaffold must be level. Unstable objects such as barrels, boxes, loose brick, or concrete blocks shall not be used to support scaffolds or planks.
- (4) No scaffold shall be erected, moved, dismantled, or altered except under the supervision of the competent person, or as requested for corrective reasons by the Safety Officer.
- (5) Guardrails and toe boards shall be installed on all open sides and ends of platforms more than 6 feet above the ground or floor.
- (6) The top edge height of top rails or equivalent member shall be installed between 36 inches and 42 inches above the platform surface. Toe board and the guardrail shall extend along the entire opening.
- (7) Scaffolds and their components must be capable of supporting, without failure, at least 4 times the maximum intended load.
- (8) Any scaffold, including accessories such as braces, brackets, trusses, screw legs, ladders, couplers, etc., damaged or weakened from any cause must be repaired or replaced immediately, and shall not be used until repairs have been completed.
- (9) All load-carrying timber members of scaffold framing shall be a minimum of 1,500 fiber (Stress Grade) construction grade lumber.
- (10) All planking must be Scaffold Grade, or equivalent, as recognized by approved grading rules for the species of wood used.
- (11) All planking or platforms must overlap (minimum 12 inches) or be secured from movement.
- (12) Each platform shall be fully planked or decked between the front uprights and the guardrail supports.
- (13) An access ladder or equivalent safe access must be provided.
- (14) Scaffold planks must extend over their end supports not less than 6 inches or more than 12 inches.
- (15) The poles, legs, or uprights of scaffolds must be plumb and securely and rigidly braced to prevent swaying and displacement.

- (16) Overhead protection must be provided for persons on a scaffold exposed to overhead hazards.
- (17) Slippery conditions on scaffolds shall be eliminated immediately when they occur.
- (18) The area below the scaffold to which objects can fall shall be barricaded, and employees shall not be permitted to enter the hazard area.
- (19) A safe distance (10 feet) from energized power lines shall be maintained.
- (20) Tag lines shall be used to hoist materials to prevent contact with power lines.
- (21) Scaffolds shall not be used during high wind and storms. High winds are classified as winds over 20 mph.
- (22) Scaffolds shall not be used if covered with snow or ice.
- (23) Ladders and other devices shall not be used to increase working heights on scaffold platforms.
- (24) Scaffolds shall not be moved while personnel are on them.
- (25) Loose materials, debris, and/or tools shall not be allowed to accumulate to cause hazards.
- (26) Scaffolding components shall not be mixed or forced to fit in a manner resulting in reduced design strength.
- (27) Scaffolds and components shall be inspected at the erection location. Scaffolds shall be inspected before each work shift, after changing weather conditions, and after prolonged work interruptions.
- (28) Casters and wheel stems shall be pinned or otherwise secured in scaffold legs. Casters and wheels must be positively locked when in a stationary position and when personnel are on it.
- (29) Tube and coupler scaffolds shall be tied to, and securely braced against, the building at intervals not to exceed 30 feet horizontally and 26 feet vertically.
- (30) The competent person designated for each project shall complete a daily inspection of the scaffold prior to use. Daily inspections shall be documented using the Scaffolding Daily Inspection Checklist included in [Appendix A](#) of this section. Completed inspection forms are to be submitted to the supervisor, who shall be responsible for maintaining those records for a minimum of two years.

4. Transport and Storage

- a. Scaffolding should be secured while being transported in or on a vehicle.

- b. Get assistance when carrying scaffolding parts to the work area. Provide the necessary number of personnel to safely transport the scaffolding components to the work area.
- c. Store scaffolding parts in a sheltered area where they will not be struck by foot or vehicle traffic. Scaffolding parts should also be stored in areas where the environmental conditions (e.g., sunlight, rain, heat) will not result in damage to the equipment.

5. Reporting Requirements

While there is no reporting requirement for scaffolds, the competent person designated to each project using scaffolds must inspect the scaffolding on a daily basis. The checklist included in [Appendix A](#) of this section shall be used to document the scaffold inspection. The completed forms should be submitted to the supervisor. Inspection records shall be retained and are subject to periodic inspection by the Safety Officer.

C. Training

1. Training will vary slightly depending on the role of each employee. Training shall be administered upon initial job assignment. Employees will be retrained when job conditions change and will receive refresher training at the discretion of the supervisor:
 - a. Affected employees will receive instruction on the particular types of scaffolds which they are to use.
 - b. Training must also include the proper procedures for installing, maintaining, and disassembling any applicable fall protection systems.
 - c. Employees who perform work while on a scaffold will be trained by a qualified person on the nature of any electrical hazards, fall hazards, and falling objects hazards, the correct procedures for dealing with those hazards, the proper use of the scaffold and proper handling of materials on the scaffold, and the maximum intended load and load-carrying capacities of the scaffolds used.
 - d. Employees who are involved in erecting, disassembling, moving, operating, repairing, maintaining, or inspecting a scaffold will be trained by a competent person on the nature of scaffold hazards, the correct procedures for the applicable duties listed above for the type of scaffold in question, as well as the design criteria, maximum intended load-carrying capacity and intended use of the scaffold.
2. NIH designated “competent person(s)” will receive additional training regarding the selection of scaffolds, recognition of site conditions, recognition of scaffold hazards, protection of exposed persons, repair and replacement options, and requirements of standards.

D. References

1. 29 CFR 1910.27, Scaffolds and Rope Descent Systems
2. 29 CFR 1910.26, Subpart L – Scaffolds

Appendix A: Scaffolding Daily Inspection Checklist

Competent Person: _____ Date: _____

Job Location (Building and Room): _____

***NOTE* If any of these questions are answered “No”, work from the scaffold shall not proceed until the deficiency is corrected.**

Yes	No	N/A	Inspection Item
			Has the scaffolding been erected according to manufacturer instructions?
			Has the worksite been inspected to identify hazards? (e.g., overhead objects, uneven ground, work area traffic, etc.)
			Has the work area been isolated to prevent injuries to pedestrian traffic?
			Has the scaffolding been inspected for physical damage? If damaged, remove scaffold from service until repaired.
			Can scaffold support four times its maximum intended load?
			Footings – Are all bearing plates and mud sills in place if on an unfinished surface?
			Are casters locked before work begins?
			Are frames fully braced and plumb?
			Is an access ladder installed, or a separate ladder in place to access the work platform?
			Are employees instructed not to use the cross braces for climbing the scaffold?
			Is the work platform fully planked at all working heights? (maximum 1-inch gap between planks)
			Are planking overhangs no less than 6 inches and no greater than 12 inches?
			Is the work platform free of clutter, mud, snow, oil or other tripping hazards?
			Is a guardrail in place if the work platform is greater than 6 feet high?
			• Top rails?
			• Mid rails?
			• Toe boards?
			• Posts?
			Are guys, ties and supports tied vertically every 26 feet and horizontally every 30 feet? (over 4:1 height/width ratio only)
			Is there a minimum of 10 feet of clearance from power lines?

IMPORTANT: MAINTAIN A COPY OF THIS INSPECTION FORM FOR YOUR RECORDS FOR A MINIMUM OF TWO YEARS.

SECTION 3-8: POWERED INDUSTRIAL TRUCKS

A. Purpose, Policy and Background

All powered industrial truck operators shall be educated so that they are informed, confident and proficient in safely operating the powered industrial truck to which they have been assigned. New (first-time) operators and operators reassigned to a type of powered industrial truck with which they are unfamiliar must receive supervised hands-on training. If an operator's skills are deemed deficient during ongoing evaluations or to maintain certification, supervised hands-on training is required to improve the operator's proficiency.

B. Responsibilities

1. Supervisor is responsible for:
 - a. Verifying that employees in their department(s) who are required to operate powered industrial trucks have received training and certification in accordance with the OSHA standard;
 - b. Establishing a regular preventive maintenance schedule for powered industrial trucks;
 - c. Inspecting their areas at least annually to confirm that safe operating procedures are posted, and that training and other records (such as inspection checklists) are maintained and up-to-date; and
 - d. Prohibiting any unauthorized person from operating powered industrial trucks.
2. Employee is responsible for:
 - a. Following safe operating practices at all times;
 - b. Completing a daily operation checklist if he/she is the first driver to use the industrial truck that day and leaving vehicle inspection documentation for others' reference (the Forklift Operator's Daily Checklist may be found in [Appendix A](#) below); and
 - c. Reporting all hazards, including but not limited to dangerous situations, powered industrial truck maintenance issues, use by unauthorized operators to their management.

C. Procedures

1. Powered Industrial Truck Requirements – the following requirements apply to the purchase of powered industrial trucks:
 - a. All trucks owned or leased shall be of the approved type and conform to the design requirements of ASME/ANSI B56-1.

- b. All trucks shall bear a label or some other identifying mark indicating approval by the testing laboratory.
 - c. All sit-down forklifts that do not currently have a seat belt shall be retrofitted by the manufacturer with the appropriate safety belt, provided the manufacturer has a retrofit program in place. In the event where a fork lift manufacturer does not have a retrofit program or no longer exists, the employer must have seat belts installed professionally.
 - d. Trucks shall be equipped with a load backrest to prevent the load from falling toward the truck when the load is elevated and tilted back.
 - e. All trucks shall be equipped with a back-up alarm.
 - f. No smoking, flame or spark producing activities is permitted within 25 feet of batteries or truck connected to a charger.
2. Battery Maintenance – the following are requirements regarding battery changing, charging, and storing:
- a. Battery charging installations shall be located in areas designated for that purpose.
 - b. Facilities shall be provided for flushing and neutralizing spilled electrolyte, for fire protection, for protecting charging apparatus from damage by trucks, and for adequate ventilation for dispersal of vapors from gassing batteries.
 - c. Reinstalled batteries shall be properly positioned and secured in the truck.
 - d. A carboy tilter or siphon shall be provided for handling electrolyte.
 - e. When charging batteries, acid shall be poured into water; water shall not be poured into acid.
 - f. Trucks shall be properly positioned and brake applied before attempting to change or charge batteries.
 - g. Ensure that vent caps are functioning properly. The battery (or compartment) cover(s) shall be open to dissipate heat.
 - h. NO SMOKING in the charging area.
 - i. Take necessary precautions to prevent open flames, sparks, or electric arcs in battery charging areas. If you are unsure, ask a qualified person or supervisor.
 - j. Tools and other metallic objects shall be kept away from the top of uncovered batteries.

