

Procedure Subject: Hot Work Procedure	Effective: 6/1/10
Areas: Any area on campus where hot work is being performed.	Reviewed/Revised: 5/18/12

1.0 Purpose, Applicability, and Scope

1.1 **Purpose**- to establish a program and procedures for controlling fire hazards resulting from work activities that have the potential to produce flames, sparks or significant heat.

1.2 **Applicability** – This shall apply to all UTC staff and contractors who perform construction or maintenance work on campus.

1.3 **Scope** –This policy covers the following types of construction or maintenance work:

- Welding and allied processes
- Heat Treating
- Grinding
- Thawing pipe
- Powder-driven fasteners
- Similar applications producing a spark, flame or heat

2.0 Abbreviations, Acronyms, and Definitions

2.1 Abbreviations/Acronyms

MSDS-Material Safety Data Sheet

OSHA-Occupational Safety and Health Administration

PAI-Permit Authorizing Individual

2.2 Definitions

Hot work: Any work that involves welding, cutting, brazing, creates sparks, excessive heat or open flames, or that may be considered by supervisors to create a fire hazard.

Designated Area: A permanent location designed for or approved for hot work operations to be performed regularly.

Fire Watch: Trained personnel who are in attendance during the entire hot work operation and are immediately available to extinguish a fire or take other effective action if needed.

Hot Work Permit: A document issued for the purpose of authorizing a specified activity.

Hot Work Operator (HWO): An individual designated to perform hot work under the authorization of a supervisor.

Permit Authorizing Individual (PAI): Inspects hot work sites prior to the start of hot work operations using the checklist found on the Hot Work permit form.

Welding and Allied Processes: Those processes such as arc welding, oxy-fuel gas welding, open-flame soldering, brazing, thermal spraying, oxygen cutting, and arc cutting.

3.0 Roles and Responsibilities

a. Supervisors shall:

- i. Appoint a designated person (PAI) to issue Hot Work permits to cover the work activities
- ii. Ensure that only approved equipment, such as torches, manifolds, regulators and pressure reducing valves are used.
- iii. Ensure that all individuals involved in the hot work operations are familiar with UTC's hot work procedure.
- iv. Ensure that all individuals involved in the hot work operations are trained in the safe operation of their equipment and the safe use of the process. These individuals must have an awareness of the risks involved and understand the emergency procedures in the event of a fire.
- v. Consult with Safety and Risk management when questions or concerns arise.

b. PAIs shall:

- i. Determine site-specific flammable materials, hazardous processes, or other potential fire hazards present or likely to be present in the work location.
- ii. Ensure combustibles are protected from ignition by
 - Moving hot work to a location free of combustible materials.
 - Moving combustible materials to a safe distance (35 feet) away from hot work.
 - Shielding combustibles with materials designed for that purpose.
 - Scheduling hot work for a time when minimal amounts of combustibles are present.
- iii. Determine that fire protection and extinguishing equipment are properly located and readily available.
- iv. Ensure sufficient local exhaust ventilation is provided to prevent accumulation of any smoke and fume.
- v. Ensure that the hot work permit is updated daily.
- vi. Re-inspect area on a final check one-half hour (30 minutes) after hot work is completed. The area must be monitored for four hours beyond the completion of work. Note monitoring may be conducted by electronic means (e.g. smoke detection).

