



SANFORD UNDERGROUND RESEARCH FACILITY

SOUTH DAKOTA SCIENCE AND TECHNOLOGY AUTHORITY

Hot Work Standard

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Revision History

Rev	Date	Section	Paragraph	Summary of Change	Authorized by
02	12/12/2023	5	5.3 & 5.5	Added bullets to section 5.3 and 5.5	CCR 868
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1.0 Purpose

The purpose of the Hot Work Standard is to prevent loss of life and property from fire or explosion as a result of hot work and provides guidance for personnel who manage, supervise and perform hot work.

SDSTA references the following to fulfill standard:

- OSHA 1910, Subpart Q, Welding, Cutting and Brazing

2.0 Scope

This standard applies to all personnel involved in hot work activities at Sanford Underground Research Facility (SURF).

3.0 Definitions

Fire Watch – A designated individual responsible for observing the area for fire hazards and/or other unsafe conditions during and after hot work.

Hot Work – Work such as riveting, welding, flame cutting or other fire or spark-producing that has the potential to create an ignition hazard and presents a fire hazard. This does not pertain to energized electrical work or other energized sources.

High Risk Hot Work – A work location or condition which poses a greater than normal threat to operations because of the heightened probability of fire initiation and/or is applied to an area where the consequence of a fire would be catastrophic, e.g. Yates Shaft.

Hot Work Permit – A document issued by SDSTA for the purpose of authorizing performance of hot work based on single-shift or multi-shift durations. This permit contains a set of precautions and reminders to be followed and will be posted for inspection in a visible and accessible location near the work site.

Hot Work Log – An electronic record maintained by the PAIs of the Hot Work Permits issued. It includes the date, location, start and stop times, and contact information.

Hot Work Operator – Individual responsible for executing the work in accordance with the written Hot Work Permit. This work includes gas welding/cutting equipment and electric arc welding or cutting machines.

Long Term Designated Hot Work Location – A permanent location designated and authorized for hot work operations. A location that is noncombustible or fire-resistive construction, essentially free of combustible and flammable contents, and suitably segregated from adjacent areas.

Permit Authorizing Individual (PAI) – ESH personnel authorized to issue hot work permits.

Permit Owner – SDSTA management representative responsible for obtaining approval and insuring that work is performed in accordance with the requirements set forth by the PAI.

Fire blanket/curtain – A heat-resistant fabric designed to be placed in the vicinity of a hot work operation with light moderate exposures such as that resulting from chipping, grinding, heat treating, sand blasting, and light welding. Designed to protect machinery and prevent ignition of combustible materials such as wood that are located adjacent to the underside of the blanket.

Fire Pad – A heat-resistant fabric designed to be placed directly under a hot work operation such as welding and cutting. It is intended for use in horizontal applications with severe exposures such as that resulting from molten substances or heavy horizontal welding designed to prevent the ignition of combustible materials that are located adjacent to the underside of the pad.

4.0 Responsibilities

4.1. Deputy Director for Operations

- 4.1.1. Authorizes and sign all designated high risk hot work permits.

4.2. Environment, Safety and Health (ESH) Director

- 4.2.1. Concurs and sign all designated high risk hot work permits.

4.3. SDSTA Department Directors

- 4.3.1. Responsible for the safe operation of hot work activities. The responsibilities listed below apply to the line managers and/or project managers involved in the safe operation of hot work activities.
- 4.3.2. Ensures that individuals involved in hot work operations are trained in the safe operation of their equipment and in the safe use of the process.
- 4.3.3. Ensures that individuals involved in hot work operations have an awareness of the inherent risks involved and understand the emergency procedures in the event of a fire.
- 4.3.4. Ensures that, as part of the quality assurance process, that the source of a potential hazard, such as a high CO reading or the smell of smoke underground, can be determined within 30 minutes of notification from a hoist operator or the Duty Officer.

4.4. ESH Department

- 4.4.1. Develop, implement, and maintain this standard.
- 4.4.2. Serve as resource for any questions regarding hot work.
- 4.4.3. Ensure that contractors (and subcontractors) are aware of the requirements of this standard.
- 4.4.4. Serve as PAI to issue permit and maintain hot work log in the electronic database.

4.5. SDSTA Project Manager

- 4.5.1. Ensures that the work is performed in accordance with the requirements in the ESH-(7000-P)-73422 Hot Work Permit.
- 4.5.2. Allows only individuals to perform hot work who are trained in hot work activities.
- 4.5.3. Ensures that contractors are advised about site-specific flammable materials, hazardous processes or conditions, or other potential fire hazards.
- 4.5.4. Determines need for an ESH-(7000-P)-175959 Disablement or Impairment Permit when applicable.

4.6. Permit Owner

- 4.6.1. Identifies hot work tasks in the projects under their control.

