

# Hot Work Program

## POLICY

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All hot work operations will be performed by trained employees who will conduct their work in accordance with the guidelines established in this program. When hot work hazards exist that cannot be eliminated, then engineering practices, administrative practices, safe work practices, Personal Protective Equipment (PPE), and proper training will be implemented. These measures will minimize those hazards to ensure the safety of employees and the public.

## RESPONSIBILITIES

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**Supervisors:** Supervisors are responsible for ensuring safe work practices are utilized and employees who perform hot work activities have received the appropriate training. Supervisors are also responsible for identifying employees affected by this policy, supplying the necessary safety equipment and ensuring it is used. If any report is received that damaged equipment is present, such as broken or cut insulation on cables, etc., the supervisor will have that equipment removed from service and have it repaired or replaced.

**Safety Manager:** The Safety Manager/designee will be responsible for providing training, maintaining records, conducting hazard assessments, and collaborating with departments on the development of site specific safety plans when necessary. He/she will also be responsible for addressing unsafe situations with the employee's supervisor, or in the case of an emergency, addressing the situation directly with the employee and notifying the supervisor in a timely manner following the emergency.

**Employees:** Employees who are involved in hot work operations are required to be familiar with this plan and its contents. Employees are responsible for completing hot work permits prior to working outside designated areas, ensuring that all fire prevention and fire protection measures are in place before any torch cutting or welding begins, wearing required PPE, verifying all welding equipment, including cables, lines and any accessories are in good working condition, and ensuring the safe handling of welding and torch cutting equipment. Employees must also report unsafe conditions to their Supervisor or the Safety Manager.

## HOT WORK

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Several types of hot work operations are conducted at Whitworth University. The most common operations include:

- MIG welding
- Gas welding, cutting and brazing
- Arc welding and cutting
- Plasma welding and cutting

- Soldering
- Abrasive grinding

It is important to recognize the type of hot being performed since each activity presents a unique set of hazards. Hazards should be mitigated through the use of engineering and administrative controls as well as through the use of Personal Protective Equipment (PPE).

## HAZARDS

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The hazards associated with hot work include health and safety hazards. Health hazards are primarily respiratory hazards due to fumes and gases that are generated by welding, cutting and brazing. Safety hazards are generally physical hazards due to the work site as well as the conditions and materials associated with the work site.

Health hazards associated with the generation of fumes and gases depend upon the welding process, the base material, the filler material, and the shielding gas if one is present. Health hazards include exposure to:

- Toxic gases
- Primary pulmonary gases
- Non-pulmonary gases
- Particulate matter
- Irritants and toxic inhalants

Safety hazards associated with hot work operations include:

- Fire
- Proximity to combustible materials
- Hazardous locations (rooms containing flammable or combustible vapors)
- Closed containers that have held flammable liquids or other combustibles
- Electric shock (arc welding)
- Infrared and ultraviolet eye damage

## PROCEDURES AND REQUIREMENTS

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### 1. Location

When possible, hot work should be done in a permanent location that is designed to provide maximum safety and fire protections. Whitworth's permanent hot work station is located in the lower level of the Facilities Services building. If any hot work is done outside of the permanent hot work area, the site must be inspected by a trained employee who is responsible for determining what fire protection equipment is necessary. A hot work permit must be completed prior to beginning work outside of the permanent welding location.

Hot work activities shall not be permitted in the following areas:

- In areas not inspected by a trained employee;
- In sprinklered buildings while such protection is impaired;
- In the presence of explosive atmospheres (mixtures of flammable gases, vapors, liquids, or dusts with air), or explosive atmospheres that may develop inside uncleaned or improperly prepared tanks or equipment that previously contained such materials, or that may develop in areas with an accumulation of combustible dusts; *and*
- In areas near the storage of large quantities of exposed, readily ignitable materials such as flammable chemicals or combustible dusts.

## **2. Materials**

Employees should determine the type of material that will be used for welding, cutting or brazing. Certain metals contain chemicals such as zinc, lead, beryllium, cadmium and mercury, and are subject to additional regulations because of the negative health effects associated with them. For example, stainless steel produces hexavalent chromium when welded on. Employees should contact the Safety Manager for additional information regarding metals that produce hazardous fumes.