3. LPG (Propane) Safety

- a. No truck may be operated with a leak in the fuel system.
- b. Fuel tanks shall not be filled while the engine is running.
- c. The valve on the fuel cylinder must be closed when the forklift is not in operation/parked overnight.
- d. The LPG tank should be shut off when "garaging" the lift truck (i.e. leaving the lift truck in a closed space or room or leaving the truck out of service for 8 hours or more).
- e. The fuel cylinder must always be secured in the brackets when the forklift is in operation.
- f. Fuel cylinders, empty or full, may not be stored inside the building.
- g. If a fuel cylinder is leaking and can be safely handled, remove the leaking tank to fresh air, well away from buildings and any sources of ignition. Contact the local fire department. Due to the fire hazard, securing the area and allowing the cylinder to empty itself is preferred to attempting to repair the leak.
- h. LPG cylinders shall be stored in a safe, secure area that is suitable for flammable materials.
- i. "No Smoking" signs shall be posted in the area.
- j. Any operator who fills LPG cylinders shall receive appropriate safety training/certification in propane safety.

4. Maintenance

- a. Any power-operated industrial truck not in safe operating condition shall be removed from service. All repairs shall be made by authorized personnel. Those repairs to the fuel and ignition systems of industrial trucks which involve fire hazards shall be conducted only in locations designated for such repairs.
- b. Trucks in need of repairs to the electrical system shall have the battery disconnected prior to such repairs.
- c. All parts of any such industrial truck requiring replacement shall be replaced only by parts equivalent as to safety with those used in the original design. Industrial trucks shall be examined before being placed in service.

5. Safe Operation

- a. Only trained and authorized personnel are permitted to operate a powered industrial truck.

- b. Only the operator is permitted on the industrial truck - no riders.
- c. No person shall be allowed to stand or pass under the elevated portion of any lift truck, whether loaded or empty.
- d. Only an approved safety platform (cage) may be used for lifting personnel, not pallets. The platform may only be used for lifting personnel; not for transporting them from one location to another.
- e. Only safety platforms, which are firmly secured to the lifting carriage and/or forks, shall be allowed when working from a forklift. Individuals working inside the cage shall wear fall protection harness and lanyard.
- f. Protection from falling objects shall be provided either by an overhead guard or personal head protection.
- g. Motorized hand trucks shall enter elevators or other confined areas with the load end forward.
- h. Vehicles shall not be operated on floors, sidewalk doors, or platforms that will not safely support the loaded vehicle.
- i. Trucks shall not be loaded in excess of their rated capacity.
- j. A loaded vehicle shall not be moved until the load is safe and secure.
- k. The lift truck operator shall remain at the controls. Only minor adjustments or movements may be made and only at creep speed.
- l. Forks must be kept as low as possible, whether loaded or empty, at all times.
- m. Dockboards and bridge plates shall have a high friction surface, be marked with their rated capacity, be properly secured, and be driven over carefully and slowly. Do not move material that is on damaged pallets, incorrectly loaded, or otherwise unsafe to handle.
- n. The brakes must be set and wheel chocks must be placed under the rear wheels of trucks, trailers or railroad cars while loading or unloading. Fixed jacks may be necessary to support a semi-trailer and prevent upending during the loading or unloading when the trailer is not coupled to a tractor.
- o. All traffic regulations shall be observed. Acceptable speed limit of 5mph shall be observed unless otherwise posted. A safe distance shall be maintained between vehicle and pedestrians (approximately three truck lengths), and the truck shall be kept under control at all times.
- p. The driver shall be required to slow down and sound horn at cross aisles and other locations where vision is obstructed. If the load being carried obstructs forward view,

- the driver shall be required to travel with the load trailing. Trucks shall not be driven up to anyone standing in front of a bench or other fixed object.
- q. If at any time a powered industrial truck is found to be in need of repair, defective, or in any way unsafe, the truck shall be taken out of service until it has been restored to safe operating condition. Defective, damaged, or unsafe trucks must be clearly marked "Do Not Use".
 - r. Never park the lift truck where it may block an exit, stairway, hallway, door, emergency equipment, fire extinguisher or electrical service panel. Wheels must be blocked if the truck is parked on an incline.
 - s. A powered industrial truck is unattended when the operator is 25 feet or more away from the vehicle or whenever the operator leaves the vehicle and it is not in view. When a powered industrial truck is left unattended, the load engaging means must be fully lowered, controls neutralized, power shut off and brakes set. When the operator of an industrial truck is dismounted and within 25 feet of the truck still in his or her view, the load engaging means must be fully lowered, controls neutralized and the brakes set to prevent movement.
 - t. Operator will sound horn and use extreme caution when meeting pedestrians, making turns, and traveling through doors.
 - u. No person shall be allowed to stand or pass under the elevated portion of any truck, whether loaded or empty.
 - v. Only stable or safely arranged loads shall be handled. Caution shall be exercised when handling off-center loads which cannot be centered.
 - w. Modifications, alterations or additions to forks or other parts of powered industrial trucks are prohibited. OSHA does not allow any such modification that will alter the capacity and safe operation of the vehicle without first receiving written approval from the equipment's manufacturer. If the manufacturer provides written approval to make the modifications, the vehicle's capacity, operation, and maintenance instruction plates, tags, and decals must be changed accordingly.

D. Training

1. All authorized operators must satisfactorily complete a Powered Industrial Truck Driving Certification Program. The training must focus on equipment operating characteristics and safe operating procedures. The certification program must include hands-on training with coaching from an experienced operator/trainer.
2. Evaluation of each different kind of industrial truck (including rental vehicles) shall be completed by the operator prior to his/her initial operation. Evaluation of all certified drivers is required every three years (or for rental vehicles prior to the next operation if three or more years have transpired since the operator's previous evaluation).

3. Certificates of Completion will be distributed to employees who successfully complete the certification and evaluation programs.

E. References

1. US Department of Labor, Occupational Safety and Health Standard, 29 CFR 1910.178, Powered Industrial Truck.

F. Definitions

Powered Industrial Truck: Any mobile, power-propelled (e.g., electric or fuel) vehicle used to carry, push, pull, lift, stack or tier materials. Powered industrial truck can be ridden or controlled by a walking operator. Earth-moving and over-the-road haulage trucks are not included in this definition. Examples of powered industrial trucks include: forklift trucks, narrow aisle rider trucks, straddle stackers and walking pallet trucks.

Certification: Certification requirements include successful training in the fundamentals and operation of the powered industrial truck and evaluation of sufficient skills for safe operation upon completion of Supervised Hands-On training. Both criteria must be met before qualification to operate the powered industrial truck without supervision. Documentation of the operator's training and evaluation dates, including the trainer's name, must be maintained in the operator's personnel file.

Refresher Training: Certified operators must attend periodic refresher training to maintain certification that will include updates (internal and regulatory), review of accidents and near misses reported in the last year, operations and equipment issues and a skills proficiency evaluation. Powered industrial truck operators, whose use of this equipment is infrequent, should participate in this type of training annually. Regular operators of powered industrial trucks will attend training every three years.

Retraining: Mandatory training is required by OSHA if an operator is involved in an incident (near misses and accidents) with a powered industrial truck. This training must be targeted to the specific incidence in a sufficient way to prevent the recurrence of similar incidents.

Supervised Hands-On Training: Supervised training on the powered industrial truck in order to familiarize the operator on the fuel system, controls and safe powered industrial truck operation.

Appendix A: Forklift Operator's Daily Checklist

Vehicle Type:	Week Beginning:						
Model:	Shift No:						
SN:							
Check appropriate box: OK Needs repair or adjustments (give details in comments section)							
Visual Checks	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
Fluid Levels – Oil, Radiator, Hydraulic							
Leaks – Hydraulic Oil, Battery, Fuel							
Tires – Condition and Pressure							
Forks, Top Clip Retaining Pin & Heel – Condition							
Load Backrest Extension – Solid Attachment							
Hydraulic Hoses, Mast Chains & Stops							
Finger Guards – Attached							
Safety Warnings – Attached							
Operator Manual – Located on Truck & Legible							
Capacity Plate – Attached; Information Matches Model and Serial No. (& Attachments)							
Seat Belt – Buckle and Retractor Working							
Operational Checks	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
Accelerator Linkage							
Parking Brake							
Steering							
Drive Control – Forward and Reverse							
Tilt Control – Forward and Backward							
Hoist and Lowering Control							
Attachment Control							
Horn							
Lights							
Back-Up Alarm (vehicle will not be used if not working)							
Hour Meter Reading							
Operator's Initials							
Supervisor's OK							
Comments:							

CAUTION – If the truck is found to be in need of repair; is in any way unsafe; or contributes to an unsafe condition, the truck shall be tagged “out of service” and not operated until it has been restored to safe operating condition.

SECTION 3-9: OVERHEAD CRANES AND HOISTS

A. Purpose, Policy and Background

This standard applies to overhead and gantry cranes (including top running monorail, underhung, and jib cranes) mobile cranes, derricks, hoists, winches, and special hoist supported personnel lifting devices.

B. Procedures

1. Program Management

a. Labeling

- b. The rated load of all lifting devices shall be plainly marked on each side of the unit. If the lifting device has more than one hoisting unit, each hoist load block shall be marked with its rated load. This marking shall be clearly legible from the ground floor.
- c. Cranes that have the specified design features, maintenance/inspection, and test intervals to lift critical loads shall be marked conspicuously so that the operator and assurance personnel can distinguish that the crane is qualified for critical lifts.
- d. A lockout/tag out system shall be used to indicate equipment that is out of service due to inspection discrepancies, repairs, ongoing maintenance operations, etc.
- e. Each overhead crane shall have the directions of its bridge and trolley movements displayed on the underside of the crane. These directions shall correspond to the directions on the operator station. These markings shall be visible from the floor but are not required if the crane is at such a height the markings would be legible without unaided vision.

b. Installation

The supporting structure, including the trolleys, monorail, or crane, shall be designed to withstand the loads and forces imposed by the hoist for the rated load. The following rules are applicable to temporarily installed and permanently installed equipment:

- (1) When hoists are used in hazardous locations, modifications to this policy and additional safety requirements may be necessary. If questions arise regarding the classification of an area, contact the responsible safety organization.
- (2) Pendant controls on electric- or air-powered hoists should be located at a convenient level above the operating floor.
- (3) Proper over-travel limit protection shall be provided as required for the location and operating conditions.

- (4) Poly-phase hoist motors shall be connected to the power supply such that hook motion agrees with the control marking. Internal connections in the hoist or pendant station wiring shall not be changed to accomplish this. Phase reversal (motor reversal), if necessary, shall be accomplished by reversing the power leads to the hoist unit.
- (5) Air-powered hoists shall be connected such that hook motion agrees with the control marking.

c. Testing

- (1) New or Altered Lifting Devices and Equipment – prior to initial use all new and altered lifting devices and equipment shall be tested by a third party. Testing shall include (as applicable):
 - (a) Hoisting and lowering;
 - (b) Trolley Travel;
 - (c) Bridge Travel;
 - (d) Limit switches, locking and safety devices;
 - (e) Trip setting of hoists limit switches; and
 - (f) Rated load test.
- (2) Existing Lifting Devices and Equipment – all lifting devices and equipment and winches shall be tested at least once every 4 years with a dummy load equal to the hoist's/winch's rated capacity.

d. Inspections

- (1) Inspections shall be performed according to the sections below and the manufacturers' recommendations. Inadequacies discovered during an inspection shall be documented and, if determined to be a hazard, the equipment must be locked/tagged out and the issue corrected prior to further use. Inspections shall be performed by qualified personnel according to approved technical operating procedures.
- (2) Daily Inspections – these inspections shall be performed and documented prior to first use each day the lifting device or equipment is used, and shall include the following (where applicable):
 - (a) Check operating and control mechanisms for proper function.
 - (b) Without disassembling, visually inspect lines, tanks, valves, drain pumps, gear casings, and other components of fluid systems for deterioration and leaks. This applies to components that can be seen from the ground level or for which there is safe access via inspection walkways.

