

City of Montpelier, Vermont
"The Smallest Capital City in the United States"

**WELDING
SAFETY POLICY & PROCEDURE**

Last Updated August 22, 2006

**WELDING
SAFTY POLICY & PROCEDURE**

TABLE OF CONTENTS

Purpose	1.0
Scope and Applicability	2.0
Reference	3.0
Policy	4.0
General Responsibilities	5.0
Procedure	6.0
Definitions	6.1
General Provisions	6.2
Training	6.2.1
Types of Welding	6.2.2
Welding Hazards	6.2.3
Safe Work Practices	6.2.4
Hot Work Permits	6.2.5
Employee Protection	6.2.6
Work in Confined Spaces	6.2.7
Specific Responsibilities.....	6.3
Managers/Department Heads.....	6.3.1
Supervisors.....	6.3.2
Employees.....	6.3.3
Safety and Loss Control.....	6.3.4
Annual Program Evaluation	6.4.0

1.0 PURPOSE

The purpose of this safety policy and procedure is to establish guidelines and procedures through which City of Montpelier employees receive the training and proper equipment needed to safely perform welding operations.

2.0 SCOPE AND APPLICABILITY

The welding process joins metal parts. Welding processes require heat and sometimes other substances to produce the weld. Byproducts resulting from the welding process include fumes and gases which can be serious health hazards to employees.

Additionally, safety hazards can exist such as the potential for fire or explosion and injuries from arc radiation, electrical shock, or materials handling.

This safety policy and procedure provides guidelines for safely performing welding operations. It presents provisions for training, discussion on types of welding, safe work practices, and employee protection requirements. It also presents critical details on hot work permits, work in confined spaces, ventilation requirements when performing welding operations, and inspection requirements.

This document also details the areas of responsibility for Department Heads, supervisors, employees, Safety and Loss Control, and Central Equipment unit within City of Montpelier.

This safety policy and procedure affects all employees who are exposed by their job duties to welding and torch cutting operations. These welding and torch cutting operations occur at, but are not limited to equipment repair shops, equipment fabrication shops, and construction operations such as bridge and road repair and maintenance.

3.0 REFERENCE

This safety policy and procedure is established in accordance with Occupational Safety and Health Standards for General industry (29 CFR 1910.251-257) and Occupational Safety and Health Standards for Construction Industry (29 CFR 1926.350-.354).

4.0 POLICY

It is the policy of City of Montpelier to provide a place of employment that is free from recognized hazards that cause or are likely to cause death or serious physical harm to employees or the public. Therefore, welding operations will be performed only by authorized and trained employees. When welding hazards exist that cannot be eliminated, then engineering practices, administrative practices, safe work practices, Personal Protective Equipment (PPE), and proper training regarding Welding will be implemented. These measures will be implemented to minimize those hazards to ensure the safety of employees and the public.

5.0 GENERAL RESPONSIBILITIES

It is the responsibility of the program administrator is to evaluate the hazard assessment for the plan and to annually review the effectiveness of this program.

It is the responsibility of each Dept. Head, to purchase welding supplies, related equipment and the appropriate PPE to be worn during welding operations.

It is the responsibility of each Dept. Head, supervisor and employee to ensure implementation of City of Montpelier safety policy and procedure on Welding. It is also the responsibility of each City of Montpelier employee to report immediately any unsafe act or condition to his or her supervisor. Specific responsibilities are found in Section 6.3.

It is understood that during actual emergency operations and training for those operations Police, Fire, EMS, and Rescue Services will use equipment and follow procedures which will deviate from those used in the general

workplace. Where ever possible these procedures and practices will comply with all OSHA requirements and will comply with accepted practices as outlined in nationally recognized standards for the individual discipline in which the organization is engaged. An example of one of those standards would be NFPA 1001.

6.0 PROCEDURE

This section provides applicable definitions, establishes general provisions, and identifies responsibilities required by City of Montpelier safety policy and procedure on Welding.

6.1 DEFINITIONS

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

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.

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

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 and cutting equipment.

6.2 GENERAL PROVISIONS

This section details the provisions of this safety policy and procedure with each provision discussed in a separate subsection. These provisions are:

- Training
- Types of Welding
- Welding Hazards
- Safe Work Practices
- Hot Work Permits
- Employee Protection
- Work in Confined Spaces
- Inspection

6.2.1 TRAINING

Employees who perform welding operations will be trained to:

- 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
- Understand the importance of regular inspections of welding equipment, attachments, and accessories

This training shall be made available upon initial employment or job re-assignment. Refresher training shall be provided upon the discretion of the supervisor.

