ENVIRONMENT, SAFETY AND HEALTH

WORK PLANNING AND CONTROL

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Version Control

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1.0 INTRODUCTION

At the Sanford Underground Research Facility (SURF) all work is subject to planning and control. Careful planning of work assures that the work is performed safely and efficiently. More specifically, work planning ensures the scope of work is understood, appropriate materials are available, all hazards have been identified and mitigative efforts established, and all affected individuals understand what is expected of them.

2.0 SCOPE

This chapter applies to all SURF personnel, including researchers and project sponsors, temporary employees and contract/subcontractor/term employees when conducting non-administrative work on SDSTA property.

3.0 DEFINITIONS

Hazard - Condition, event, or circumstance that could lead to or contribute to an unplanned or undesirable event. A hazard is the potential for harm. In practical terms, a hazard often is associated with a condition or activity that, if left uncontrolled, can adversely affect personnel, equipment or the environment.

Hazard Analysis (HA) – A hazard analysis is the first step in a process used to assess risk. The result of a hazard analysis is the identification of different type of hazards and the mitigations to minimize the hazards. A hazard analysis then becomes a tool to aid in planning work.

Informal, Documented, and Formal - Low risk HA (see table 1) are considered informal and can be either verbal or documented on a Low Risk Analysis (LRA). A formal HA is written on a JHA Form and is termed a Job Hazard Analysis (JHA), or for routine/repetitive work is written on a SOP Form and is termed an SOP.

Job Hazard Analysis (JHA) - A job hazard analysis is a documented process that focuses on the sequential steps of the task, the associated hazards and their identified controls. It considers the relationship between the worker, the task, the tools, and the work environment.

Job Site Walk Down – An evaluation of the job site for identifying hazards, controls, and operational considerations.

Low Risk Analysis (LRA) – A field level process used to document low risk work activity planning. (Note: Field level Job Hazard Analysis Notebook)

Pre-Job Briefing – Dialogue between those involved in the work which describes the scope of work, procedural steps, roles and responsibilities, and hazards and controls.

- Formal: Documented process
- Informal: Undocumented (verbal) process

Pre-job Briefing may consist of:

- Toolbox Talk Form
- Pre-Shift meeting

Post-Job Review – A review of the work that has been performed to identify any improvements or conditions that should be recorded for future job planning efforts.

Risk - Potential to cause harm or damage to a person, property or environment.

- Low Risk: General tasks performed on a normal daily basis
- High Risk: Tasks with an elevated potential to cause harm

Risk Assessment - The overall process used to evaluate the hazard and risk factors with the potential to cause harm.

Standard Operating Procedure (SOP) – Formal documented process that focuses on a specific task and describes the standardized method to safely perform it.

Subject Matter Expert: A person, department or organization who by their experience level, education, training or background are uniquely qualified to assess specific hazards and controls.

Work Planning and Control (WPC) – Systematic process for determining methods for completing the assigned task safely and efficiently. The process includes:

- Defining the work to be performed
- The methods for performing the work
- Hazard analysis
- Pre-job briefing
- Work authorization

4.0 ROLES & RESPONSIBILITIES

4.1 Supervisors:

- Ensure that employees are trained to perform the assigned work and in the use of WPC.
- Plan the work and identify those activities that require a JHA or SOP.
- Conduct job site walk-downs.
- Ensure WPC documents are developed, reviewed and signed before work begins.
- Conduct a pre-job briefing with employees before work begins.
- Ensure that work is performed in accordance with WPC documents.
- Retain copies of WPC documents per retention guidelines (see Section 5.7).
- Seek advice from the ESH Department, as appropriate.

4.2 Workers / Researchers:

- Participate in development of the WPC documents.
- Review and sign WPC documents prior to start of work.
- Participate in a pre-job briefing with co-workers who share in the work performance before work begins.
- Perform work in accordance with the WPC documents.
- Contact your supervisor or ESH Department with any questions on the WPC documents.

4.3 Environment, Safety, and Health (ESH) Department

- Provide assistance in preparation of WPC documents.
- Review and concur on all JHA and SOP documents.
- Provide WPC training.