- (c) Without disassembling, inspect all functional operating and control mechanisms, including brakes where visible, for excessive wear and contamination by excessive lubricants or foreign matter.
 - (d) Inspect hooks for cracks and deformities.
 - (e) Inspect rope reeving for proper travel and drum lay.
 - (f) Inspect hoist chains for excessive wear or distortion.
 - (g) Inspect slings and straps for tears, frays, and other deterioration to equipment in accordance with manufacturers' specifications. Equipment that shows this deterioration shall be rendered inoperable/unusable (i.e. completely severing a nylon sling when it is frayed or stretched beyond safe use).
 - (h) Operator's Daily Checklist for Overhead Cranes is provided as [Appendix A](#).
- (3) Annual Inspections for Cranes/Inspections for Idle Cranes – at least once per year, all cranes in regular service shall be inspected. Additionally, this paragraph applies to any crane which has been idle for a period of 6 months or greater. The inspection shall be performed by a third party and include review for the following deficiencies:
- (a) Deformed, cracked, or corroded members and welds and loose bolts or rivets in crane structure and runway. Various methods of nondestructive (NDT) testing such as ultrasonic, radiography, magnetic particle, liquid penetrant, etc., shall be used as needed.
 - (b) Cracked or worn sheaves and drums.
 - (c) Wear or cracks in pins, bearings, shafts, gears, followers, and locking and clamping devices. Surface or volumetric NDT shall be used to validate the existence or absence of cracks indicated by this inspection.
 - (d) Wear in brake and clutch system parts, linings, pawls, and ratchets that are readily accessible without major disassembly beyond an acceptable limit. Major teardown to inspect such parts should be based on a frequency consistent with gearbox lubrication components.
 - (e) Inadequacies in load and other indicators over full range.
 - (f) Wear in chain drive sprockets and stretch in the chain beyond an acceptable limit.
 - (g) Evidence of a malfunction in travel, steering, braking, and locking devices.
 - (h) Evidence of a malfunction in any safety device.

- (i) Pitting or other signs of deterioration in electrical apparatus. Special attention shall be given to feed rails.
 - (j) Evidence of overheating.
 - e. Crane Maintenance Program – before maintenance, adjustments, repairs, and replacements are initiated; the following safety precautions shall be taken:
 - (1) Move crane to an area where maintenance will not interfere with other operations.
 - (2) Turn off all controls, move main or emergency switch to OPEN, and lock and tag switch in OPEN position unless it is necessary to have power on to perform the maintenance task.
 - (3) If other cranes are operating on the same runway as the crane being repaired, ensure that proximity limit switches are operating on all cranes or that an observer is stationed to prevent interference with other cranes.
 - (4) Cranes shall not be operated until all safety devices have been activated and tested/adjusted if involved in the maintenance action.
- 2. Training and Operation – prior to use of any lifting device and equipment, the supervisors shall train the employee on the following operating procedures. Hoists and winches shall be operated according to this section, and the manufacturers' recommendations.
 - a. Operators will adhere to all tags placed on the hoist or winch controls.
 - b. Before starting a hoist or winch, the operator shall be certain that all personnel are clear of the area. Operators shall not engage in practices that will divert their attention while operating a hoist.
 - c. The hoist rope or chain shall be free from kinks or twists and shall not be wrapped around the load.
 - d. The load shall be attached to the load block or hook by means of slings or other devices. Hook point loading shall be avoided.
 - e. The operator shall test all controls before beginning an operation. If the controls do not operate properly, adjustments or repairs shall be made before operations begin.
 - f. Hoists and winches shall not be loaded beyond rated load except during authorized tests. Platform systems shall not be loaded beyond maximum load as designated on the platform hoist system.
 - g. Hoists and winches shall not be used for handling personnel unless specifically designed for such purpose.
 - h. Personnel shall not be located under suspended or moving loads.

- i. An operator shall be at the hoist or winch controls at all times while a load is suspended.
- j. Before each lift or series of lifts, the operator shall functionally test proper operation of the upper limit switch with no load on the hook. Upper limit switches shall not be used as operating controls.
- k. Hoists and winches shall not be used to load test items such as slings, platforms, or lifting fixtures unless specifically identified to do so based on a specified percentage of rated load; and a safety analysis approved by the Loading Dock Equipment Manufacturers; and the responsible safety, engineering, operations, maintenance organizations. Test procedures shall be approved by the responsible safety, engineering, operations and maintenance organizations. This is to ensure that the hoist or winch is not damaged due to sudden unloading should the test article fail. The Hoist Daily Checklist is provided as [Appendix B](#).
- l. Installed or fixed air or electric powered hoists and winches, excluding platform systems, shall be operated by designated personnel only.
- m. The operator shall ensure that the hoist or winch is within inspection and periodic recertification intervals by examination of its tag(s) and/or appropriate documentation.
- n. Outdoor hoisting operations should not commence if winds are above 20 knots (23 mph, 37 km/hr.) steady state or if gusts exceed 35 knots (40 mph, 65 km/hr.). Consideration shall also be given to sail area and weather conditions such as lightning, snow, etc., before commencing operations.
- o. Hoists and winches shall not be used for side pulls unless specifically designed to do so.
- p. If radio communications are to be used, operators and/or lift supervisors shall test the communication system prior to each operation. Operations shall stop immediately upon communication loss, and shall not continue until communication is restored.
- q. If hand signals are required, only standard signals shall be used according to [Appendix C](#). Hand signals shall be posted in a conspicuous location.
- r. The operator shall know the weight of the working load. When raising loads that approach 75% of the rated capacity of the hoist or winch, the operator shall test the holding brakes. The brakes shall be tested by raising the load minimally above the surface and holding the load with the brake. The load should be held long enough to allow any dynamics to dampen out.
- s. Perform a thorough inspection of all ropes paying particular attention to the signs of deterioration and damage
- t. A minimum clearance of 3 inches overhead and 2 inches laterally must be provided and maintained between crane and obstructions. Stops must be provided at the limits of travel of the trolley, and bumpers capable of stopping the crane provided where required.

3. Documentation

- a. Test – after each test, a summary report, including procedures used shall be provided by the testing firm to NIH for recordkeeping. Inadequacies shall be documented and, if determined to be a hazard, corrected prior to further use. These reports shall be kept on file for a minimum of two test cycles and shall be made readily available.
- b. Inspection – after each annual inspection, qualified, authorized personnel shall prepare written, dated, and signed inspection reports. These reports shall include procedure reference and adequacy of the crane/crane components. Inadequacies shall be documented and, if determined to be a hazard, corrected prior to further use. These reports shall be filed and made readily available by the organizational element responsible for inspection.
- c. Training – the supervisor shall document employee training and provide written record to the Safety Officer.

C. References

1. US Department of Labor, Occupational Safety and Health Standard, 29 CFR 1910.179, Overhead and Gantry Cranes.
2. American Society of Mechanical Engineers B30.2, Overhead and Gantry Cranes.

D. Definitions

Brake: A device used for retarding or stopping motion.

Certification: That situation when the lifting device or equipment maintenance, test, or other operational checks have been performed and are current.

Control Braking: A method of controlling speed by removing energy from the moving body or by imparting energy in the opposite direction.

Crane: A machine for lifting and lowering a load and moving it horizontally, with the hoisting mechanism an integral part of the machine.

Critical Lift: A lift where failure/loss of control could result in loss of life, loss of or damage to equipment, or major facility components, etc., whose loss would have serious programmatic or institutional impact. Any lifting of personnel with a crane, lifts where personnel are required to work under a suspended load, and operations with special personnel and equipment safety concerns beyond normal lifting hazards is considered a Critical Lift.

Critical Weld: A weld where the single failure of which could result in injury to personnel or damage to property or flight hardware by dropping or losing control of the load.

Design Load: The value used by the manufacturer as the maximum load around which the device or equipment is designed and built based on specified design factors and limits. This is also the load referred to as the "Manufacturer's Rated Load."

Dummy Load: A test load, to simulate the real load; typically a test weight.

Frequently: For the purpose of this document, the term "frequently" is used to mean once or more per year.

Hazard: Any real or potential condition that can cause injury or death to personnel, or damage to or loss of equipment or property.

Hoist: A machinery unit device used for lifting and lowering a load.

Holding Brake: A brake that automatically prevents motion when power is off.

Idle Lifting Device: Lifting device that has no projected use for the next 12 months.

Lifting Devices and Equipment: Devices such as overhead and gantry cranes (including top running monorail, underhung, and jib cranes), mobile cranes, derricks, hoists, winches, special hoist supported personnel lifting devices, hydra-sets, load measuring devices, hooks, slings and rigging, mobile aerial platforms, powered industrial trucks and jacks, used for lifting and lowering.

Load: The total load, including the sling or structural sling, below the hoisting device hook, being raised or moved.

Rated Load or Safe Working Load or Rated Capacity: An assigned weight that is the maximum load the device or equipment shall operationally handle and maintain. This value is marked on the device indicating maximum working capacity. This is also the load referred to as "safe working load" or "working load limit". If the device has never been down rated or uprated, this also is the "manufacturer's rated load."

Sling: A lifting assembly and associated hardware used between the actual object being lifted and hoisting device hook.

Special Hoist Supported Personnel Lifting Device: Device specifically designed to lift and lower persons via a hoist. These devices include hoist supported platforms where personnel occupy the platform during movement. These devices do not including elevators, lifting personnel with a crane, mobile aerial platforms, or platforms or others items hoisted unoccupied to a position and anchored or restrained to a stationary structure, before personnel occupy the platform.

Standby Lifting Device: Lifting device that is not in regular service but used occasionally or intermittently as required. Intermittent use is defined as a lifting device which has not been used for a period of one month or more, but less than 6 months.

Structural Sling: A rigid or semi-rigid fixture that is used between the actual object being lifted and hoisting device hook. Examples are spreader bars, equalizer bars, lifting beams, etc.

Winch: A stationary motor-driven or hand-powered hoisting machine having a drum around which is wound a rope, chain or web used for lifting and lowering a load (does not apply to winches used for horizontal pulls).

Wire Rope Slings: Wire ropes made into forms, with or without fittings, for handling loads and so made as to permit the attachment of an operating rope.

Working Load: If the device has never been down rated or uprated, this also is the "manufacturer's rated load.