## **3. Hot Work Permits**

Hot work permits are useful accountability tools to ensure that all necessary precautions are taken prior to commencing hot work. Hot work permits also ensure that employees are aware of and use the appropriate safeguards when performing hot work operations. Anytime hot work will be conducted outside of the permanent welding area, a trained employee who is authorized to issue hot work permits must inspect the job location prior to the work commencing. In addition, all flammable materials must be moved at least 35 feet away from the work area. If flammable materials cannot be moved they must be properly shielded by using items such as welding blankets.

Employees must follow all aspects of the hot work permit and all permits must be returned to Whitworth's Safety Manager when projects are completed. Appendix A displays Whitworth University's Hot Work Permit.

Hot work permits are not needed in areas designated for hot work operations.

## **4. Required PPE**

Hot work requires various forms of personal protective equipment (PPE) depending on the level and type of work being performed. PPE that is required for hot work activities will be provided by Whitworth University at no cost to the employees. Employees will be required to be familiar with the PPE requirements for each process and are responsible for wearing the required pieces of PPE when engaged in hot work activities.

### Welding, Cutting and Brazing

Welders will be required to wear protective welding helmets and flameproof gauntlet gloves at all times. Helpers and attendants will also be provided with proper eye and face protection. Additional PPE may be required when conducting medium to heavy work. These may include: flameproof aprons or jackets, woolen clothing, fire resistant leggings or boots, welding caps, and hearing protection. Appendix B outlines the PPE requirements for the correct shade of lenses based on the work being performed. Appendix C outlines the conditions for light, medium and heavy work.

### Abrasive Grinding

Employees will be required to wear a protective face shield, gloves and a tight fitting long sleeve shirt or jacket when conducting abrasive grinding. Additional PPE may be required.

## **5. Fire Watch**

A fire watch is implemented to ensure the fire-safety of a building or area in the event of any hot work or situation that may pose an increased risk to persons or property. The term fire watch is used to identify a procedure for the detection of fire by person(s) designated when hot work has occurred or when automatic detection systems are disabled.

A fire watch will be required whenever hot work is performed in locations where anything other than a minor fire might develop, or if any of the following conditions exist:

1. Appreciable combustible material, in building or construction contents, closer than 35 feet to the point of operation;
2. Appreciable combustibles are more than 35 feet away but are easily ignited by sparks;
3. Wall or floor openings within a 35-foot radius expose combustible material in adjacent areas including concealed spaces in walls or floors; *or*
4. Combustible materials are adjacent to the opposite side of metal partitions, walls, ceilings, or roofs and are likely to be ignited by conduction or radiation.

The length of the fire watch shall be determined by the employee who authorized the permit at the time the hot work permit is issued, and is determined by the extent and location of the hot work. *This time cannot be less than one ½ hour after the completion of the hot work process. Fire watchers shall have fire-extinguishing equipment readily available and shall be trained on its use. They shall not conduct any other operations while performing the duties of a fire watch and shall be familiar with the facility and procedures for sounding an alarm in the event of a fire that is not within their capability to extinguish.*

## 6. Proper Ventilation

When welding, cutting or brazing activities are performed in Facilities Services' permanent hot work area, the exhaust hood must be turned on to ensure fumes are removed from the area. When conducting hot work outside of the permanent hot work area, refer to the following ventilation criteria.

Mechanical ventilation will be provided for welders and helpers when:

- Welding is being performed in a space less than 10,000 cubic feet per welder.
- A room has a ceiling height less than 16 feet
- A confined space or welding space contains partitions, balconies, or other structural barriers to the extent that obstruct cross ventilation.

Natural ventilation is considered sufficient for welding or cutting operations where these restrictions are not present.

## 7. Welding in Confined Spaces

Employees must contact Whitworth's Safety Manager before authorizing hot work permits for work in confined spaces.

A hot work permit and a confined space entry permit are required if welding operations are performed in a confined space, regardless of how the confined space is normally classified. No work is to commence until all requirements of the Confined Space Entry Program are met and a hot work permit is completed.