- 4.6.2.** Allows only individuals to perform hot work who are competent with respect to the hot work task being performed and who have been trained with respect to the requirements of this standard and permit procedure.
- 4.6.3.** When a Hot Work Permit is required, the PAI should be contacted at least 24 hours in advance. If a hot work permit is required outside of normal administrative hours, contact an ERT member to obtain a permit. The permit owner must assure all inspections, precautions, and reporting pertaining to hot work are performed and documented.
- 4.6.4.** Provides hot work planning documentation if the hot work is determined to be high risk.
- 4.6.5.** Ensures fire protection and extinguishing equipment is immediately available at the work area.
- 4.6.6.** Be sufficiently familiar with the content of this standard so they can determine when a Hot Work Permit is needed for activities under their supervision.
- 4.6.7.** Ensures that all contractors (and subcontractors) in their work area adhere to the requirements of this standard.

4.7. Hot Work Operator

- 4.7.1.** Examines the work area and limits work to the permitted area.
- 4.7.2.** Obtains an issued permit by the PAI prior to starting hot work operations.
- 4.7.3.** Determines need for a Disablement or Impairment Permit when applicable.
- 4.7.4.** Ensures that all requirements of the Hot Work Permit are met.
- 4.7.5.** Assigns Fire Watch position as required by the Hot Work Permit.
- 4.7.6.** Ensures the permit remains at the worksite until the work is complete.
- 4.7.7.** Protect combustibles that cannot be removed by covering them with an approved noncombustible material such as a fire blanket/curtain or pad, as per the Hot Work Permit.
- 4.7.8.** Handles all hot work equipment in a safe manner as described in this section.
- 4.7.9.** Ensures special precautions taken to avoid accidental operation of automatic fire detection or suppression systems (e.g. special extinguishing systems or sprinklers).
- 4.7.10.** Notifies all affected personnel and ERT of Hot Work activities prior to work commencing.
- 4.7.11.** Ensures familiar with the procedure for reporting an emergency in the event of a fire. Verify the location of the nearest means of emergency communication. Locate the ESH-(6000-FD)-100304 Emergency Reporting System Flow Diagram posted in the work area.
- 4.7.12.** Permits can be placed in a water-resistant container (e.g. baggie) and carried by the hot work operator where hot work is performed in wet locations.
- 4.7.13.** Takes appropriate measures to remove any hazards identified on the permit or protect them from possible ignition.
- 4.7.14.** Ensures that fire protection and extinguishing equipment are adequate, functional, and properly located.
- 4.7.15.** Performs a pre-use inspection of equipment to ensure all are in safe operating condition.
- 4.7.16.** Issues a stop work if unsafe conditions are discovered or develop while performing the task.

4.8. Fire Watch

- 4.8.1.** Monitors for unsafe conditions during and after hot work.
- 4.8.2.** Understands the hazards of the work site and of the hot work operations.
- 4.8.3.** Confirms that safe conditions are maintained during hot work operations, keeping the work area free and clear of combustibles.
- 4.8.4.** Verifies that hot slag or sparks from hot work operations do not come into contact with combustibles.
- 4.8.5.** Stops the hot work operations if unsafe conditions develop.
- 4.8.6.** Inspects fire protection and extinguishing equipment to verify it is fully charged, is operable, and appropriate for the type of possible fire.

- 4.8.7.** Has fire-extinguishing equipment readily available and must be trained in its use.
- 4.8.8.** Is familiar with the procedure for reporting an emergency in the event of a fire. Verify the location of the nearest means of emergency communication. Locate the Emergency Reporting System Flow Diagram posted in the work area.
- 4.8.9.** Watches for and attempts to extinguish any incipient state fires that are within the capacity of the available equipment. If the fire watch determines that the fire is not within the capacity of the equipment, the fire watch must immediately report the emergency.
- 4.8.10.** Remains in the hot work area for at least 30 minutes after completion of the hot work; additional time for Fire Watch may be required by the nature of the job and hazards present and indicated on the permit. During fire watch, it is acceptable to perform other local tasks if those tasks do not distract the person from the fire watch responsibility.

4.9. Contractors

- 4.9.1.** Follow this standard while on SURF property.
- 4.9.2.** Perform a pre-use inspection of equipment brought on SURF property.
- 4.9.3.** Furnish their own fire extinguishers. Units shall be of type and size suitable for the job to be completed and listed as such in the hazard analysis.
- 4.9.4.** Ensure inspections tags and seals are current for all extinguishers used on all jobs.

5.0 Instructions

- 5.1.** All hot work conducted at SURF must be authorized through a Hot Work Permit. The permit authorizes work for a specific task(s) conducted in a specific area. The location of hot work shall be identified on the permit. Hot work activities shall follow SDSTA's work planning and control process.
- 5.2.** When a Hot Work Permit is required, the PAI should be contacted at least 24 hours in advance. If a hot work permit is required outside of normal administrative hours, contact an ERT member to obtain a permit. The permit owner must assure all inspections, precautions, and reporting pertaining to hot work are performed and documented.
 - The process for obtaining, filling out, conducting, and closing hot work can be found on ESH-(7000-WI)-207069 Hot Work Permit Work Instruction.
- 5.3. Hot Work**
 - Hot work has the potential to create an ignition hazard and presents a fire hazard such as:
 - o Grinding
 - o Chain Saw Sharpening
 - o Heat treating
 - o Hot riveting
 - o Powder-driven fasteners
 - o Oxy-Acetylene torch
 - o MAPP gas torch
 - o Thawing pipe
 - o Torch-applied roofing
 - o Welding processes