6.2.2 TYPES OF WELDING

Several types of welding operations are used in City of Montpelier. The most common welding operations include:

- TIG
- Gas welding and cutting
- Arc welding and cutting
- Resistance welding
- Plasma

The gas welding process unites metals by heating. The gases commonly used as the fuel gas are oxygen and acetylene. The gas cutting process removes metal by a chemical reaction of the base metal with oxygen at an elevated temperature.

The arc welding and cutting process uses electric current and two welding leads. One welding lead is connected to the electric power supply while the other lead is attached to the work surface.

Resistance welding is a metal-joining process where welding heat is generated at the joint by the resistance to the flow of electric current.

6.2.3 WELDING HAZARDS

The hazards associated with welding include health and safety hazards. Health hazards are primarily respiratory hazards due to the generation of fumes and gases. Safety hazards are generally physical hazards due to the work site and 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 any. Health hazards include exposure to:

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

Air sampling may be required to identify the fumes and gases emitted from a specific operation.

Safety hazards associated with welding 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

APPENDIX A – presents precautions that should be followed to minimize, control, or eliminate these safety hazards.

6.2.4 SAFE WORK PRACTICES

Safe work practices for all welding operations include:

- Placing work at an optimal height to avoid back strain or shoulder fatigue
- Using fall protection equipment for work on elevated surfaces more than 6 feet above the floor or ground surface
- Wearing personal protective equipment (PPE) as applicable for the work conditions
- Following special precautions when welding or cutting in a confined space
- Posting warning signs to mark just-completed welding or cutting surfaces
- 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)
- Following fire protection and prevention practices during the welding operation (See **Appendix B** for further details)
- Using proper ventilation techniques during welding operations (See **Appendix C** for further details **SPP#1910.94, Ventilation**, for related information)

6.2.5 HOT WORK PERMITS

Hot Work Permits are a useful accountability tool to ensure that all the necessary precautions are taken prior to commencing welding. They also assure that employees are aware of and use the appropriate safeguards when performing welding operations. Hot work permits are not needed in areas designated for welding and cutting operations (IE: DPW Equipment Repair Shop). In confined spaces a hot work permit is required if any welding operations are performed in that space regardless of whether or not a confined space entry permit is required. **Appendix D presents City of Montpelier's Hot Work Permit.**

6.2.6 EMPLOYEE PROTECTION

Employee protection during welding operations must include:

- Safeguards and provisions for fall protection
- Tripping hazard prevention
- Eye Protection
- Protection from arc welding rays
- Protective clothing
- Protection from electrical shock hazards

Additionally, to prevent injury from burns, all areas that have been just welded or cut will be marked to inform other employees that the material or area is hot.

For fall protection, employees will be provided either with fall protection such as safety belts, life lines, or railings where falls from heights of 6 feet or more are possible.

Tripping hazards will be minimized by welding lines being placed in order not to create trip and fall hazards. Cables will not block passageways, stairways, or other exits.

Eye protection will be provided by helmets or hand held shields being used during all arc welding or arc cutting operations, excluding submerged arc welding. Helpers or attendants will be provided with proper eye protection.

Specifications for eye protection are detailed in Appendix E of this safety policy and procedure. Also, see SPP# 1910.132, Personal Protective Equipment, for additional details.

Arc welding rays protection will be provided by non-combustible or flame resistant screens, shields or suitable eye protection to workers or other persons adjacent to the welding operations. Booths and screens shall permit circulation of air at floor level.

Protective clothing will vary with the size, nature, and location of the work. Criteria for selection of protective clothing are detailed in *Appendix E* of this safety policy and procedure.

Electrical protective devices will be used to protect employees from the possibility of electrical shock when welding operations are performed in wet areas or areas where high humidity is present. Refer to SPP#1910.137, Electrical Protective Devices, for additional detail.

6.2.7 WORK CONFINED SPACES

No work is to commence until all requirements of the Confined Space Entry Safety Policy and Procedure are met and a Hot Work Permit is submitted. Refer to SPP# 1910.146, Confined Space Entry, for additional details.