When welding or cutting is performed in a confined space, the gas cylinders and welding machines shall be left outside the space. Before operations are started, heavy portable equipment mounted on wheels shall be securely blocked to prevent accidental movement. All heavy and portable equipment used in confined space welding or torch cutting operations will be secured before operations begin.

Mechanical ventilation must be provided during any confined space welding operation to prevent the accumulation of toxic materials or possible oxygen enrichment or deficiency.

When a welder must enter a confined space through a manhole or other small opening, they must be attached to a manned lifeline. Refer to Whitworth's permit-required confined space entry procedures for the entry requirements.

When arc welding operations are completed or temporarily stopped, all electrodes will be removed from the holders. The holders are to be carefully positioned and stored so that accidental contact cannot occur.

## SAFE WORK PRACTICES

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In addition to the procedures and requirements listed above, the following safe work practices must be adhered to during all hot work operations.

- When possible, placing work at an optimal height to avoid back strain or shoulder fatigue;
- Using fall protection equipment for work on elevated surfaces more than 4 feet above the floor or ground surface (Refer to Whitworth's fall protection program);
- Following safe housekeeping principles;
- Using equipment as directed by the manufacturer instructions or practices;
- Removing any butane lighters, matches, or other combustibles from pockets prior to performing work;
- Not performing welding work with oily clothing (Leathers may need to be worn over clothing); *and*
- Minimizing tripping and fall hazards caused by welding lines. Cables shall not block passageways, stairways, or other exits.

## TRAINING

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Employees who perform hot work operations will be trained in Whitworth's hot work procedures. Employees will also receive training on the specific procedures for each type of welding (TIG, gas, arc, etc.). Training records will be created and maintained by the Safety Manager/designee in conjunction with departments. The training program will enable the employee to:

- Perform hot work operations according to Whitworth's hot work program;
- Recognize the hazards associated with various welding operations;
- Know the safe work practices for welding operations;
- Understand the importance and requirements of hot work permits;
- Use the appropriate personal protective equipment (PPE) for the job;
- Recognize confined spaces and the requirements associated with them; *and*
- Understand the importance of regular inspections of welding equipment, attachments, and accessories.

This training shall be made available upon initial employment, job re-assignment, or prior to conducting hot work for the university. Refresher training will be provided whenever deviations from the procedures outlined in this policy occur or upon the discretion of the supervisor.

## PROGRAM EVALUATION

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The hot work program will be evaluated at least annually by the Safety Manager/designee to ensure that it is effective in practice and that it complies with all applicable regulations.

## DEFINITIONS

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**Arc** – is what is between the end of the electrode and the base metal. The resistance causes heat.

**Approved** – Listed or approved by a nationally recognized testing laboratory.

**Brazing** – A process used to join metal parts by using heat or other substances to produce the braze.

**Confined Space** – A space that is not designed for human occupancy, has limited openings for entry and exit, may lack adequate ventilation, and may contain or produce dangerous air contamination.

**Cutting** - Processes used to separate pieces of metal.

**Hazardous** - Any act, condition, or substance which poses health and safety risks to employees.

**Hot Work** – Hot work is any process that can be a source of ignition when flammable material is present or can be a fire hazard regardless of the presence of flammable material in the workplace. Common hot work processes are welding, soldering, cutting, brazing and abrasive grinding that generates sparks.

**Hot Work Permit** - A permit allowing employees to perform work involving welding, cutting, or any task that would deplete oxygen, create toxic fumes and vapors, or create the potential for fire or explosion.

**Pulmonary** - Any body function related to the lungs.

**Welder/Welding Operator** – Any operator of electric or gas welding, cutting and brazing equipment.

**Welding** – A process used to join metal parts by using heat or other substances to produce the weld.

## REFERENCE

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WAC 296-24-680 through 296-24-722

If you have questions regarding Whitworth University's hot work program please contact the University's Safety Manager in the Human Resources office at 777-3236.

**Approved By:** Vice President of Finance & Administration

**Date:** 11/12/2015

**Reviewed By:** Safety Manager

**Date:** 11/29/2016

APPENDIX A

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**Hot Work Permit (Front)**

**HOT WORK PERMIT**      No. \_\_\_\_\_

(Work is not permitted unless this card is complete and posted at work site.)