- Reciprocating saws when cutting metal
- Similar applications producing or using a spark, flame or heat.
- Exceptions:
 - A Hot Work Permit is not required for the following:
 - ◆ Permanently installed boilers, furnaces, and cooking stoves.
 - ◆ Electric soldering irons.
 - ◆ Bunsen burners or similar laboratory operations integrated into laboratory safety management system. (if the operation generates smoke, impairment of the smoke detector may be necessary)
 - ◆ Charcoal grills, or gas grills when located outside, at least 25 feet from flammable gas/liquid storage areas and the nearest building.
 - ◆ Resistance welders.

5.4. Hot Work Safety Measures

- Adequate ventilation shall be provided for all welding, cutting, brazing, and related operations. Adequate ventilation shall be enough ventilation such that personnel exposures to hazardous concentrations of airborne contaminants are maintained below the allowable limits. Respiratory protective equipment shall be used when adequate ventilation is not practical.
- Personnel shall take precautions to avoid breathing the airborne fume(s) directly. Avoiding the fume can be done by positioning of the work, the head, or by ventilation which captures or directs the fume away from the face.
- Hoses, cables, and conduits shall be located and protected to minimize tripping hazards.
- When welding or cutting in confined spaces, gas cylinders and welding power sources shall be located outside of the confined space.
- When the hot work operator is required to be on a ladder while welding or cutting, the ladder should be nonconductive or otherwise insulated from work and ground. Personnel will follow ladder safety instructions in the ESH-(7000-S)-73415 Fall Protection and Prevention Standard.
- Hot Work Operators shall wear appropriate Personal Protection Equipment for the task being performed.

5.5. High Risk Areas

- If the hot work is determined to be high risk, the permit owner or hot work operator must provide work planning documentation.
 - The Deputy Director for Operations and Director of ESH signatures are required on the permit prior to work commencing.
- The Yates Shaft from the 300 level to the 4850 level is a high-risk hot work area due to the timber sets which are combustible. This is a main ventilation intake of the underground workings.
 - When conducting hot work within the Yates Shaft, a fire blanket/curtain/pad is required to prevent sparks or hot metal from falling below the work area.

- Headframe above the shaft collar and 35 feet perimeter of the edges of the shaft.
- Any areas of natural vegetation within 50 feet of where hot work is performed.

5.6. Multiple Shift Hot Work Permits

- Permits can be issued for one shift or for multiple shifts. Where conditions are constant, permits can be issued, at the PAI's discretion, for a period of up to 31 days. If a Hot Work Permit is issued for more than one shift, a re-inspection of the area is required prior to hot work performance each shift when the permit is in use.

5.7. Long Term Hot Work Designated Locations

- SDSTA designates the following locations.
 - Ross Warehouse Shop, located in the Ross Yard
 - Ross Headframe Workbench Area (Grinding only)
 - Ross Shaft
 - Lower Foundry (Grinding only)
 - Yates Maintenance / Battery Shop, located in the lower Yates Yard
 - Yates ramp tool room (Grinding only)
 - Waste Water Treatment Plant – New shop (Boiler/Generator room)
 - Waste Water Treatment Plant – Influent building (Grinding only)
 - Waste Water Treatment Plant – Wash bay pad area
 - Rounds Operation Center – Maintenance shop area
- Designated locations do not have the requirements for notification or providing start and stop times.
- Designated locations will align with work planning and controls.
- Designated locations can be revoked in non-complying locations.
- At a minimum, monthly inspections are required and documented in the electronic work order system.
- Proper housekeeping shall be maintained.
- SDSTA utilizes signage to identify these designated locations at SURF.

5.8. Hot Work and Fire Detection Systems

- When it is likely that a fire detection system will be activated by a hot work operation, the system may be disabled, and the disablement or impairment requirements shall be implemented. See ESH-(7000-S)-17588 Disablement or Impairment Standard.
 - The system must be reactivated when the hot work operation is completed or at the end of the workday, whichever comes first.

5.9. Completion of Hot Work

- The hot work operator will retain the hot work permit at the job site until the work is completed.

- Fire Watch will continue for a minimum half-hour after hot work is completed; additional time for Fire Watch may be required by the nature of the job and hazards present and indicated on the permit.

6.0 Documented Information/Related Documents

- 6.1.** ESH-(7000-P)-73422 Hot Work Permit
- 6.2.** ESH-(7000-P)-175959 Disablement or Impairment Permit
- 6.3.** ESH-(7000-WI)-207069 Hot Work Permit Work Instruction
- 6.4.** ESH- (7000-S)-17588 Disablement & Impairment Standard
- 6.5.** ESH-(6000-FD)-100304 Emergency Reporting System Flow Diagram
- 6.6.** OSHA 1910, Subpart Q, Welding, Cutting and Brazing