5.0 PROCEDURE

5.1 Job Site Walk Down

Where the job site can be safely accessed, an evaluation of the job site should be conducted. This evaluation should be conducted prior to developing the hazard analysis in order to assure all job site hazards and work control issues are identified and addressed.

5.2 Hazard Analysis Process (see also flow chart)

1. The supervisor and employees perform an assessment of the risks in accordance with Appendix A, Table 1. ESH professionals are available to assist.
2. A written JHA or SOP is required if:
    a. The task involves two or more of the low-risk general hazards or one high-risk hazard in Appendix A, Table 1.
    b. The task is outside the normal duties and responsibilities for your group and involves one or more hazards from Appendix A, Table 1.
3. If a written JHA or SOP exists, it must be reviewed and revised as appropriate for current job site conditions and to incorporate previous work experiences and lessons learned.

5.3 Development of JHA/SOP

1. Detailed scope of work, including how the person/team intends to complete the work;
2. Walk down or inspection of the work area and equipment while planning the work;
3. Complete the work planning sections and identify materials and equipment to be used;
4. Identification of hazards with Subject Matter Expert involvement;
5. Identification of work requirements, controls, procedures, instructions and personal protective equipment necessary to perform the work safely (including permits); and
6. Involvement of the workers in the preparation of the work plan.
    a. The level of detail in the JHA/SOP should be appropriate for the complexity of the work and the hazards involved.
    b. The supervisor will review the JHA/SOP for completeness and determine whether the hazards for the work have been adequately identified and controlled. Permits, Safety Data Sheets (SDS), and other supporting documents must be available at the work site and may be attached to the JHA/SOP.
7. Obtain approvals and concurrences from:
    a. Department / Science Leadership
    b. Author / Owner
    c. ESH staff
8. External JHA/SOP or Toolbox Talk formats are allowed provided the above elements are sufficiently addressed and acceptable to SURF.

5.4 Pre-Job Briefing

1. In all cases, a pre-job briefing is required. The individuals performing the job shall discuss the work plan to ensure everyone is aware of how the job will proceed. The following will be discussed at a minimum:
    a. Summarizing the critical steps and materials:

This includes steps where the success depends solely on the individual work, and that serious injury or significant loss of property could result from not following the prescribed safe work procedures.

b. Anticipating what can go wrong or where errors can occur:
This may include distractions, confusing procedures, inexperience and assumptions. Examining what errors have occurred with the activity in the past may be helpful.

c. Foreseeing consequences:
What could go wrong? How can it be prevented?

d. Review operating experience:
How has the task gone in the past? Work plans should incorporate defenses to prevent a repeat incident.

e. Review of Equipment:
Review of PPE, equipment necessary for the job, engineering controls, and equipment controls.

2. For low-risk tasks not requiring a written JHA/SOP, the pre-job briefing may be a verbal exchange or documented on the Low Risk Analysis (LRA).
3. For more complex and higher-risk tasks that require a written JHA/SOP, a more detailed and formal pre-job briefing is required. (Tool Box Talk form).
4. All who participate in the pre-job briefing will document the review by signing the Tool Box Talk form. This will release the work to be performed.

5.5 Performance of Work

1. The work plan/hazard analysis shall be readily available to those performing the work.
2. Anyone entering the work site must be informed of the hazards prior to being allowed on the work site.
3. The work activity must be performed in accordance with the WPC process.
4. Work activity shall stop immediately if:
    - There is a change in the work scope,
    - Work conditions change,
    - New hazards are identified, or
    - The controls prove inadequate or ineffective.

   If work activity is stopped for any of these reasons, the WPC documents shall be reviewed and revised as necessary.
5. Unplanned situations may arise requiring deviations from the WPC process to address immediate dangers. Once the situation becomes stabilized, the WPC process will be updated to reflect change to conditions. Worker safety is paramount.

