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Specification
for

Hot Work Procedure

REVISION

Rev No.	DCN No.	Change Summary	Release Date	DCN Initiator	Document Owner
4	DCN0860	Added terminology; Responsibilities spelled out, duties defined.	12/4/12	J. Colavito	R. Segura

Prior revision history, if applicable, is available from the Document Control Office.

1 PURPOSE AND SCOPE

The purpose of this document is to ensure the safe operation of hot work equipment at the College of Nanoscale Science and Engineering (CNSE) facility in accordance with the requirements set forth in 29 CFR 1910 Subpart Q - *Welding, Cutting and Brazing*.

To pinpoint areas where hot work can be conducted, to establish what controls shall be utilized and to determine what training is needed.

To identify hot work operations, due to their risk, that may be exempt from this procedure.

1.1 Scope

A Hot Work Permit (EHS-00029-F1) must be completed any time an activity involves the use of an open flame or spark producing equipment. Such activities include, but not limited to, welding, cutting, brazing, burning, grinding and soldering operations.

These work instructions apply to all CNSE employees, tenant employees, contractors and sub-contractors that are engaged in hot work operations at the CNSE facility.

2 RESPONSIBILITIES

2.1 **Hot Work Operator**: Person physically performing the Hot Work

The hot work operator is responsible for ensuring that all equipment is inspected prior to use, that equipment is in good operating order and that the appropriate controls have been put in place in accordance with the Hot Work Permit (EHS-00029-F1).

2.2 **Fire Watchers**: Person designated for fire watch during Hot Work and 30 minutes after completion

Fire Watchers shall have fire extinguishing equipment readily available and be trained in its use. They shall be familiar with the equipment for sounding an alarm in the event of a fire. They shall watch for fires in all exposed areas, try to extinguish them only when obviously within the capacity of the equipment available, or otherwise sound the alarm. A fire watch shall be maintained for at least a half hour after completion of welding or cutting operations to detect and extinguish possible smoldering fires.

2.3 Work Sponsor

Shall recognize the responsibility for the safe usage of cutting and welding equipment on the property and based on fire potentials, establish areas for cutting and welding in other areas. Designate an individual responsible for authorizing cutting and welding operations in areas not specifically designed for such processes. Ensure that cutters or welders and their supervisors are suitably trained in the safe operation of their equipment and the safe use of the process. Advise all contractors about flammable materials or hazardous conditions of which they may not be aware.

2.3.1 Work Sponsor and operator sections must be completed at time of submittal to Work Authorization Permit Meeting on both the Work Authorization Permit AND the Hot Work Sub-Permit.

2.4 Supervisor/Manager

Shall be responsible for the safe handling of the cutting or welding equipment and the safe use of the cutting or welding process. Determine that combustible materials and hazardous areas present or likely to be present in the work location have been identified. Ensure combustibles are protected from sources of ignition. Secure authorization for the cutting or welding operations from the designated management representative. Determine that the hot work operator secures his approval that conditions are safe before going ahead. Ensure that fire protection and extinguishing equipment are properly located at the work location. Where fire watches are required, ensure that they are available.

3 ASSOCIATED DOCUMENTS

EHS-00029-F1 Hot Work Permit

4 SAFETY

Prior to the beginning of the work, the hot work operator shall evaluate the need for engineering controls and necessary Personal Protective Equipment.

4.1 **Engineering Controls** – A fume collector shall be used as a control to allow for the adequate removal of welding fumes from the hot work operators breathing zone. A fume collector shall be selected for a hot work operation based on the following circumstances:

4.1.1 The number of hot work operators conducting hot work in one area, simultaneously (minimum of 10,000 cubic feet per welder).

4.1.2 The possible evolution of hazardous fumes, gases, or dust as a result of the use of such metals as Fluorides, Zinc, Beryllium, Mercury, Cadmium, Lead, Stainless Steel, and/or Cleaning Compounds.

4.1.3 The hot work being performed is in an enclosed, confined or screened area, which is not equipped with adequate ventilation.

4.2 **Protective Eye Protection** – All glass for lenses shall be tempered, substantially free from air bubbles, waves and other flaws. Except when a lens is used to provide proper optical correction for defective vision, the front and rear surfaces of lenses and windows shall be smooth and parallel.

4.2.1 Lenses shall bear some permanent distinctive marking by which the source and shade may be readily identified.

4.2.2 The following is a guide for the selection of the proper shade numbers.

Welding operation	**Shade No.**
Shielded metal-arc welding - 1/16, 3/32, 1/8, 5/32 inch electrodes	10
Gas-shielded arc welding (nonferrous) - 1/16, 3/32,1/8, 5/3 inch electrodes	11
Gas-shielded arc welding (ferrous) - 1/16, 3/32, 1/8, 5/32 inch electrodes	12
Shielded metal-arc welding: 3/16, 7/32, 1/4 inch electrodes 5/16, 3/8 inch electrodes	 12 14
Atomic hydrogen welding	10-14
Carbon arc welding	14
Soldering	2
Torch brazing	3 or 4
Light cutting, up to 1 inch	3 or 4
Medium cutting, 1 inch to 6 inches	4 or 5
Heavy cutting, 6 inches and over	5 or 6
Gas welding (light) up to 1/8 inch	4 or 5
Gas welding (medium) 1/8 inch to 1/2 inch	5 or 6
Gas welding (heavy) 1/2 inch and	6 or 8

4.2.3 A welding helmet with filter lenses and plates must meet the test for transmission of radiant energy prescribed in ANSI Z87.1-1968.