Date: \_\_\_\_ / \_\_\_\_ / \_\_\_\_      Time: \_\_\_\_\_ (AM / PM)

Building/Site: \_\_\_\_\_

Area: \_\_\_\_\_      Dept: \_\_\_\_\_

Work to be done: \_\_\_\_\_

\_\_\_\_\_

Special precautions: \_\_\_\_\_

\_\_\_\_\_

Fire watch: \_\_\_\_\_

Expires: \_\_\_\_ / \_\_\_\_ / \_\_\_\_      Time: \_\_\_\_\_ (AM / PM)

*I have examined the location where work is to be done, taken the necessary precautions and permission is granted for this work.*

Signed: \_\_\_\_\_  
EMPLOYEE RESPONSIBLE FOR WORK AUTHORIZATION

Time begun: \_\_\_\_\_      Time complete: \_\_\_\_\_

**FINAL CHECK**

*When specified by the hot work program, the work area and all adjacent areas where sparks may have spread were inspected for at least 30 minutes after work was completed and no fire conditions were noted.*

Signed: \_\_\_\_\_  
Signed by Fire Watch Personnel

**Submit completed permit Whitworth's Safety Manager.**

## Hot Work Permit (Back)

### Hot Work Precautions Checklist

- Fire suppression system in service (sprinklers, CO<sup>2</sup>, foam)
- Fire alarm system in test (contact Front Office, x3254)
- Location of nearest fire alarm box identified
- Fire extinguishers or small standpipe fire hose accessible
- Floor/ground clean (and wetted-down when necessary)
- Flammable liquids and other hazards removed from area
- Containers, tanks, ducts, and other enclosures cleaned and purged of flammable vapors, liquids, dusts and other hazardous materials
- Cutting and welding equipment in good condition
- Combustibles were moved at least 35 feet away from the welding area and immovable combustibles were properly guarded
- All floor and wall openings within 35 feet covered
- Non-combustible covers used to protect nearby combustibles and equipment
- All hazardous operations discontinued in area
- When specified by the hot work program, fire watch was present for at least 30 minutes after welding

## APPENDIX B

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The following is a guide for the selection of the proper shade numbers. These recommendations may be varied to suit the individual's needs.

<b>Filter Lenses for Protection Against Radiant Energy</b>			
<u>Welding operation</u>	<u>Electrode Size 1/32 (inches)</u>	<u>Minimum protective arc current</u>	<u>Shade Number</u>
<u>Shielded metal arc welding</u>	<u>Less than 3</u>	<u>Less than 60</u>	<u>10</u>
	<u>3-5</u>	<u>60-160</u>	<u>10</u>
	<u>5-8</u>	<u>160-250</u>	<u>12</u>
	<u>More than 8</u>	<u>250-500</u>	<u>14</u>
<u>Gas shielded arc welding (nonferrous)</u>	<u>2,3,4,5</u>		<u>11</u>
<u>Gas shielded arc welding (ferrous)</u>	<u>2,3,4,5</u>		<u>12</u>
<u>Gas metal arc welding</u>		<u>Less than 60</u>	<u>7</u>
		<u>60-160</u>	<u>10</u>
		<u>160-250</u>	<u>10</u>
		<u>250-500</u>	<u>10</u>
<u>Plasma arc cutting</u>		<u>Less than 300 (light)</u>	<u>8</u>
		<u>300-400 (medium)</u>	<u>9</u>
		<u>400-800 (heavy)</u>	<u>10</u>
<u>Torch soldering</u>			<u>2</u>
<u>Torch brazing</u>			<u>3 or 4</u>
<u>Gas welding</u>			
<u>Light</u>	<u>Under 1/8</u>	<u>Under 3.2</u>	<u>3 or 4</u>

## APPENDIX C

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**Table 1**  
**Criteria for Light, Medium and Heavy Work**

Operations	Plate thickness inches	Plate thickness mm
Gas welding: Light	< 1/8	< 3.2
Gas welding: Medium	1/8 - 1/2	3.2 - 12.7
Gas welding: Heavy	> 1/2	> 12.7
Oxygen cutting: Light	< 1	< 25
Oxygen cutting: Medium	1 - 6	25 - 150
Oxygen cutting: Heavy	> 6	> 150