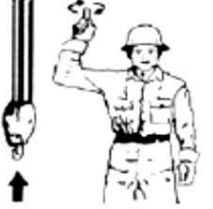

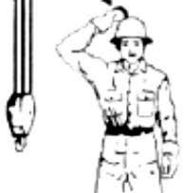





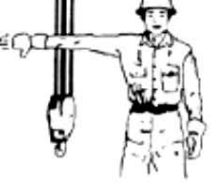



Appendix A: Operator's Daily Checklist – Overhead Cranes

CRANE NO.		CAPACITY		LOCATION			SHIFT			HOUR METER		HRS. OPERATED		DATE	
							1	2	3	START	STOP				
OPERATOR'S NAME				RIGGER'S NAME			INSTRUCTION - Check all items indicated. Inspect and indicate as satisfactory - S, Unsatisfactory - U, or mark as not applicable – “NA”								
1. WALK AROUND INSPECTION				2. MACHINERY INSPECTION				3. OPERATOR CAB INSPECTION				4. OPERATION INSPECTION			
		S	U			S	U			S	U			S	U
a	Foundations & Supports			a	* Holding Brake			a	Housekeeping			a	* Power Supply Relay		
b	Access			b	Load Control Brake			b	* Warning Tags			b	Manual Reset		
c	Secured Items			c	Covers Secure			c	Cab Door(s)			c	* Stop Button Control		
d	Walkways & Handrails			d	* Upper Sheaves			d	Fire Extinguisher			d	* Pendant Buttons		
e	Bridge Drive Motor			e	* Wire Rope			e	Controls Identification			e	* Upper Limit/Main		
f	* Bridge Brake			f	Fluid Leaks			f	Electrical Enclosures			f	* Upper Limit/Auxiliary		
g	Hydraulics			g	Batteries			g	Pendant Strain Relief			g	Lower Limit/Main		
h	Couplers/Connecting Rods			h	Electric Motors			h	Visibility/Windows			h	Lower Limit/Auxiliary		
i	* End Trucks			i	Electric Panels			i	* Safety Devices			i	* Bridge Controls		
j	Rail Sweeps			j	Runway Bridge Conductors			j	Warning/Indicator Lights			j	* Bridge Break		
k	Windlocks/Chocks/Stops			k	Runway Bridge Collectors			k	Alarms			k	* Trolley Control		
l	Windlocks/Chocks/Stops			l	Electrical Guards							l	* Main Hook		
				m	Festoon System							m	* Auxiliary Hook		
				n	Warning Tags/Signs							n	Work Area		
				o	Exposed Electrical Hazards							o	* Runway Stops		
				p	* Trolley Stops							p	* Travel Limit Relays		
INSTRUCTIONS - Inspect all applicable items each shift. Suspend all operations immediately when observing an unsatisfactory condition of any item indicated above with an asterisk (*). In addition, suspend operation when any unsafe condition is observed and immediately notify your supervisor. Other conditions not affecting safety shall be noted under "Remarks" and reported to your supervisor.												OPERATOR'S SIGNATURE			
REMARKS												SUPERVISOR'S SIGNATURE			

Appendix B: Hoist Daily Checklist

CRANE NO.		CAPACITY		LOCATION		SHIFT			DATE		
						1	2	3			
OPERATOR'S NAME				INSTRUCTION - Check all items indicated. Inspect and check as satisfactory - S, Unsatisfactory - U, or mark as not applicable – “NA”							
1. MECHANICAL INSPECTION				2. ELECTRICAL INSPECTION				3. OPERATION INSPECTION			
		S	U			S	U			S	U
a	Controls Identification			a	Upper Hoist Limit Switch			a	Hoist Function		
b	Warning Tags/Signs			b	Lower Hoist Limit Switch			b	Trolley Function		
c	Warning/Indicator Lights/Alarms			c	Collectors/Conductors			c	Bridge Function		
d	Wire Rope/Chain			d	Festoon/Power Cable			d	Jib Swing		
e	Hoist Hook			e	Electrical Enclosures			e	Excessive Hoist Noise		
f	Hook Latch			f	Electrical Motors			f	Excessive Load Drift (Vertical)		
g	Upper Support Hook			g	Loose Wires			g	Excessive Load Drift (Horizontal)		
h	Upper Sheaves			h	Pendant Button Operation			h	Hoist Positioning Over Load		
i	Holding Brake			i	Emergency Stop Button			i	Work Area		
j	Load Control Brake			j	Controls Identification						
k	Trolley Stops			k	Exposed Electrical Hazard						
l	Overhead Support Structure			l	Disconnect Location						
m	Fluid Leaks										
n	Pendant Strain Relief										
REMARKS											
OPERATOR'S SIGNATURE											

Appendix C: Standard Crane Operations Hand Signal

 <p>EXTEND BOOM</p>	 <p>DOG EVERYTHING</p>	 <p>TRAVEL</p>	 <p>RETRACT BOOM</p>
 <p>EXTEND BOOM (ONE HAND)</p>	 <p>RETRACT BOOM (ONE HAND)</p>	 <p>HOIST</p>	 <p>LOWER</p>
 <p>USE MAIN HOIST</p>	 <p>USE WHIP LINE</p>	 <p>RAISE BOOM</p>	 <p>LOWER BOOM</p>
 <p>MOVE SLOWLY</p>	 <p>RAISE THE BOOM & LOWER THE LOAD</p>	 <p>LOWER THE BOOM & RAISE THE LOAD</p>	 <p>SWING</p>
 <p>STOP</p>			 <p>EMERGENCY STOP</p>

SECTION 3-10: MERCURY

A. Purpose

This document covers facility maintenance and repair personnel who have a potential to be exposed to mercury in the workplace and to all personnel responsible for procuring supplies and equipment that have traditionally contained mercury. The purpose of this policy is to:

1. Establish requirements to safeguard employees while performing duties that could result in occupational exposures to mercury.
2. Establish procedures for the proper management and disposal of mercury when encountered in the workplace.
3. Establish procedures to follow in the event of an accidental spill of mercury.
4. Establish requirements to purchase supplies and equipment that are mercury free or have low mercury content and are bio-based if available.
5. Establish a collection of operational and procurement related procedures that makes a mercury-free organization to the maximum extent possible and contributes to the overall NIH Environmental Management System (EMS) goal of being mercury-free. Over time, mercury usage in buildings has resulted in very expensive decontamination and hazardous waste disposal costs when the useful life of the building is over and the site is prepared for future use. These procedures also support the NIH policy of “Sustainable Buildings” by not creating contamination hazards as part of on-going operation and maintenance.
6. Establish procedures and guidelines to achieve the maximum amount of recycling possible in the workplace, including but not limited to: all facility operations, including maintenance and repair, administration, grounds maintenance, demolition, renovation and new construction projects.

B. Scope and Policy

NIH facilities are operated and maintained in a manner that minimizes chemical hazards that cause or are likely to cause, death, illness or serious physical harm to employees or the public. As such, it is NIH policy to operate and maintain its facilities in a manner that minimizes the risk of environmental contamination resulting from the spill or release of mercury. In compliance with Executive Order 13148, aimed at reducing the amounts of toxic chemicals used, this institution strives to eliminate the use of mercury to the maximum extent possible, in thermometers, relays, switches, thermostats, fluorescent lighting, cleaning and other commercial products. Also, tasks involving potential exposure to mercury and other toxic chemicals must be identified and awareness training provided to appropriate staff to allow work to be performed safely. Training includes guidelines on purchasing mercury-free products as well as guidelines and instructions for chemical spill response and cleanup; and disposal instructions for all waste containing mercury.

C. Background

1. Mercury is a naturally occurring metal element and potent neurotoxin. It is capable of entering the system through the skin or through inhalation. In very small quantities, mercury is capable of impairing neurological development in fetuses and young children, damaging of the central nervous system of adults, and causing kidney damage. It does not degrade and is not destroyed by combustion. In addition, it persists in the environment and can bio-accumulate in the aquatic environment.
2. Provided below are occupational exposure limits for mercury and its compounds.

Recommended Threshold Limit Values (TLV) for Mercury	
Mercury Compounds	Time Weighted Average (TWA)
Alkyl compounds	0.01 mg/m ³
Aryl compounds	0.1 mg/m ³
Elemental and inorganic forms	0.025 mg/m ³

3. Like lead and cadmium, mercury is a heavy metal that is extremely malleable, expanding and contracting according to temperature. Its unique properties are suited to numerous technological and manufacturing products and processes.
4. In dentistry, for instance, mercury amalgam is used in fillings because of its strength and ability to accommodate the temperature ranges of the foods and liquids we eat or drink. It is also widely used in thermometers, relays, switches, thermostats and fluorescent light bulbs or tubes, and in the production of some chemicals, pharmaceuticals, cosmetics, cleaning and other commercial products.
5. Discarded devices containing elemental mercury and mercury-contaminated debris are both regulated as hazardous waste by U. S. Environmental Protection Agency (EPA) and State of Maryland hazardous waste regulations. The NIH must manage and dispose of these materials in accordance with these regulations.

D. Responsibilities

1. General Responsibilities

It is the responsibility of each supervisor and employee to ensure implementation safety policy on mercury and other environmental issues in the workplace. It is also the responsibility of each employee to report immediately any non-compliant act or condition to his or her supervisor.

2. Specific Responsibilities

- a. Managers – responsible for identifying the employees affected by this policy and ensuring they receive adequate training on the requirements of this SSOP. Managers will obtain and coordinate the required training for the affected employees and will also ensure compliance with this safety policy through their auditing process.
- b. Supervisors – will ensure that affected employees are trained in the procedures to do the following: safely handle any mercury containing devices or contaminated materials; dispose or recycle any mercury containing devices in accordance with applicable regulations and NIH policies; purchase supplies and equipment that are mercury-free or have low mercury content, and are bio-based if available.
- c. Employees – shall follow the guidance of this document in the performance of their routine work. Employees shall not dispose of any material or device containing or contaminated with mercury in the regular trash. If questions or uncertainties arise, employees shall consult with their supervisor.
- d. Assigned Safety Officer – will provide assistance to managers, supervisors, or others as necessary on any matter concerning this policy and will assist in locating the required training. As support to the Assigned Safety Officer, the Division of Environmental Protection (DEP), and other approved specialized sources or consultants shall be used to provide assistance on mercury and other environmental issues, as needed.
- e. Purchases and Services – Managers and Supervisors shall ensure that equipment and replacement supplies purchased through their oversight have been reviewed for compliance with this document.

E. Training

1. Personnel who perform building operations, maintenance and repair and renovation work are required to receive training.
2. Training shall include the following instructions and hands-on training:
 - a. Description and identification of mercury-containing devices or materials requiring disposal as hazardous waste. Some common mercury-containing devices/materials can be found in [Appendix A](#): Systems, Equipment, and Supplies Containing Mercury.
 - b. Identification of mercury when removing or replacing sink traps.
 - c. General review of NIH waste disposal and recycling guidance and policies that are to be followed in the workplace.
 - d. General review of Green Purchasing Guidelines that includes the purchase of mercury-free products.