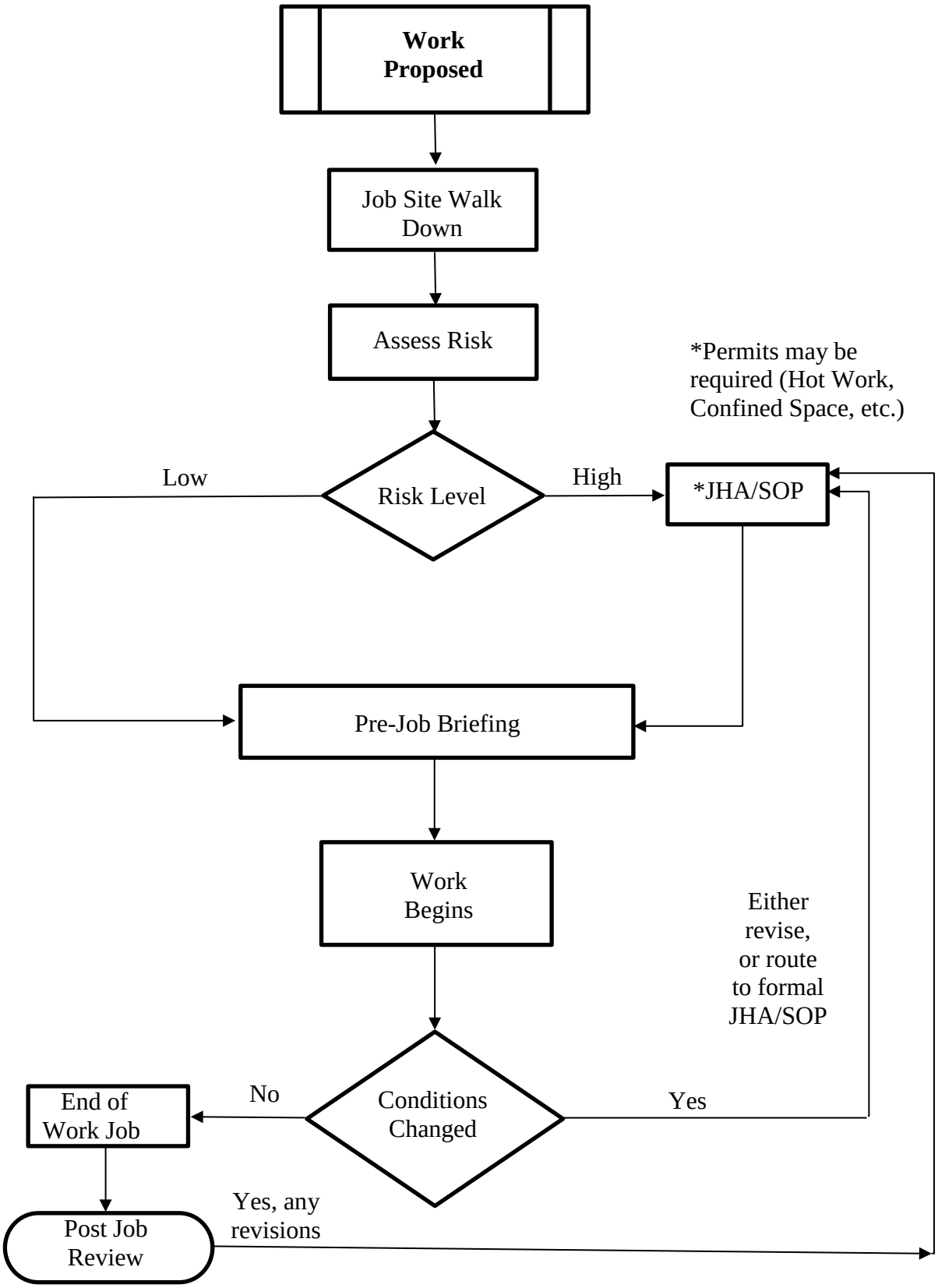
5.6 Post-Job Review

Ensure any updates to the JHA/SOP if improvements are identified.

5.7 WPC Record Retention

Records will be archived and will be made available to anyone who requests them for the purposes of providing oversight, trending, and/or lessons learned.