Mechanical ventilation will be provided during any confined space welding operation to prevent the accumulation of toxic materials or possible oxygen enrichment or deficiency. All heavy and portable equipment used in confined space welding or torch cutting operations will be secured before operations begin.

When a welder must enter a confined space through a manhole or other small opening, the welder will be attached to a manned lifeline. The lifeline will be attached to not interfere with the welding operation or with the removal of the welder in case of an emergency. A preplanned emergency rescue procedure will be in place prior to the welding operations.

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.

6.3 SPECIFIC RESPONSIBILITIES

6.3.1 MANAGERS/DEPART HEADS

Managers/ Dept Heads are responsible for PPE and training for welders. They will also be responsible for identifying the employees affected by this safety policy and procedure.

Managers/Dept Heads will obtain and coordinate the required training for the affected employees. Managers/Dept. Heads will also ensure compliance with this safety policy and procedure through their auditing process.

6.3.2 SUPERVISORS

Supervisors will be responsible for ensuring the safe handling of welding and torch cutting equipment and ensuring safety, fire prevention and protection during welding and torch cutting processes.

Supervisors are also responsible for ensuring that all welding equipment, including cables, lines and any accessories, are in good working condition. If any indication of 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.

6.3.3 EMPLOYEES

Employees who are involved in welding operations are responsible for ensuring that all fire prevention and fire protection measures have been taken before any torch cutting or welding begins.

Employees are responsible for ensuring that all PPE's is worn properly for the specific hazard involved and that all equipment is in good working condition. Each employee is responsible for bringing hazards to the attention of his or her supervisor for correction as soon as the hazard is recognized.

6.3.4 SAFETY AND LOSS CONTROL

Safety and Loss Control will provide prompt assistance to managers/dept. heads, supervisors or others as applicable on any matter concerning this safety policy and procedure. Safety and Loss Control will assist in developing or securing the required training.

Additionally, Safety and Loss Control Safety Engineers will provide consultative and audit assistance to ensure effective implementation of this safety policy and procedure.

**EMPLOYEE LEARNING EXERCISE
FOR
WELDING**

Employee: _____

Date: _____

1. True False Five types of welding are TIG, Gas welding and cutting, Arc welding and cutting, Resistance welding (spot welding), and Plasma.
2. True False Health hazard from welding include: Toxic gases, Primary pulmonary gases, Non-pulmonary gases, Particulate matter, Irritants and toxic inhalants.
3. True False Safety hazards associated with welding operations include: Fire, Proximity to combustibles, Hazardous locations, Closed containers that have held flammable liquids or other combustibles, Electric shock, Infrared and ultraviolet rays.
4. True False Mechanical ventilation is required whenever welding in a space where the ceiling is less than 16 feet.
5. True False Filter lenses of shade 9 or darker shall be used for arc welding.
6. True False Hot Work Permits are required any time welding operations are conducted outside of a designated welding area.
7. True False Electrodes must be removed from holders when not in use.

All Test Answers Are True.

WELDING SAFETY PROGRAM

6.4 ANNUAL PROGRAM EVALUATION

Program Name: Welding Safety Program

Evaluation Date: _____

Evaluation Team:

NAME

TITLE

DEPARTMENT

NAME	TITLE	DEPARTMENT

List Injuries, exposures or near misses attributable to failure of program or failure to follow program:

Recommendations for additions to procedures/policies with explanation for each:

Recommendations for deletions of procedures/policies with explanation for each:

Recommendations for modifications to procedures/policies with explanation for each:

Description and date of actual modifications made:

APPENDIX A: SAFETY HAZARDS PRECAUTIONS

- Welding should be done in a permanent location that can be designed to provide maximum safety and fire protections. Otherwise, if the welding and cutting equipment is portable the site should be inspected to determine what fire protection equipment is necessary. See SPP# 1910.157, Fire Protection, for related details.
- Where welding is done near combustible materials, special precautions are necessary to prevent sparks or hot slag from reaching such material and starting fires. If the work cannot be removed, the combustible material should be moved a safe distance away.
- Welding or cutting activities should not be allowed in or near rooms containing flammable or combustible vapors, liquids or dusts. If welding is required in these locations, all of the surrounding premises should be thoroughly ventilated and have frequent gas testing performed.
- Closed containers that have held flammable liquids or other combustibles should be thoroughly cleaned before welding or cutting.