F. Procedures

1. Summary of Mercury Disposal Guidance for Buildings Operation and Maintenance

a. Safety

- (1) Take precautions to avoid spills and breakage of items containing mercury.
- (2) Call the Chemical Waste Service (301-496-4710) for assistance if equipment for the draining of mercury is required, or if handling and removal procedures could result in spills. Chemists will be sent to assist you.
- (3) Keep mercury items secure. NEVER take mercury home or remove without official authorization.
- (4) Dispose of all mercury items in accordance with NIH procedures for chemical waste. This includes items with trace levels of contamination.

f. Spills

- (1) Report all spills and areas suspected to be contaminated to the Fire Department.
- (2) DO NOT ATTEMPT TO CLEAN UP MERCURY SPILLS REGARDLESS OF THEIR SIZE. Elemental mercury (metallic) vaporizes readily when spilled. Therefore, droplets should be cleaned up quickly.
- (3) Immediately notify the hazardous material (HAZMAT) emergency responder for your facility. On the main NIH Campus in Bethesda, call the NIH Fire Department (dial 911), on other NIH installations in Maryland dial 9-911. Give the responder the location of the mercury spill, your name and telephone number.
- (4) The area should be promptly evacuated, secured, and not reentered until officially decontaminated. This will lessen the opportunity for exposure and keep the mercury from being further dispersed. Prevent the spread of mercury. The droplets can roll around and adhere to the sides of the laboratory casework, walls and floors. Many of them are too small to see.
- (5) DO NOT ATTEMPT TO MOVE OR CLEAN UP ANY OF THE BROKEN PIECES OF THE THERMOMETER OR OTHER MERCURY-CONTAINING ITEM. This will lessen the potential for exposure, dispersal, and enhance (HAZMAT) emergency responder ability to efficiently complete the clean-up.
- (6) [Appendix B](#) lists a summary of mercury disposal guidance.

2. Mercury Device Recycling Opportunities
 - a. Some companies accept old thermostats and related devices and recycle the mercury. DEP will seek out opportunities for recycling these mercury containing devices and advise the managers and supervisors accordingly.
 - b. Where feasible, replace mercury-containing items with non-mercury or low-mercury alternatives.

G. References

1. Occupational Safety and Health Standards for General Industry 29 CFR 1910
2. Federal Hazardous Waste Regulations, Code of Federal Regulations Title 40, Parts 260 – 299
3. Code of Maryland Regulations (COMAR), Hazardous Waste Regulations, Title 26, Subpart 13
4. RCRA 6002 Green Procurement Regulations
5. Montgomery County Recycling – Executive Regulation 15-04
6. Executive Order 13101 – Greening the Government through Waste Prevention, Recycling, and Federal Acquisition
7. Executive Order 13148 – Greening the Government through Environmental Leadership in Environmental Management
8. ACGIH Guide to Occupational Exposure Values, 2006

H. Definitions

Hazardous Waste – All hazardous materials as defined in 40 CFR 261 et seq.; all Controlled Hazardous Substances as defined in 26 COMAR 13.02.06; similar wastes defined in other states statutes and regulations; and chemical wastes that are not currently regulated under federal regulations as hazardous, but have toxic or hazardous waste characteristic(s) or which may meet criteria for listing as hazardous waste in 40 CFR 261.11.

COMAR – Code of Maryland Regulations.

Montgomery County Recycling Materials – Materials required for Residential and Commercial Recycling (including corrugated cardboard containers, office paper, newspaper, aluminum and bi-metal cans, glass and plastic containers, and yard waste) in accordance with Montgomery County Executive Regulations 109-92AM, as amended.

NIH Chemical Waste Tag – A NIH tag that is attached to a chemical or mixed waste container or item to provide a means for generators to date and identify wastes and to mark the date on which it was discarded.

Appendix A: Systems, Equipment and Supplies that May Contain Mercury

Listed below are common commercial items used at the NIH that contain regulated amounts of mercury. Non-mercury or low-mercury alternatives are listed for many of the items.

Category	Application or Example	Alternatives
ANALYTICAL INSTRUMENTS (mercury chloride as reagent)	Sequential Multi-Channel Auto-Analyzer (SMCS) AU 2000	Ion Selective Electrode
BAROMETERS AND MANOMETERS	Monitoring air pressure, weather conditions Flow meters and controllers for natural gas supplies	Bourdon tube Electronic gauges Non-mercury flow meters
COMMERCIAL CLEANING AGENTS Bleach Detergents Scouring powders Soaps	Cleaning and disinfection – mercury may be a contaminant in these products	Use alternate brands with lower mercury levels or no detectable mercury
DIRECT CURRENT WATT HOUR METERS	Duncan meters – no longer made, may still be in use	
DISPLACEMENT/PLUNGER RELAY	Power supply, switching, lighting Electric commercial appliances	
FLAME SENSOR/SAFETY VALVE Stainless steel bulb, capillary tube, bellows/control device	Main gas burners w/ standing pilot or electrical ignition pilot Some infrared heaters (component supplied by Robert Shaw and Harper-Wyman) Some furnaces (components supplied by White Rodgers) Commercial kitchen appliances	
LAMPS	Fluorescent Bilirubin blue General purpose High output germicidal lamps Cold cathode Hot cathode Slimline metal halide high pressure sodium vapor Mercury vapor ultra-violet spectral lamps Neon (all colors except red, orange and pink)	High intensity discharge Fluorescent lights certified to pass EPA TCLP test for mercury and lead Mercury- and lead-free high pressure sodium lamps Energy-efficient lighting systems
PAINT	Mercury-based anti-mildew agents	Non-mercury biocides
RELAYS AND SWITCHES	Displacement/Plunger Relays: <ul style="list-style-type: none"> •High current/voltage lighting •Power supply switching •Tungsten lighting •Wetted reed relay/wetter reed switch •Test, calibration and measurement equipment Tilt Switches: <ul style="list-style-type: none"> •Airflow/fan limit control •Building security systems •Chest freezer lid switches •Fire alarm box switches •Fluid level controls •Pressure controls •Silent light switches •Temperature controls 	Mechanical and solid state relays Mechanical switches Magnetic dry reed switches Optic sensors
THERMOSTATS	Temperature control in rooms, incubators, refrigerators, etc.	Thermostat with bi-metallic strip Snap switches, electronic type
THERMOMETERS	Various	Electronic (digital) Non-mercury liquid filled
WATER TREATMENT CHEMICALS	pH adjustment (contaminant in sodium hydroxide, sulfuric acid)	Lower mercury content chemicals from alternate suppliers Alternative neutralizing chemicals such as hydrochloric acid

Appendix B: Summary of Mercury Disposal Guidance for Maintenance Operations

Item	Labeling	Packaging and Disposal
Intact, non-leaking electrical components such as thermostats, mercury switches, sodium vapor lamps, etc.*	Fill out and attach NIH Chemical Waste Tag to the outer container	Place item(s) in plastic bag, then consolidate bagged items into a metal drum provided by the Chemical Waste Service (CWS)
Fluorescent light tubes	None	Placed used tubes back into supply box Tubes are picked up weekly by CWS for recycling
Sink traps; no mercury observed when dumped into a 5-gallon, snap-top bucket	Fill out and attach NIH Chemical Waste Tags to bucket and to plastic bags containing drained traps	Seal snap-top bucket and call CWS at 301-496-4710 for pick-up
Sink traps; mercury observed when dumped into a 5-gallon snap-top bucket*	Fill out and attach NIH Chemical Waste Tags to bucket and to plastic bags containing drained traps	Seal snap-top bucket and call CWS at 301-496-4710 for pick-up Thoroughly wash hands and examine clothing for visible signs of mercury
Mercury thermometers and manometers	Fill out and attach NIH Chemical Waste Tag to the outer container	Place item in plastic bag, then in a plastic jar or other leak resistant, unbreakable container and call CWS at 301-496-4710 for pick-up

* These items are hazardous waste to be collected by the CWS.

CHAPTER 4 – GENERAL EQUIPMENT SAFETY

SECTION 4-1: MACHINERY AND MACHINE GUARDING

A. Purpose, Policy and Scope

1. It is NIH policy to provide a workplace free from recognized hazards that cause or are likely to cause death or serious physical harm to employees or the public. Therefore, any mechanical motion that may cause injury shall be guarded. Adequate training regarding relevant machine guarding will be implemented, when mechanical motion exists that can be hazardous.
2. The purpose of the policy is to establish requirements for safeguarding employees while working with or near machinery with functioning mechanical power train sources and points-of-operation.
3. Most machinery uses power transmission components to transfer power from a motor, engine or other prime mover, to an element of a machine where a useful function occurs. These power transmission components, or power train, include pulleys, ropes, sheaves, sprockets, rotating members, reciprocating arms, moving belts, meshing gears, cutting teeth, and friction rollers. Pinch, nip, impact or shear points are created as these components come together.
4. This document provides guidelines for safeguarding and recognizing mechanical hazards due to potentially hazardous moving parts. It includes information on training requirements, discussion on where hazards occur, machine guarding requirements, machinery maintenance and repair requirements, labels, signs, and marking requirements for machines with potentially hazardous moving parts.
5. The equipment this section refers to includes, but is not limited to the following:
 - Power presses (drill presses)
 - Abrasive wheel machines (grinders)
 - Milling machines
 - Woodworking machines (circular, radial, miter saws)
 - Metal working machines
 - Reciprocating machine element
 - Power Lawnmowers
 - Walk-Behind Rotary Mowers
 - Industrial Shredders
 - Pressure rolls
 - Belts and pulleys
 - Pulley with spokes
 - Chains and sprocket
 - Flywheels or gear train
 - Rotating shafts
 - Coupling
 - All additional classes of mechanized field equipment

B. Responsibilities

1. Management – are responsible for ensuring that adequate funds are available and budgeted for the purchase of machine guards.

2. Supervisor

- a. Will ensure that affected employees are trained in the safe operation of all machines that will be used in the performance of their duties.
- b. Will ensure that an adequate supply of PPE is maintained in inventory and that employees are provided with PPE as necessary for their job.
- c. Will ensure that PPE gets replaced as necessary.
- d. Will check that employees are wearing required PPE and that machine guards are not removed/disabled.
- e. Will ensure that all defective machinery/equipment is taken out of service.

3. Employees

- a. Shall immediately inform their supervisor if any guard or shield is damaged or becomes inoperable.
- b. Shall also report immediately any recognized hazard to their supervisor.
- c. Shall not operate any machine that does not have an operable guard as originally designed.
- d. Shall not remove or otherwise modify any machine guard except to perform allowed routine maintenance or service.