Hazard Analysis Process Flow Chart



5.8 References and Related Documents:

- JHA Form
- Tool Box Talk Form
- SOP Form
- Low Risk Analysis (previously known as Job Hazard Analysis Notebook)

Appendix A: Guidelines for Formal Hazard Analysis

Table 1 – Low and High Risk Hazards

Low-Risk General Hazard (If your task has TWO or more low-risk general hazards, write a JHA/SOP.	**High-Risk Hazards** (If your task has ONE high-level hazard, write a JHA/SOP.
Chemicals, Hazardous or Toxic Substances • Use of chemicals/materials, which under a normally controlled work environment, **do not** pose a significant safety or health hazard. (Refer to the SDS). Contact ESH Environmental Manager / IH Specialist for guidance in determining the hazard level of chemicals.	• Use of materials that are flammable, combustible, corrosive, reactive, toxic, caustic, poisonous, where the quantity or manner of use may adversely affect workers, equipment, or the environment. (Refer to the SDS). Contact ESH Environmental Manager / IH Specialist for guidance in determining the hazard level of chemicals. Examples: Handling and transporting hazardous substances such as bare lead bricks that may expose workers to Pb dust.
Confined Space Work • Work in a space that has limited or restricted means for entry or exit. Work in a "Non-Permit Required Confined Space" or a "Permit Required Confined Space" that has been reclassified as a "Non-Permit Required Confined Space".	• Entry into a "Permit Required Confined Space" when not all hazards can be incorporated into the permit. Contact IH Specialist for guidance and permit.
Crane & Hoist Use • Any lifting operations > 80% of the rated capacity using approved lifting fixtures and devices.	• Load requires exceptional care in handling because of size, shape, close tolerance installation, high susceptibility to damage, or other unusual factors (e.g. High Value Lift). • If load exceeds 80% of the rated capacity. • Lifts involving prototype or initial use of in-house lifting devices / fixtures or attachments. • Critical Lift
Cryogenic Equipment or Systems • Refer to high risk column.	• Working with cryogenic materials of any volume. Potential for exposure to reduced atmospheric oxygen. • Transporting cryogenic dewar in a conveyance or vehicle. • Working on cryogenic systems.

Electrical Work • Tasks during which workers are not likely to be exposed to voltages, currents, or stored electrical energy of sufficient magnitude and duration to injure if shocking, arcing, sparking, or heating should occur.	• Work activities near or on exposed electrical conductors, circuits, or equipment that are or may be energized and where there is a significant and unmitigated (potential) exposure to electrical shock or a significant potential for arcing, flash burns, electrical burns, or arc blast. • When not all hazards can be incorporated into the **Energized Electrical Work Work Permit or Equipment Specfic Lockout Procedure**. • Concrete coring and cutting when hazards cannot be adequately addressed in the Energized Electrical Work Permit (EEWP). • First-time, unattended operation of non-commercial electronics or with electronics modified at SURF.
Excavation and Trenching • Trenching or excavation less than 4 feet in depth.	• Where the potential exists for encountering buried utilities. • Entering an excavation/trench that is > 4 feet in depth. • Wet unconsolidated materials are present • Hazardous atmosphere potential • Sewer or Natural gas lines exposed • Exposure to vehicular traffic
Fall Exposure • Work from a ladder at <4-feet (measured from the level on which standing) • Work from a scissors lift or articulating boom lift equipped with guard rails and used in accordance with manufacture requirements.	• Fall potential is > 4-feet. when performing maintenance work. ***NOTE:*** *HA also requires rescue plan when using fall protection equipment.* • Any use of scaffolding, including erection of the scaffolding. ***NOTE:*** *Any erection or dismantling of scaffolding must be overseen by scaffolding competent person.*
"First time use" of new or unfamiliar equipment • Training has been conducted by a competent person. • Competent person is present during "First time use/ initial use".	• Any first time use of mechanical or electrical equipment if a significant injury could occur. • Activity presenting unfamiliar hazards to employees.