APPENDIX B: FIRE PROTECTION AND PREVENTION PRACTICES

- Supervisors will inspect areas where welding or torch cutting is to take place and take proper measures to ensure fire hazards are eliminated or protected against. If combustibles are within 35 feet of the welding area, welders will use guards or shields to contain sparks and slag.
- Employees trained as fire watchers will be available in areas where welding is taking place. Appropriate fire extinguishers will be immediately available and accessible at the welding operation.
- No welding, torch cutting or heating shall be done where flammable paints, the presence of other flammable compounds, or heavy dust concentrations exist.
- A Hot Work Permit must be completed and followed where torch cutting and welding operations are conducted in close proximity to flammables, combustibles, hazardous materials or processes, and in confined spaces. Hot work permits assure that employees are aware of and use appropriate safeguards when conducting welding operations in these environments. (Appendix D presents City of Montpelier Hot Work Permit.)

APPENDIX C: VENTILATION GUIDELINES FOR WELDING OPERATIONS

- 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.
- The minimum rate for mechanical ventilation will be 2,000 cubic feet per minute per welder unless exhaust hoods or air-supplied respirators are provided.
- When using local exhaust hoods, they will be placed as close to the operation as possible. The exhaust hood will provide a rate of 100 linear feet per minute of air flow in the welding zone.
- Air-supplied respirators will be used when mechanical ventilating is not possible or when materials such as beryllium and cadmium are used. Refer to SSP# 1910.134, Respiratory Protection, for additional details.
- Local exhaust ventilation or air-supplied respirators will be used when welding or torch cutting on coated metals (e.g., zinc, mercury, cadmium, lead, etc.) indoors or in confined spaces. Outdoors operations shall be done using respiratory protective equipment.

APPENDIX D: HOT WORK PERMIT

(GOOD FOR THIS SHIFT ONLY)

Date: _____

From: _____
Time

To: _____
Time

Bldg: _____ Dept. _____ Floor _____

Work to be done: _____

Work performed by: _____
Name

Fire watcher (s) assigned? Yes No

Names of fire watcher (s): _____

Safety Checklist

Yes No

- Have all flammable or combustible materials been removed from the work area (35 foot radius)?
- If any flammables or combustibles cannot be removed, have they been covered by fire resistant shields or tarpaulins?
- Is adequate fire fighting equipment readily available?
- Have vulnerable areas of combustible floors and/or roofs been wet-down or properly covered?
- Have wall and/or floor openings been properly covered?
- Is the hot work equipment in good working condition?
- Is a Confined Space Permit required?
- If pressurized lines or lines containing hazardous gases or liquids must be broken or cut, have the appropriate safety measures been taken?
- Are Lock-Out Tag-Out Procedures required?
- Has the atmosphere been checked with a multi gas meter for flammable/explosive gas levels or other atmospheric hazards?
- Is ventilation adequate? If no, has forced ventilation or supplied air been provided?
- Is adequate PPE (gloves, eye and hearing protection, breathing apparatus, special clothing, boots, etc.) provided for exposed workers?

Other special precautions taken: _____

Signatures Required Before Beginning Work

I have been instructed and I understand the hazards as well as the precautions necessary to do this work safely.

Signature of person performing the work

I verify that this work site has been inspected, that all necessary precautions have been taken to prevent fires and/or explosions to control hazardous conditions, and the individual signed above is authorized to begin doing this work.

Signature of Supervisor

Date

Time (AM/PM)

Signatures Required After Completing Work

This work was completed:

Date: _____

Time (AM/PM) _____

Signature of person performing the work

I have personally inspected the worksite after completion of the work and find the area to be in safe condition.

Signature of Supervisor

Date

Time (AM/PM)

APPENDIX E: CRITERIA FOR PERSONAL PROTECTIVE EQUIPMENT

Eye Protection Selection

Arc Welding and Arc Cutting – Helmets and hand held shields shall be used by personnel viewing the arc during welding and cutting operations, excluding submerged arc welding. Safety spectacles or goggles shall be worn during arc welding and cutting operations to provide protection from injurious rays from adjacent work and from flying objects. The spectacles or goggles may have either clear or colored glass, depending upon the amount of exposure to adjacent welding or cutting operations.

Shade No. (s) 9 thru 14 are recommended for Safety Spectacles or goggles used for gas metal-arc and shielded metal-arc welding. Helpers shall be provided with proper eye protection in accordance with ANSI Standard Z87.1.