4. Division of Occupational Health and Safety (DOHS)

- a. The Technical Assistance Branch (TAB) will provide assistance to managers, supervisors, or others as necessary on any matter concerning this safety policy.
- b. TAB can assist in coordinating machine guarding training as needed.
- c. TAB will work with managers and supervisors to ensure that all newly purchased machine guarding equipment and supplies comply with current safety regulations and this safety policy.

C. Training

1. Employees who operate machines with potential hazards due to moving parts shall be trained on how to use the related machine guards and why the guards are in place.
2. Employees shall be trained upon initial assignment, when changes are made to the guards, when additional guards are put in place, and when accidents occur that relate to the guards. Employee training shall include the following instructions and hands-on training:

- a. Description and identification of the hazard associated with the machine;
- b. The guards, how they provide protection, and the hazard for which they are intended;
- c. Precautions to take when machine is unguarded during maintenance and repair;
- d. Administrative practices such as distance and location;
- e. Type and use of personal protective equipment (PPE);
- f. What to do and whom to contact if a guard is damaged, missing, or defective; and
- g. Review of the Safe Operating Practices for the specific machines to be used by the employee.

D. Procedures

1. Machine Guard Requirements

Guards provide physical barriers between the hazardous equipment components and the operator and/or others in the vicinity. The following must be taken into consideration if the operator will use guards to isolate the hazard.

- a. **Prevent Contact.** Guards must be designed to minimize the possibility of the operator or others in the area from placing their hands or any part of their body into hazardous moving parts. Specific types of machines have specific requirements for distance of the guard from the point of operation. Guards must conform to regulatory standards. This information is available in the manufacturer's specifications and OSHA regulations.
- b. **Remain Secure.** Workers should not be able to easily remove or tamper with the guard. Guards must be attached to the machine when possible. If attachment to the machine is not possible, the guards should be installed so as to protect against the hazard.
- c. **Protect from Falling Objects.** Guards should ensure that no objects could fall into moving parts.
- d. **Create No New Hazards.** Guards must not create potential hazards.
- e. **Create No Interference.** A guard should not create an unacceptable interference for the worker.
- f. **Allow Safe Maintenance and Lubrication.** It should be possible to lubricate the machine without removing the guard.
- g. **Anchoring Fixed Machinery.** A machine designed for a fixed location must be securely anchored to prevent walking or moving.

- h. Revolving barrels, containers and drums must be guarded by an enclosure interlocked with the drive mechanism so the barrel, gun, or container cannot revolve unless the guard is in place.
- i. Exposure of Blades. Blades of a fan located less than seven feet above the floor or working level must be guarded. Guards must not have openings larger than ½ inch.
- j. Lockout/Tag out: Removal of guard requires following the NIH Lockout/Tag out procedures.

2. Guidelines for Equipment Safeguarding

- a. The first step in machine guarding is for supervisors and employees to identify all of the mechanical hazards on the tool in question. Each moving part on the tool should be evaluated to determine if its motion creates a mechanical hazard. The types of motions associated with moving parts on equipment are usually rotation and transverse motion.
- b. Rotating parts can be hazardous even at slow speeds. Contact with a rotating part could force a person's hand or arm into a dangerous position, or could cause a cut or abrasion if there are any protruding parts on the rotating part (e.g., nuts, set screws, burrs, etc.) Rotating parts can also create nip points with another rotating part (e.g., two gears meshing together) or a tangentially moving part (e.g., belt and pulley). A rotating part adjacent to a fixed part can create a crushing or shearing hazard (e.g., spokes on a rotating wheel adjacent to a fixed part).
- c. Transverse motion includes parts that move in a straight line (i.e. pneumatic cylinders and belts). Transverse motion can create pinch or crush hazards by trapping hands, fingers, or other body parts between the moving part and a fixed part. Transverse moving parts working with rotating parts can also draw hands or fingers into a nip point (e.g., belt and pulley).
- d. Once the hazards associated with all of the moving parts on the system have been identified, a method of machine guarding must be implemented in order to safeguard against these hazards. Machine guarding methods fall into the following areas.

(1) Guards

Guards are the most common type of machine guarding safeguard used to protect against mechanical hazards associated with moving parts, particularly for power transmission parts such as gears or belts. Guards are typically fixed devices that prevent access to the moving part. They should be designed such that a person cannot reach over, under, around, or through the guard to access the moving part. Guards should either be secured so that a tool is required to remove the guard, or provided with an interlock that stops the moving part when the guard is removed. In all cases, a guard that protects against mechanical hazards should have a hazard warning label on it to indicate the type of hazard that it is protecting against (e.g.,

pinch point, crush hazard, etc.). Guards should be substantial enough that a person cannot flex or deform the guard.

(2) Devices

(a) *Presence-Sensing*

A presence-sensing device serves as an interlock that detects when a person has entered the hazard area associated with a moving part and stop motion of the part. A light curtain is an optical sensing device and is probably the most common example of a presence-sensing device, but electromechanical and capacitive type devices also exist. Since presence-sensing devices used to protect against mechanical hazards are considered safety interlocks, they must meet all of requirements for safety interlocks, including:

- Hardware Based;
- Fail Safe;
- Operator Notification; and
- Manual Reset.

One important consideration for presence sensing devices is that they must be designed and located such that they detect a person entering the hazard area and stop the motion of the moving part before the person has reached the part. This requires careful consideration of how the device senses entry into the hazard area, the distance between the sensing location and the moving part, and the speed of the moving part.

(b) *Two-Hand Trip*

Two hand trip devices are designed so that two hands are required to activate the control that initiates moving parts, so that the person's hands are required to be clear of the hazard area when motion is initiated. It is important that the two hand controls are placed far enough away from the moving part such that the person is clear of the hazard zone when activating the controls. Care must also be taken in the ergonomic design of the placement of the two control buttons, as if they are too far apart or are awkward to reach and activate, people may grow tired of using them and attempt to bypass the control.

(c) *Gates*

A gate is a moveable barrier that moves into place before hazardous motion of a moving part is initiated. A common example is a cover that moves upward to enclose a wafer cassette prior to a robot loading and unloading the cassette. Care must be taken that the gate itself does not create a new mechanical hazard, such as a pinch point or shear point. As the gate is a moveable barrier that must be in place for mechanical motion to occur, the circuit that senses the cover is in place is considered a safety interlock circuit.

(3) Location

Guarding by location can be used to provide protection against mechanical hazards, but very careful consideration must be given to ensure that the mechanical hazards are truly guarded by location. An example of guarding by location is a moving part on a tool that is not accessible to personnel due to the mechanical structure of the tool or the surrounding facility that the tool is installed in (e.g., personnel cannot reach the hazard zone of the moving part due to the physical layout of the tool or facility). In general, this method of machine guarding is not encouraged; as experience has shown that many times moving parts that are considered "inaccessible" during normal operation become accessible during maintenance or service.

3. Machine Repair and Servicing

- a. An employee who is trained and knowledgeable about the particular piece of equipment being adjusted will make all adjustments. Machine design should permit lubrication and adjustment without removal of guards. If machine guards must be removed, the maintenance and repair crew must always replace them prior to re-energizing. Maintenance work shall not be performed until the machine is disconnected and locked out, consistent with the Lockout/Tag out policies.
- b. For mechanical power presses, safety blocks should be used as an additional safeguard, although the machine may be locked out electronically.
- c. All woodworking machines will be maintained in good condition. This includes replacing dull blades, cutting heads, and damaged or unserviceable parts. Equipment blade changes or adjustments will be performed only when the power source has been disconnected to comply with the NIH Lockout/Tag out standard.
- d. Equipment on which guards cannot be installed shall be removed from service. This includes older equipment which never had factory-installed guards.

E. Reference

1. US Department of Labor, Occupational Safety and Health Administration (OSHA), Guarding of portable power tools, 29 CFR 1910.212 through 1910.247), and 29 CFR 1910.243

F. Definitions

Abrasive Wheel – A bench grinder wheel consisting of various particles bonded together and used for grinding objects to a particular shape or size.

Electrical Guard – Electronic means of protection provided to protect employees from electrical components or accidental equipment start-up.

Guard – An enclosure designed to protect employees from rotating or moving mechanical parts.

Kickback Device – Any device that protects the operator from equipment throwing the work back towards the operator.

Point of Operation – The point at which cutting, shaping, boring, or forming is accomplished upon the stock.

Portable – Hand-held operated.

Push stick – A narrow strip of wood or soft material with a notch cut into one end, by which it is used to push short pieces of material through saws.

Ring Test – The use of a non-metallic object to tap a grinding wheel at 45-degree intervals. If the wheel exhibits a dead sound, the wheel is unsafe to use.

Shield – An enclosure or barrier designed to protect employees from processes involving the possibility of disintegrating machine parts or parts being ground upon, pressed, or struck.

SECTION 4-2: EYE WASH STATIONS AND DRENCH SHOWERS

A. Purpose

Emergency eye wash and shower units are designed to deliver water to rinse contaminants from a user's eyes, face or body. As such, they are a form of first aid equipment to be used in the event of an accident. However, they are not a substitute for primary protective devices (including eye and face protection and protective clothing) or for safe procedures for handling hazardous materials.

B. Scope

1. This program specifically outlines the definitions, procedures and training requirements to be utilized by employees to prevent unexpected and accidental injury and damage to the eye.
2. Eyewash stations and showers in areas controlled by other Institutes and Center (ICs) are the responsibility of the ICs occupying those spaces. Additionally, Division of Facilities Operation and Maintenance (DFOM) will use this program to ensure that emergency eyewash stations and drench showers located in DFOM-controlled spaces such as mechanical rooms, as well as common use areas (e.g., hallways, vestibules, lobbies, etc.) are properly maintained, inspected, and tested.
3. It is the duty of each employee to become familiar with the contents of this program, and use eye protection on the job. There shall be an eye wash station (and drench shower where appropriate) in workplace areas that have hazardous chemicals that can produce or cause injury to employees during their hours of employment.
4. OSHA 1910.151(c), states: *“that where the eyes or body of any person may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use.”* ANSI Z358.1 details more specific emergency equipment requirements and provides enforceable guidelines for OSHA to mandate upon any inspection. Safety and health training for employees including specialized job safety and health training should be appropriate to the work performed by the employee.

C. Policy

1. This instruction establishes policy and prescribed procedures to comply with the OSHA and ANSI requirements in and during the use of Emergency Eye Wash Stations and Drench Shower Operations. Employees should be familiar with this form of safety protection and procedures.
2. All employees shall comply with OSHA 1910.151(c) and ANSI Z358.1 series.
3. Deviations from the requirements of this instruction shall only be permitted with the written approval of the supervisor.