- vi. Document the hot work permit and insuring all the guidelines on the permit are followed.
 - vii. Ensure that a fire watch is posted at the site when:
 - Hot work is performed in a location where other than a minor fire might develop, or where the following conditions exist.
 - Combustible materials in building construction or contents are closer than 35 ft to the point of hot work.
 - Combustible materials are more than 35 ft away but are easily ignited by sparks.
 - Wall or floor openings are within 35 feet and expose combustible materials in adjacent areas. This includes combustible materials concealed in walls or floors.
 - Combustible materials are adjacent to the opposite side of partitions, walls, ceilings, or roofs and are likely to be ignited.
- c. Employees performing hot work shall:
- i. Obtain a Hot Work permit prior to performing the work.
 - ii. Ensure that combustible materials are not in the vicinity of the work.
 - iii. Safely handle hot work equipment so as not to endanger lives and property.
 - iv. Stop work immediately should unsafe conditions develop and have Safety and Risk Management access conditions.
 - v. Follow all precautions listed on the permit and follow UTC's Hot Work procedure.
- d. Fire Watch shall:
- i. Watch for fires, smoldering material or other signs of combustion.
 - ii. Be aware of the inherent hazards of the work site and of the hot work.
 - iii. Ensure that safe conditions are maintained during hot work operations and stop the hot work operations if unsafe conditions develop.
 - iv. Ensure fire-extinguishing equipment is readily available and be trained in its use.
 - v. Extinguish fires when the fires are obviously within the capacity of the equipment available. If the fire is beyond the capacity of the equipment, sound the alarm immediately.
 - vi. Be familiar with the facilities and procedures for sounding an alarm in the event of a fire.
 - vii. Ensure that a fire watch is maintained for at least 1/2 hour after completion of hot work operations in order to detect and extinguish smoldering fires. More than one fire watch shall be required if combustible materials that could be ignited by the hot work operation cannot be directly observed by a single fire watch (e.g. in adjacent rooms where hot work is done on a common wall).
 - viii. Remain at their post for the prescribed period, including through breaks and lunches, where applicable.
 - ix. Fire Watch cannot do any other job duties while performing fire watch.

- e. Safety and Risk Management shall:
 - i. Provide training to individuals who will issue permits.
 - ii. In coordination with supervisors, review and approve UTC's confined space procedure on an annual basis, or when regulations or policies are changed.
 - iii. Provide regulatory assistance to supervisors, employees and contractors concerning Hot Work.

- f. Contractors shall:
 - i. Ensure their employees follow UTC's Hot Work procedure.
 - i. Ensure that permits are obtained for any hot work being performed and are updated on a daily basis.
 - ii. Ensure that proper conditions exist to allow safe performance of hot work and following precautions listed on the permit.

4.0 Program Activities:

A. Prior to Work

Before hot work operations begin in a non-designated location, a completed hot work permit is required. The permit is to be completed 48 hours prior to the start of the work (exceptions made on an emergency basis) and is valid for one day and one area, and should be posted in the area of hot work for the duration of the activity. An example of a Hot Work permit can be found in Appendix A.

The following conditions must be confirmed by the Supervisor and/or PAH before permitting the hot work to commence:

- Equipment (e.g. welding equipment, shields, personal protective equipment, fire extinguishers) must be in satisfactory operating condition and in good repair.
- The floor must be swept clean for a radius of 35 ft. if combustibile materials, such as paper or wood shavings are on the floor,
- Combustible floors (except wood on concrete) must be
 - kept wet or be covered with damp sand (note: where floors have been wet down, personnel operating arc welding or cutting equipment shall be protected from possible shock)., or
 - protected by noncombustible or fire-retardant shields.
- All combustibile materials must be moved at least 35 ft away from the hot work operation. If relocation is impractical, combustibles must be protected with fire-retardant covers, shields or curtains. Edges of covers at the floor must be tight to prevent sparks from going under them, including where several covers overlap when protecting a large pile.
- Openings or cracks in walls, floors, or ducts within 35 ft of the site must be tightly covered with fire-retardant or noncombustible material to prevent the passage of sparks to adjacent areas.
- If hot work is done near walls, partitions, ceilings, or roofs of combustibile construction, fire-retardant shields or guards must be provided to prevent ignition.

- Fully charged and operable fire extinguishers that are appropriate for the type of possible fire shall be available immediately at the work area. These extinguishers should be supplied by the group performing the hot work. The fire extinguishers normally located in a building are not considered to fulfill this requirement.
- If hot work is done in proximity to a sprinkler head, a wet rag shall be laid over the head and then removed at the conclusion of the welding or cutting operation. During hot work, special precautions shall be taken to avoid accidental operation of automatic fire detection or suppression systems (for example, special extinguishing systems or sprinklers).
- Nearby personnel must be suitably protected against heat, sparks, and slag.