Flammable Atmosphere • When the potential for a hazardous atmosphere does not exist. Contact ESH.	• When the potential for a hazardous atmosphere exists. Contact ESH.
Hand Tools and Sharp Instruments • Using commercially available tools as per the manufacturer's recommendation.	• Using in-house designed or modified tools or tooling. • During the commissioning phase/deployment of non-commercial tools • Whenever a new unfamiliar tool is introduced.
Hazardous Substance Abatement Activities •None. Refer to high risk column.	• Work involving abatement of asbestos, beryllium, lead, PCBs or mercury.
Hydraulic and Pneumatic Systems (Fluids such as: oil, water, air, etc.) • Connecting hoses or lines to pressurized oil, water, or air systems. • The use of standard equipment by compentent individuals. • Pressure washing operations or power sprayers.	• Any work where a sudden uncontrolled release (failure) of pressure or fluids could result in injury (e.g. people working around a heavy object supported hydraulically could get "caught between") or impact to the environment (air, land, or water). • Modifying or reconfiguring hydraulic or pneumatic systems. • Operating hydraulic cutters.
Lasers • Lasers less than class 3b.	• Work with a Class 3b or 4 lasers. Note: Work with a class 3b or 4 laser requires Subject Matter Expert approval.
Machining and Grinding • The use of standardized machinery per manufacturer's recommedations and in conjunction with a Hot Work Permit.	• Machining or grinding hazardous materials such as lead, etc. • Removal of structural welds on large weldments. • Machinery operated without appropriate guards. • Any work that generates sparks in an area with flammable liquids or combustible materials, or in a confined space.

Magnetic Fields • Refer to high risk column.	• Work in > 2.5 gauss field if personnel are fitted with cardiac pacemakers or metallic implants. • Work near any area with a fringe field of more than 1 kilogauss. • Any time averaged exposure of people to 300 gauss or more per unit time. • Any situation were ferrous objects can be subject to magnetic forces causing sudden or unexpected movement into the magnetic field.
Noise Hazard • Exposure <85.0 dBA 8-hour TWA.	• Exposure >90.0 dBA 8-hour TWA (ESH must be consulted)
Other Work Environments • Nuisance dust from general cleaning, sweeping, or windy conditions. • Work in areas of excessive heat or cold.	• Any remediation work to Historical Buildings. • Exposure to cleaning material with significant amounts of visible mold. • Exposure to animal feces during clean-up operations (birds, rodents, raccoons, etc.) • Working with systems or equipment which are pressurized > 15 psig. • Working with vacuum vessels. • Work requiring construction, altering, and/or repair, including painting and decorating. • A material being used in a state that is altered from its original form, that as a result may be hazardous to the health of the workers, the environment, or presents a potential for fire/explosion. • Potential for Fatigue (e.g., long hours, short deadlines). • Activities presenting hazards unfamiliar to employees.
Radiation •None. See high risk column.	• All work with radioactive materials (regardless of whether quantities are exempt) or radiation producing devices must be coordinated with the SURF Radiation Safety Officer.
Repetitive Motion or Ergonomically Challenging Tasks • <50 lbs. Never to exceeds one's abilities.	• Lifting unusually shaped or heavy >50 lbs • Tasks with repetitive motion. • Work conducted from awkward positions with the potential to cause harm.

Respiratory Hazards • Work involving a voluntary use of a filtering face piece respirator . See ESH representative for details.	• Work that requires respirator protection due to a potential overexposure.
Release/Spill Potential Refer to SDS sheets and high risk column. See ESH	• Potential release of hazardous materials list (list found in 40CFR302, and 40CFR355). • Potential release of chemicals, petroleum products, etc. to surface waters (streams or ponds) or drains that lead to surface waters. • Potential release, intentional or unintentional, of chemicals, petroleum products, etc. to the sanitary system.
Stored Energy Commercial activated devices designed to release energy in a controlled manner and will not induce harm.	• Any unusual arrangement of heavy objects. Other mechanical stored energy hazards (e.g. springs). • Work on equipment where there is potential for unexpected release of energy (hydraulic, pneumatic, thermal, potential, etc.) where LOTO **is required**. • Work near equipment that has the potential to release stored energy through falling, rotating, or other unplanned movement **NOT** covered by a LOTO procedure. • Work on or near computer actuated mechanical equipment.
Waste Generation • See ESH	• Work that will generate a mixed (radioactive + regulated) waste. • Work that will generate more than 5 gallons of regulated waste. • Work that will generate waste that has a flash point below 140 degrees F, a pH below 2 or greater than 12.5, or which contains any toxic substance (see Safety Data Sheet).
Welding, flame cutting, brazing, open flame work • See ESH for Hot Work Permit	• Welding work in an area where passers-by can see the arc. • Work requiring welding, brazing, or open flames.