D. Training

1. Supervisors will ensure that all employees are trained in the safe operation of the eye wash station and drench shower. They will also ensure that employees know how to properly select and use eye protection, appropriate for the job (hazard). Additionally supervisors will ensure adequate supplies of appropriate eye protection are easily available for all employees.
2. The training includes formal instruction and a job site walk through to examine the operation and proper use of a drench shower and eye wash unit.
3. Training Certification
 - a. Each department/IC will verify compliance with the Eye Wash and Drench Shower Training by preparing a written certification record. The certification record must contain the following:
 - (1) Name of the employee trained;
 - (2) Date of training; and
 - (3) Signature of the person who conducted the training or the signature of the employer.
 - b. The certificate will be maintained within the sections and made available for review.

E. Responsibilities

1. Managers – are responsible for ensuring that adequate funds are available and budgeted for the purchase of all eye wash stations and drench showers. Managers should also identify the employees that may use these items and obtain and coordinate the required training for these employees.
2. Supervisors – must ensure that all regular inspections and tests are completed and documented in accordance with regulatory guidance. Inspection and test documentation must identify the equipment inspected, the date of inspection, and the name or initials of the person performing the inspection. Supervisors must maintain annual inspection reports for three years. Random and unscheduled inspections may also be conducted.
3. Employees – should become familiar with the location and operation of each eye wash station and drench shower in their work area. Employees shall immediately inform their supervisor if any of the eye wash stations or drench showers are blocked or not working properly.
4. Assigned Safety Officer
 - a. The Safety Officer will provide assistance to managers, supervisors, or others as necessary on any matter concerning this safety policy and will assist in providing the required training.

- b. The Safety Officer will work with managers and supervisors to ensure that all newly purchased eye wash stations and drench showers comply with current safety regulations.
- c. At least annually, each department/IC will conduct an audit of eye wash station/ drench shower procedures in their work areas in cooperation with the Safety Officer to ensure compliance and to correct any identified deficiencies.

F. Procedures

1. Emergency Eyewash/Drench Shower Common Elements

- a. Regulatory guidance recommends that supply lines be thoroughly flushed prior to installation.
- b. Check flowing water pressure at inlet supply. Minimum water flow requirement per ANSI is 30 pounds per square inch (psi). Ideal water flow is 40-50 psi.
- c. Water temperature should be “tepid” (i.e. moderately warm or lukewarm). However, where it is possible that a chemical reaction might be accelerated by warm water, OMS or Safety Officer should be consulted to determine what the optimum water temperature would be.
- d. Eye Washes and Showers should be installed in accessible locations that require no more than 10 seconds to reach (equating to about 55 feet from the location of the hazardous area). There should be no obstructions (such as doorways) within the path to the eyewash or shower. In areas where highly caustic material is present (strong acids), the eye wash should be placed immediately adjacent to the hazard.
- e. If shut-off valves are installed in the supply line for maintenance purposes, provisions shall be made to prevent unauthorized shut off (lockout/tag out).
- f. Where the possibility of freezing conditions exist; equipment shall be protected from freezing or freeze-protected equipment shall be installed.
- g. When possible the unit should be connected to drain piping.
- h. The emergency equipment should be in a well-lit area and identified with a highly visible sign (bright yellow or green).

2. Emergency Eye Wash

- a. Eye Washes (plumbed) should be positioned with the spray heads not less than 33 inches and no greater than 45 inches from the surface in which the user stands and minimum of 6 inches from the wall (this is in conjunction with the present plumbed laboratory eye washes to faucet-mounted applications) or nearest obstruction.
- b. Upon activation the water flow shall be adequate to flush both eyes. The velocity shall

be low enough to be non-injurious to the user. In the event of an emergency, activate eye wash by pushing handle back. Hold both eyelids open with thumb and forefinger. Roll eyeballs back and forth so fluid flows on all surfaces of eye and under eyelid. Flow must be maintained for 15 minutes. After equipment use, seek a medical advisor (OMS) immediately for further treatment.

- c. The eye wash valve on activated should remain open without the use of the operator's hands until intentionally shut off.
 - d. Minimum flow requirement for eye washes is 0.4 gallons per minute (GPM) at 30 psi for 15 minutes.
 - e. Eye wash should activate in one second or less using a one-step activation process.
 - f. DOHS recommends that the *Standard Eye Wash Fixture - Pedestal Mounted* (plumbed) be installed versus the Swing-a-way and Deck mounted units which are attached to faucets in hand sinks. Historically these mounted types of eye washes have been found to have a tendency to become clogged or leak.
3. Emergency Drench Shower
- a. The face of the shower head shall not be less than 82" or more than 96" from the surface on which the user stands.
 - b. The spray pattern shall have minimum diameter of 20" at 60" above the surface on which the user stands.
 - c. The center of the spray pattern shall be at least 16 inches from any obstruction.
 - d. Shower pull-rod handle should be no more than 69 inches above the floor.
 - e. Minimum flow requirement for a drench shower if plumbed is 20 GPM at 30 psi.
 - f. The shower valve should remain open until intentionally shut-off.
 - g. Drench shower should activate in one second or less using a one-step activation process.
4. Emergency Drench Hose
- a. Hand-held drench hoses, *provides support for the emergency eye wash and shower equipment, but should not be used as the only source of emergency relief.*
 - b. Drench hoses should deliver a minimum, 3 GPM at 30 psi.
5. Testing Procedures for Drench Showers
- a. Connect a flow meter to the shower to be tested or provide other means for testing flushing fluid. Determine flow rate is at least a minimum of 20 GPM. The shower

should have a supply that allows this to be sustainable for a minimum of 15 minutes.

- b. Open the valve on the drench shower and verify proper operation. Valve should activate in one second or less and stay-open until manually shut-off.
- c. When shower is activated, a sufficient volume of flushing fluid should be available to supply the flow rate for a minimum of 15 minutes.
- d. The flushing fluid shall be substantially dispersed throughout the spray pattern.

6. Inspections

a. Periodic

- (1) Each eye wash and drench shower shall be activated regularly to ensure proper operation of equipment and to flush water supply.
- (2) Keep screens within spray heads clean at all times and ensure protective caps are on top of heads, preventing particulate from entering into the screens. Protective caps should pivot easily and freely away from spray heads when system is activated.
- (3) During activation, check for leaks, obstruction of flow or any damaged parts. Replace parts as needed or contact manufacturer if equipment is not functioning properly.
- (4) Plumbed units shall be activated weekly for 3-5 minutes to ensure they are working properly. Activation of the systems ensures that water flows evenly and clearly; the proper temperature range is maintained; and that any sediment in the water lines is flushed away.
- (5) Self-contained showers shall be visually checked weekly to ensure all working parts are still intact.
- (6) Inspections and activation checks shall be documented in a table or log that includes the date of the test, name (initials after first entry) of individual conducting the test, and any concerns or issues noted during the activation cycle. These logs shall be maintained in a location at or adjacent to the eyewash/shower system. Any concerns noted shall be addressed to the supervisor for correction, repair and/or replacement.

b. Annual

Both plumbed and self-contained eye-wash station and drench showers shall be tested annually. This is to ensure tepid water throughout a full 15 minutes of water flow, as well as maintaining the pressure and shower patterns. This test shall also include a comprehensive inspection of the facility to evaluate any modifications to the work space that may have affected the accessibility of the station; to assess whether any new

hazards have been introduced into the area, and to identify fixtures needing replacement or repair.

G. References

1. United States Department of Labor, Occupational Safety and Health Administration. 29 CFR Part 1910.151(c), Medical services and first aid.
2. American National Standards Institute, Inc. ANSI Z358.1 series. American National Standard for Emergency Eyewash and Shower Equipment.

SECTION 5-3: PERSONAL PROTECTIVE EQUIPMENT AND RISK ANALYSIS

A. Scope

The PPE program applies to the use of various PPE to protect the employee. This program specifically outlines the definitions, procedures and training requirements to be utilized by employees to use PPE on the job. It is the duty of each employee to become familiar with the contents of this program and ensure compliance with its procedures. Heads of departments shall ensure that employees under their supervision receive training in the contents of this program and ensure records of this training are maintained.

B. Policy

1. Personal protective equipment (PPE) is not a substitute for good engineering or administrative controls or good work practices. PPE may be used in conjunction with these controls to further ensure the safety and health of employees; primarily when substitution, engineering or administrative controls are not sufficient enough to eliminate or reduce the safety hazard without additional protections. Personal protective equipment will be provided, used, and maintained when it has been determined that its use is required; and that such use will lessen the likelihood of occupational injury and/or illness. All workers shall be reminded that PPE is useful only as long as it is used and maintained properly.
2. All PPE will be of safe design and construction for the work to be performed and shall be maintained in a sanitary and reliable condition. Careful consideration will be given to comfort and fit of PPE in order to ensure that it will be used. Protective devices are generally available in a variety of sizes. Care should be taken to ensure that the right size is selected.

C. Responsibilities

1. Management is responsible for ensuring that adequate funds are available and budgeted for the purchase of PPE.
2. Department of Occupational Health and Safety (DOHS):
 - a. Provides technical advice and guidance on proper selection, use, and maintenance of PPE.
 - b. Evaluates PPE during survey and inspections to determine if it will provide proper protection.
 - c. Provide training, as needed, on the proper selection, use, and maintenance of PPE.
3. Supervisors have primary responsibility to ensure that their employees are properly protected and trained in the use of PPE. Selection of PPE is made through an assessment of the employee duties to determine hazards and identification of appropriate protection. Assessments shall be performed using sound judgment and appropriate expertise to

determine the extent and degree of hazard created by specific tasks. Responsibilities include:

- a. Providing appropriate PPE, and making it available to employees.
 - b. Ensuring employees are trained on the proper use, care, and cleaning of PPE.
 - c. Maintaining records on PPE assignments and training.
 - d. Supervising staff to ensure that the written PPE Program elements are followed and that employees properly use and care for PPE.
 - e. Seeking assistance from the Safety Officer to evaluate hazards.
 - f. Notifying the Safety Officer when new hazards are introduced or when processes are added or changed;
 - g. Ensuring defective or damaged equipment is immediately replaced.
4. Employee has the responsibility of the employee to use the PPE and wear it appropriately at all times. The employee is also responsible for maintaining and cleaning their PPE.

D. Training

1. The supervisor must provide training to each employee who is required to wear PPE during the course of his or her work activities. The training should teach the employee the proper use, wear, and care of PPE. The supervisors are responsible for ensuring that employees are satisfactorily trained. The training shall include, but not necessarily be limited to, the following subjects:
 - a. When PPE is necessary to be worn;
 - b. What PPE is necessary;
 - c. How to properly don, doff, adjust, and wear PPE;
 - d. The limitations of the PPE; and
 - e. The proper care, maintenance, useful life and disposal of the PPE.
2. In addition, the affected employee must demonstrate an understanding of the above-mentioned training, and the ability to use PPE properly, before being allowed to perform work requiring the use of PPE. To verify that each worker has received and understands this training a written certification is required to be maintained by the employer.
3. Employees must be retrained when there is reason to believe that the employee does not have the understanding and skill required in the initial training. Circumstances where

retraining is required include changes in work place, changes in type of PPE used, or inadequacies in an affected employee's knowledge or use of assigned PPE.