B. Prohibitions

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

1. In the presence of explosive atmospheres, or in situations where explosive atmospheres may develop inside contaminated, improperly prepared tanks or equipment which previously contained flammable liquids.
2. In areas with an accumulation of combustible debris, dust, lint and oily deposits.
3. In areas near the storage of exposed, readily ignitable materials such as combustibles.
4. On a container, such as a barrel, drum or tank that contained materials that will emit toxic fumes when heated.
5. In a confined space, until the space has been inspected and determined to be safe. Refer to UTCs' Confined Space Procedure.
6. In cases when an entire building fire detection system is shut down.
7. In buildings with sprinkling systems while such protection is impaired.
8. Hot work shall not be attempted on:
 - A partition, wall, ceiling or roof that has a combustible covering or insulation, or on walls or partitions of combustible sandwich-type panel construction.
 - Pipes or other metal that is in contact with combustible walls, partitions, ceilings or roofs shall not be done if the work is close enough to cause ignition by conduction.

C. Personal Protective Equipment

The welder shall be equipped with protective devices and/or apparel as indicated on the permit or as listed below:

1. Portable and/or mechanical ventilation capable of keeping the levels of fumes, dust and gases below the thresholds established in the Occupational Safety and Health Administration's (OSHA) Permissible Exposure Limits (PELs). If local exhaust or general ventilation are not available and fume, dust and gas generation is high, respirators shall be used;
2. Gloves, apron and/or jacket that are made of a material that is an insulator from heat and electricity;

3. Welders helmets equipped with proper filter plate and cover lenses.
4. Respiratory protection (NOTE: No employee shall be issued or be required to use a respirator until that employee has satisfied the criteria set forth in UTC's Respiratory Protection Procedure);
5. Screens to protect persons not properly protected from the visual effects of viewing arc welding or cutting and during gas or oxygen cutting or welding.
6. Lifelines and harnesses for work in confined spaces as set forth in UTC's Confined Space Procedure.

D. Fire Watch

A fire watch will be required in the following instances:

- All Oxy-acetylene welding and cutting activities.
- Other welding where the operator wears eye-protection for welding. The eye protection will impair the operator's ability to see/detect when something may ignite.
- The fire watch does not have to be limited to performing no other duties, however he may not leave the area of welding and his primary duty must be to detection and prevention of fires. *Example: a welder and his helper-the helper can assist the welder, but may not leave the area to get supplies unless the welder stops and performs the duties of fire watch.*

NOTE: A person assigned to fire watch cannot perform any other duties while they are doing fire watch.

E. Work Closeout:

- A fire watch shall be maintained for at least 30 minutes after completion of hot work operations in order to detect and extinguish smoldering fires.
- The PAI shall inspect the job site 30 minutes following completion of hot work and close out the permit with the time and date of the final check.

F. Designated Hot Work Rooms

A designated hot work room is a permanent location designed for hot work. These rooms do not require a permit to perform hot work. For a room to be classified as a designated hot work room, it must meet the following requirements:

- It must be of noncombustible fire-resistant construction, essentially free of combustible and flammable contents.
- It must be suitable segregated from adjacent areas.
- It must be equipped with fire extinguishers.
- It must be approved and inspected by Safety and Risk Management.

G. Operations not requiring a hot work permit

Examples of operations that do not require a hot work permit include:

- Bunsen burners in labs
- Fixed grinding wheels
- Electric soldering irons

If unsure whether an operation is considered hot work, please contact Safety and Risk Management or a supervisor.

H. Confined Spaces

The following precautions are in addition to the requirements of a confined space entry program and must be followed when performing hot work in a confined space:

- To prevent accidental contact, when arc welding is to be suspended for any substantial period of time, such as during lunch or overnight, all electrodes shall be removed from the holders and the holders carefully located so that accidental contact cannot occur and the machine be disconnected from the power source.
- In order to eliminate the possibility of gas escaping through leaks or improperly closed valves, when gas welding or cutting, the torch valves shall be closed and the gas supply to the torch positively shut off at some point outside the confined space area whenever the torch is not to be used for a substantial period of time, such as during lunch hour or overnight. Where practical, the torch and hose shall also be removed from the confined space.
- When welding or cutting is being performed in any confined space, the gas cylinders and welding machines shall be left on the outside. Before operations are started, heavy portable equipment mounted on wheels shall be securely blocked to prevent accidental movement.