Gas Welding and Oxygen Cutting – Goggles or other suitable eye protection shall be used during all gas welding or oxygen-cutting operations. Spectacles with suitable filter lenses and without side shields are permitted for use during gas welding operations on light work, for torch brazing, or for inspection. Common sunglasses or safety issue sunglasses are not considered an acceptable alternative.

Resistance Welding and Brazing – All operators of resistance welding or resistance brazing equipment and their helpers shall use face shields, spectacles, or goggles, depending on the particular job, to protect their faces or eyes, as required.

Specifications for Protectors

Material Properties – Helmets and hand-held shield bodies shall be made of material which is thermally and electrically insulating, non-combustible or self-extinguishing, and opaque to visible ultra-violet, and infrared radiation. Helmets, shields, and goggles shall be capable of withstanding disinfecting.

Area of Protection – Helmets and hand-held shields shall be designed to protect the face, forehead, neck and ears to the vertical lines back of the ears from weld spatter and from direct radiant energy from the arc.

Window for Filter and Cover Plates – Helmets and hand-held shields shall be provided with a window for filter plates and cover plates, and shall be designed for easy removal and replacement of plates.

Materials Effect on Skin – All protective parts shall be constructed of a material which will not readily irritate or discolor the skin.

Ventilation – Goggles shall be ventilated to deter fogging of the lenses. Ventilation of cup-type goggles shall be baffled to prevent passage of light rays into the interior of the eyecup.

Cover Lens or Plates – Cover lenses or plates shall be provided to protect the filter lens or filter plate in goggles, helmets, or hand-held shields from welding spatter, pitting, and scratching. Cover lenses and plates shall be clear, glass, or self-extinguishing plastic, and need not be impact resistant.

Filter Lenses or Plates – All filter lenses and plates shall be impact resistant. All filter lenses and plates shall be substantially free from bubbles, waves and other flaws. Except when a lens is ground to provide proper optical correction for defective vision, the front and rear surfaces of lenses and plates shall be smooth and parallel.

Marking – Filter lenses and plates shall bear some permanent distinctive marking by which the manufacturer and shade number may be readily identified. In addition, all glass filter lenses and plates, when treated for impact resistance, shall be marked with the letter “H” to designate impact resistance.

Guide for Selection of Filters – A guide for the selection of appropriate shade numbers is given in the ***SPP# 1910.132, Personal Protective Equipment.***

Maintenance – Helmets and goggles shall be well-maintained. Helmets and goggles should not be transferred from one employee to another without being disinfected.

Protective Clothing

Criteria for Selection – Appropriate protective clothing required for any welding and torch cutting operation will vary with the size, nature, and location of the work to be performed.

Gloves – All welders and oxygen cutters shall wear protective gloves.

- For light work, durable flame-resistant cotton gloves should be used and for heavier work, leather or other suitable durable flame-resistant materials should be used. Insulated linings should be used to protect areas exposed to high radiant energy.

Aprons – Aprons made of leather or other suitable flame-resistant materials should be used when additional protection against sparks and radiant energy is desired.

Treat Clothing – Clothing treated with non-durable flame-retardant materials shall be retreated after each wetting or cleaning.

- Woolen clothing is preferable to cotton because it is not so readily ignited and helps protect the welder from changes in temperature. Cotton clothing, if used, should be chemically treated to reduce its combustibility. All outer clothing such as jumpers or overalls should be reasonably free from oil or grease.
- Sparks may lodge in rolled-up sleeves or pockets of clothing or cuffs of overalls or trousers. It is recommended that sleeves and collars be kept buttoned and pockets be eliminated from the front of clothing. Trousers or overalls should not be turned up on the outside.
- For heavy work, fire-resistant leggings or other equivalent means should be used.
- A sheet metal screen in front of the worker's legs can provide further protection against sparks and molten metal in torch cutting operations.
- Cape sleeves or shoulder covers with bibs made of leather or other flame-resistant material should be worn during overhead welding or torch cutting operations. Skull caps made from flame-resistant material may be worn under helmets to prevent head burns.

For overhead welding and torch cutting, or welding and torch cutting in extremely confined spaces, ear protection is desirable. This may be accomplished by following the **SPP# 1910.95, Hearing Conservation Program**, and using the recommended type of hearing protector.