E. Types of Personal Protective Equipment

1. Listed below are some of the more common types of PPE. It is not meant to be a comprehensive list. Other types of personal protective equipment exist and are available to employees based on the hazard encountered and the type of PPE required to mitigate the hazard. Contact your supervisor or DOHS for any questions regarding the use of any protective equipment while on the job.

2. Head Protection

Use of head protection and hard hats is mandatory when on any active construction or remodeling/renovation project where overhead work is being performed. If contractor employees are wearing head protection, employees on the job site must also wear head protection.

- a. Hard hats or bump caps must be worn in areas where there is a potential for injury to the head from falling objects or from contact with overhead objects.
- b. Hard hats shall fit snugly, and shall be adjustable.
- c. There shall be sufficient clearance between the shell of the hard hat and the suspension.
- d. The hard hat shell shall be kept clean and shall be inspected for any defects such as cracks, dents, or worn spots.
- e. Hard hats shall not be left sitting in direct sunlight or in extreme heat areas as damage may occur to the shell.
- f. All head protection must be ANSI Z87.1 certified.

3. Eye Protection

- a. Safety glasses, with side shields, or goggles when appropriate, must be worn by every employee, customer, or visitor entering any area that exposes the eye to the following hazards:
 - (1) Flying pieces of metal or steel.
 - (2) Where chips or dust may be created.
 - (3) Where chemicals may be present.
 - (4) Where liquids or solid particles may be blown or splashed.
 - (5) The possibility of pressure release.

- b. A face shield and safety glasses with side shields must be used when doing grinding of any type or when using wire wheel buffers.
- c. When working with chemicals that pose a splash hazard, splash-proof goggles must be worn. They may be worn with or without a face shield. A face shield alone does not provide adequate protection to the eyes from chemical splashes. Therefore, a face shield shall never be worn without goggles when this type of hazard is present.
- d. Face shields and goggles should be cleaned after use; and properly stored to limit deterioration.
- e. Damaged face shields and goggles will be removed from services and replaced by a good set immediately.
- f. A welding helmet with tinted face shield and safety glasses with side shields must be worn when welding to protect eyes from light, sparks, and radiation.
- g. If an employee wears prescription lenses, eyeglasses with protective lenses or goggles that can be worn over glasses shall be worn.
- h. OSHA regulations require that each affected employee who wears prescription lenses while engaged in operations that involve eye hazards shall wear eye protection that incorporates the prescription in its design, or shall wear eye protection that can be worn over the prescription lenses (goggles, face shields) without disturbing the proper position of the prescription lenses or the protective lenses.
- i. Employees engaged in work hazardous to eyes can obtain prescription safety glasses through the Occupational Medical Service (OMS). The individual must complete the NIH Form 29-2. Completed forms must be signed by the employee's supervisor or Administrative Officer and submitted with a current prescription (not more than one year old) to the OMS Health Unit in Building 13, Room G904. Please contact OMS at (301) 496-9278 for dates and times when this service is provided.

4. Foot Protection

- a. Safety shoes must be worn by employees working in areas where there is a risk of injury from falling objects, objects piercing the sole, or where employee's feet are exposed to electrical hazards.
- b. Safety footwear shall be kept clean and inspected regularly for any defects, such as: torn, loose soles, or cracked or torn toe protection.
- c. Safety shoes or boots shall fit so that the equipment does not cause unusual tiring or irritation.
- d. Use of foot protection is mandatory when working on any active construction or remodeling/renovation project where contractor employees are wearing foot protection.

If contractor employees are wearing foot protection, employees on the job site must also wear foot protection.

- e. Employees requiring safety footwear must bring a completed "Request for Safety Footwear, NIH-1980," to the DOHS Safety Shoe Program Manager in Building 13, Room 3K-04. This form can be found on the DOHS intranet site. Employees are authorized to obtain a new pair of safety shoes when the current shoes are no longer serviceable (generally about every 12 months). Any medical conditions requiring special footwear for an individual must be documented by a private physician or by the NIH OMS. For more information on the Safety Shoe Program contact the DOHS Technical Assistance Branch at (301)496-3353.

5. Hand Protection

- a. Hand protection shall be worn where applicable.
- b. Hand protection shall fit well enough to allow proper dexterity for the job being performed.
- c. Hand protection that has been contaminated by chemicals, oils or greases should be either decontaminated or discarded.
- d. Hand protection shall be kept free from damage or tears. Torn/damaged hand protection shall be discarded.
- e. Hand protection shall be worn when handling materials that maybe abrasive, or may have burrs.
- f. Insulated gloves should be worn when working around heat or steam.
- g. Employees must wear the appropriate rubber gloves for protection against chemical hazards.
- h. Glove selection for chemical use should be based on the manufacturer's permeability and degradation data. When selecting the proper glove based on specific chemical and conditions of use. DOHS can assist in the selection of proper gloves based on specific chemical hazards and use conditions. In general:
 - (1) Butyl rubber gloves protect against a wide variety of chemicals such as peroxides, acids, bases, alcohols, aldehydes, ketones, esters, and nitro compounds. They resist oxidation, ozone corrosion and abrasion, and remain flexible at low temperatures. However, butyl rubber does not perform well with aliphatic and aromatic hydrocarbons and halogenated solvents.
 - (2) Natural (latex) rubber gloves are usually fairly thin and provide a low barrier protection against incidental contact with water solutions of acids, alkalis, salts and ketones. They are very elastic and are resistant to abrasion. Some people are prone to development of latex allergies.

- (3) Neoprene gloves are usually of similar texture and appearance to latex gloves. Like latex, thin neoprene gloves offer comfort, dexterity, and resistance to tears and abrasions. Thin neoprene gloves, while generally more resistant than latex, provide a low barrier protection against incidental contact with hydraulic fluids, gasoline, alcohols, organic acids and alkalis.
- (4) Nitrile gloves are usually of similar texture and appearance to latex or neoprene gloves. Like latex and neoprene, thin nitrile gloves offer comfort, dexterity, and resistance to tears and abrasions. They are made of a copolymer and provide protection from chlorinated solvents such as trichloroethylene and perchloroethylene, as well as oils, greases, acids, caustics, and alcohols, but are generally not recommended for use with strong oxidizing agents, aromatic solvents, ketones, and acetates.

F. Procedures

1. Hazard Assessment

- a. **Hazard Identification:** The first step in the safety assessment process involves a walk-through survey of the areas in question. The purpose is to identify sources of hazards to workers. Supervisors shall identify the type and nature of hazards, which may be present as a result of a particular task.
- b. The supervisor's observations during the walk-through survey should include the following:
 - (1) Sources of motion;
 - (2) Sources of high temperature;
 - (3) Types of chemical exposure;
 - (4) Sources of light radiation;
 - (5) Sources of noise;
 - (6) Sources of falling objects;
 - (7) Sources of sharp objects;
 - (8) Sources of rolling or pinching objects;
 - (9) Layout of the workplace; and
 - (10) Any electrical hazards.
- c. **Determine Risk:** The second step in the safety assessment process involves the analysis of data gathered during the survey of the workplace. The supervisor should determine the probability of employee exposure to the hazard. A determination of actual risk can be applied to the task by considering the probability and severity of an event.
 - (1) Use the following to help determine the likelihood of a mishap occurring, based on hazard exposure:
 - (a) Frequent – Occurs often or repeatedly and is continuously experienced.
 - (b) Likely – Occurs several times or on a predictable basis.

- (c) Occasional – Will occur but not on a predictable basis.
- (d) Seldom – May or may not occur but can be expected to occur at some point in time.
- (e) Unlikely – Probability is extremely low. The event will not occur or occurs very rarely.

(2) Use the following to help determine the anticipated outcome of the mishap:

- (a) Catastrophic – Death;
- (b) Critical – Severe injury or occupational illness;
- (c) Moderate – Minor injury or illness; or
- (d) Negligible – Less than minor injury or illness.

(3) Based on the probability and severity of an incident, a risk assessment is generated as is shown in the table below. This information can help determine whether the any risk should be avoided, or mitigated and what hazard control measures – from substitution, to engineering controls, to requiring PPE – should be incorporated to help reduce the risk to a more acceptable level.

RISK ASSESSMENT MATRIX							
(Read right and up)			Probability an Incident will Occur				
			Frequent	Likely	Occasional	Seldom	Unlikely
			A	B	C	D	E
Severity Effects	Catastrophic	I	Extremely High		High		Medium
	Critical	II	High		Medium	Low	
	Moderate	II I	High	Medium			
	Negligible	I V	Medium	Low			

2. Hazard Control: Once the supervisor has identified and documented the hazard, the appropriate control must be selected. Substitution or engineering controls is the preferred choice for controlling hazards. Administrative controls such as SOPs, work/rest charts, etc. are also used to control hazards. Use of PPE is the least preferred.
 - a. Selection of PPE will be based on its protective properties related to the specific hazard and/or conditions of the environment in which it will be used. The supervisor is responsible for maintaining an adequate inventory of PPE and providing it to personnel.
 - b. When requested, the Safety Office will make final determination of the appropriate type of PPE. The type of PPE selected must ensure a level of protection greater than the minimum required to protect employees from the hazards. The PPE selected will be documented on the same form used during the safety assessment.

3. Inspection and Replacement

- a. Inspection: It shall be the responsibility of the employee to properly inspect, clean, store and maintain in good working order all PPE issued to them. Whenever problems or defects are discovered in any of the issued PPE, the employee shall inform their supervisor of the discrepancy, and the defective PPE shall be returned to the designated area in exchange for PPE in proper working order.
- b. Replacement: PPE will be replaced or repaired on an “as needed” basis as determined by the employee’s supervisor. Shoes will not be replaced more frequently than once per calendar year, except in the case of documented on-the-job damage or deterioration. Supervisors will ensure that replacement is made in a timely manner.

4. Recordkeeping

Written records shall be kept to document hazard assessments and employee training. The Supervisor shall maintain their employees’ training records for at least three years. Hazard assessments should be retained indefinitely or until the hazard has been eliminated or minimized to the extent that PPE is no longer required.

G. References

1. US Department of Labor, Occupational Safety and Health Administration, *Personal Protective Equipment*, 29 CFR 1910, Subpart I.
2. American National Standards Institute Z89.1, American National Standard for Industrial Head Protection
3. American National Standards Institute Z87.1, American National Standard for Occupational and Educational Eye and Face Protection
4. American National Standards Institute /International Safety Equipment Association 105-2000, American National Standard for Hand Protection Selection Criteria
5. ANSI Z41, Personnel Protection - Protective Footwear, was replaced by the Society of Testing Material (ASTM) International Standards: ASTM-F 2412-05 Standard Test Method for Foot Protection and ASTM-F 2413-05 Standard Specification for Performance Requirements for Foot Protection