5.0 Training:

The following information will be covered during training:

- The importance of safe hot work procedures;
- A summary of the OSHA Welding, Cutting, and Brazing standard (29 CFR 1910.252) and of the NFPA 51B standard.
- An overview of UTC's written Hot Work Program.
- An explanation of how Safety and Risk Management can assist departments.
- The inherent risks involved.
- Emergency procedures in the event of a fire.
- Instructions on all equipment and processes.

6.0 Recordkeeping:

- Hot work permits shall be maintained for one year after work has been completed.
- Training Documentation will be kept for all affected employees indefinitely.
- Safety and Risk Management shall maintain all equipment calibration

7.0 Additional References / Standards:

OSHA Welding, Burning, and Brazing, 1910.252

NFPA 51B

UTC's Confined Space Policy, Electrical Safety Policy

UTC's Respiratory Protection Program

EXAMPLE OF HOT WORK PERMIT

This Hot Work Permit is required for any operation involving open flames or producing heat and/or sparks and must be completed by a PAI (Permit Authorizing Individual) and posted at the site. Hot Work includes, but is not limited to: Brazing, Torch Cutting, Grinding, Soldering, and Welding.

If the required precautions cannot be met, Hot Work is not permitted.

HOT WORK DONE BY CONTRACTOR		
DATE:	WO #	
BUILDING NAME, BLDG #, ROOM #, LOCATION		
NATURE OF JOB		
NAME OF HOT WORK OPERATOR		
I verify the above location has been examined, the precautions checked on the Required Precautions Checklist have been taken to prevent fire, and permission is authorized for work.		
NAME OF COMPETENT HOT WORK SUPERVISOR (CHWS) Contact # _____ Fax # _____		
PERMIT REQUEST	DATE	TIME AM PM
PERMIT EXPIRES	DATE	TIME AM PM
SIGNATURE OF CHWS		
EH&S Approval		
<u>REQUIRED PRECAUTIONS CHECKLIST</u>		
Approved		
Expiration Date		
Notes:		
<ul style="list-style-type: none"> ○ Available sprinklers, hose streams, and extinguishers are in service/operable. ○ Hot work equipment in good repair. 		
<u>Requirements within 35ft of work</u>		
<ul style="list-style-type: none"> ○ Flammable liquids, dust, lint and oil deposits removed. ○ Explosive atmosphere in area eliminated. ○ Floors swept clean of combustibles. ○ Combustible floors wet down, 		
<ul style="list-style-type: none"> ○ covered with damp sand or fire-resistant sheets. ○ Remove other combustibles where possible. Otherwise protect with fire-resistant tarpaulins, screens or shields. ○ All wall and floor openings covered. ○ Fire-resistant tarpaulins suspended beneath elevated hot work. 		
<u>Work on walls or ceilings/enclosed equipment</u>		
<ul style="list-style-type: none"> ○ Construction is noncombustible and without combustible covering or insulation. ○ Combustibles on other side of walls moved away. ○ No danger exists by conduction of heat into another room or area ○ Enclosed equipment cleaned of all combustibles. ○ Containers purged of flammable liquids and vapors. 		
<u>Fire watch/hot work area monitoring.</u>		
<ul style="list-style-type: none"> ○ Fire watch will be provided during and continuously for 30 minutes after work, including during any work breaks. ○ Fire watch is supplied with suitable extinguishers. ○ Fire watch is trained in use of this equipment and in sounding alarm. ○ Fire watch may be required for adjoining areas, above and below. ○ Hot work area inspected 30 minutes after job is completed. 		
<u>Other precautions Taken</u>		
<ul style="list-style-type: none"> ○ Confined space entry permit required. ○ Area is protected with smoke or heat detection. ○ Ample ventilation to remove smoke/vapor from work area. ○ Lockout/tagout required. 		
<u>Comments:</u>		