4.3 **Protective Clothing** - Employees exposed to the hazards created by welding, cutting, or brazing operations shall use heat resistant apron, sleeves and gloves that are appropriate for hot work operations.

4.4 **Protective Screens** – Shall be put in place to protect persons from the visual effects of viewing arc welding or cutting and during gas or oxygen cutting or welding.

5 PROCEDURE

5.1 Area Inspection

5.1.1 Prior to starting a project that requires hot work, the supervisor of the hot work operator or in certain cases the hot work operator shall obtain a Hot Work Permit (EHS-00029-F1) from Environmental, Health and Safety (EHS) Department.

5.1.2 Prior to the issuance of the Hot Work Permit, the *EHS department shall* inspect the area using the checklist contained within the Hot Work Permit. Items included in this review include, but are not limited to:

- That the Hot Work operator(s)/fire watch are trained in the safe operation of their equipment;
- Hot Work operator must verify the apparatus used for the hot work is in good condition;
- Hot Work operator must verify they leak checked all equipment prior to use (hoses, regulators, cylinders);
- Verification that the hot work operator(s)/fire watch understand the emergency procedures in the event of a fire or general emergency;
- Verification and location of fire protection and extinguishing equipment;
- Verification that operator(s) are utilizing Personal Protective Equipment; and
- Verification that the proposed work does not jeopardize the health and safety of the operator or others.

5.1.3 If the aforementioned criteria are not met, a permit shall not be issued until all concerns are corrected.

5.1.4 If there are automatic fire detection devices present in the immediate area that need to be deactivated to prevent alarms, the hot work operator must contact the Facilities group to place the system in an ‘off-line status’, so smoke and heat detectors that might be affected by the work do not trigger a building evacuation.

5.2 Fire Watch

5.2.1 The EHS Department requires the employee conducting the hot work to provide a fire watch when hot work is performed in a location where the following condition(s) exist:

- Combustible materials in building construction or building contents are closer than 35 feet to the point of operation of the hot work;
- Combustible materials are more than 35 feet away, but are easily ignited by sparks;
- Wall or floor openings within a 35 feet radius expose combustible materials in adjacent areas, including concealed spaces in walls or floors; and
- Combustible materials are adjacent to the opposite side of partitions, walls, ceiling, or roofs and are likely to be ignited.

5.2.2 The fire watch shall be maintained during all breaks and a half hour after completion of the hot work operation in order to detect and extinguish smoldering fires on the floors above, below and adjacent to the hot work area if applicable.

5.2.3 The hot work area shall be monitored for an additional 30 minutes. This method of monitoring shall be determined at the time the Hot Work Permit is issued. A final review shall take place by the designated Fire Watch thereafter to ensure the hot work area is free from fire.

5.2.4 The Hot Work Permit shall be signed and posted as a record of the hot work operation.

5.3 Permit Posting

A copy of the Hot Work Permit shall be retained and filed by the EHS Department; and *a copy shall be posted in a visible location within the hot work area*.

5.4 Prohibitions

Hot work shall not be permitted in the following areas until the conditions prohibiting hot work have been modified:

- In the presence of explosive atmospheres, or in situations where explosive atmospheres may develop inside contaminated or improperly prepared tanks or equipment which previously contained flammable liquids;

- In areas with an accumulation of combustible debris, dust, lint and oily deposits;
- In areas near the storage of exposed, readily ignitable materials such as combustibles;
- On a container such as a barrel, drum or tank that contained materials that will emit toxic fumes when heated; and/or
- In a confined space, until the space has been inspected and determined to be safe.

6 EXEMPTIONS

6.1 Use of a Gas Tungsten Arc (GTAW) Welding (GTAW) Unit/Tungsten Inert Gas (TIG) welder is not classified as a hot work operation and has a low risk of producing sparks or other ignitable sources.

6.2 As a result of this evaluation, this operation is exempt from the fire watch, combustible segregation and fire alarm system deactivation requirements, set forth in this procedure.

6.3 To comply with this exemption the following equipment shall only be utilized during this operation:

- Lincoln Electric Precision 185 TIG Welding Unit operated in conjunction with Compressed Argon Gas.
- Ace Industrial Products Portable Air Cleaner with 0.3 Micron HEPA Filter.

6.4 This operation is only permitted by management to be performed in CESTM L135B.

7 TRAINING

Employees shall be trained on all aspects of this procedure prior to initial assignment and whenever there is a change.

8 RECORDS

Completed Hot Work Permit(s) shall be kept on file in the EHS Department for at least three years.