ADVANCED
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WELDING SAFETY POLICY & PROCEDURE

OSHA Standards -29 CFR

General industry (29 CFR 1910.251-257)

Construction Industry (29 CFR 1926.350-.354)

Last Updated November 1, 2009

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WELDING SAFTY POLICY & PROCEDURE

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1.0 PURPOSE

The purpose of this safety policy and procedure is to establish guidelines and procedures through which ALS 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 Project Manager, supervisors, employees, Safety and Health department..

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 ALS 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 Project Managers/Forman, to purchase welding supplies, related equipment and

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the appropriate PPE to be worn during welding operations.

It is the responsibility of each Project Managers/Forman, supervisor and employee to ensure implementation of ALS safety policy and procedure on Welding. It is also the responsibility of each ALS 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.

6.0 PROCEDURE

This section provides applicable definitions, establishes general provisions, and identifies responsibilities required by ALS 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

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- 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 space 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 ALS. 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 ***OSHA #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

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operations are performed in that space regardless of whether or not a confined space entry permit is required**.** ***Appendix D presents ALS'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 form 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

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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 *OSHA #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 OSHA # 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 PROJET MANAGERS/FORMAN

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

Project Managers/ Forman will obtain and coordinate the required training for the affected employees.

Project Managers/ Forman will also ensure compliance with this safety policy and procedure through their auditing process.

6.3.2 FORMAN

Forman 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 process.

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Forman 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 cable, etc. the Forman will have that equipment removed from service and have it repaired.

6.3.2 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 HEALTH DEPARTMENT

Safety and health department will provide prompt assistance to managers/Project Managers/Formans, supervisors or others as applicable on any matter concerning this safety policy and procedure. Safety and health department will assist in developing or securing the required training.

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

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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 the 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.

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WELDING SAFETY PROGRAM

6.4 ANNUAL PROGRAM EVALUATION

Program Name: **Welding Safety Program**_____

Evaluation Date: _____

Evaluation Team:

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:

_____
_____
_____

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APPENDIX A: SAFETY HAZRDS 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 *OSHA # 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 ALS Hot Work Permit.)***

APPENDIX C: VENTILATION GUIDELINES FOR WELDING OPERATIONS

1. Mechanical ventilation will be provided for welders and helpers when:
   - o Welding is being performed in a space less than 10,000 cubic feet per welder.
   - o A room has a ceiling height less than 16 feet
   - o A confined space or welding space contains partitions, balconies, or other structural barriers to the extent that obstruct cross ventilation.
2. 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.
3. 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.
4. 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.
5. 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.

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APPENDIX D: HOT WORK PERMIT **(GOOD FOR *THIS SHIFT ONLY*)**

Date: _____

From: _____ To: _____ Time

Time

Bldg:

_____ Dept. _____ Floor _____

Work to be done:

_____

Name

Fire watcher (s) assigned? Yes No

Names of fire watcher (s):

_____

Safety Checklist

Yes	No	
Yes	No	Have all flammable or combustible materials been removed from the work area (35 foot radius)?
Yes	No	If any flammables or combustibles cannot be removed, have they been covered by fire resistant shields or tarpaulins?
Yes	No	Is adequate firefighting equipment readily available?
Yes	No	Have vulnerable areas of combustible floors and/or roofs been wet-down or properly covered?
Yes	No	Have wall and/or floor openings been properly covered?
Yes	No	Is the hot work equipment in good working condition?
Yes	No	Is a Confined Space Permit required?
Yes	No	If pressurized lines or lines containing hazardous gases or liquids must be broken or cut, have the appropriate safety measures been taken?
Yes	No	Are Lock-Out Tag-Out Procedures required?
Yes	No	Has the atmosphere been checked with a multi gas meter for flammable/explosive gas levels or other atmospheric hazards?

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Yes No Is ventilation adequate?

Yes No If no, has forced ventilation or supplied air been provided?

Yes No 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)

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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 form 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

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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 ***OSHA # 1910.95, Hearing Conservation Program,*** and using the recommended type of hearing protector.

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Regulations (Standards - 29 CFR)

Substance data sheet for occupational exposure to lead – 1910.1025 App A

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- **Part Number:** 1910
- **Part Title:** Occupational Safety and Health Standards
- **Subpart:** Z
- **Subpart Title:** Toxic and Hazardous Substances
- **Standard Number:** 1910.1025 App A
- **Title:** Substance data sheet for occupational exposure to lead

I. **SUBSTANCE IDENTIFICATION**

A. Substance: Pure lead (Pb) is a heavy metal at room temperature and pressure and is a basic chemical element. It can combine with various other substances to form numerous lead compounds.

B. Compounds Covered by the Standard: The word "lead" when used in this standard means elemental lead, all inorganic lead compounds and a class of organic lead compounds called lead soaps. This standard does not apply to other organic lead compounds.

C. Uses: Exposure to lead occurs in at least 120 different occupations, including primary and secondary lead smelting, lead storage battery manufacturing, lead pigment manufacturing and use, solder manufacturing and use, shipbuilding and ship repairing, auto manufacturing, and printing.

D. Permissible Exposure: The Permissible Exposure Limit (PEL) set by the standard is 50 micrograms of lead per cubic meter of air (50 ug/m(3)), averaged over an 8-hour workday.

E. Action Level: The standard establishes an action level of 30 micrograms per cubic meter of air (30 ug/m(3)), time weighted average, based on an 8-hour work-day. The action level initiates several requirements of the standard, such as exposure monitoring, medical surveillance, and training and education.

II. HEALTH HAZARD DATA

A. Ways in which lead enters your body. When absorbed into your body in certain doses lead is a toxic substance. The object of the lead standard is to prevent absorption of harmful quantities of lead. The standard is intended to protect you not only from the immediate toxic effects of lead, but also from the serious toxic effects that may not become apparent until years of exposure have passed.

Lead can be absorbed into your body by inhalation (breathing) and ingestion (eating). Lead (except for certain organic lead compounds not covered by the standard, such as tetraethyl lead) is not absorbed through your skin. When lead is scattered in the air as a dust, fume or mist it can be inhaled and absorbed through you lungs and upper respiratory tract. Inhalation of airborne lead is generally the most important source of occupational lead absorption. You can also absorb lead through your digestive system if lead gets into your mouth and is swallowed. If you handle food, cigarettes, chewing tobacco, or make-up which have lead on them or handle them with hands contaminated with lead, this will contribute to ingestion.

A significant portion of the lead that you inhale or ingest gets into your blood stream. Once in your blood stream, lead is circulated throughout your body and stored in various organs and body tissues. Some of this lead is quickly filtered out of your body and excreted, but some remains in the blood and other tissues. As exposure to lead continues, the amount stored in your body will increase if you are absorbing more lead than your body is excreting. Even though you may not be aware of any immediate symptoms of disease, this lead stored in your tissues can be slowly causing irreversible damage, first to individual cells, then to your organs and whole body systems.

B. Effects of overexposure to lead –

1) Short term (acute) overexposure.

Lead is a potent, systemic poison that serves no known useful function once absorbed by your body. Taken in large

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enough doses, lead can kill you in a matter of days. A condition affecting the brain called acute encephalopathy may arise which develops quickly to seizures, coma, and death from cardiorespiratory arrest. A short term dose of lead can lead to acute encephalopathy. Short term occupational exposures of this magnitude are highly unusual, but not impossible. Similar forms of encephalopathy may, however, arise from extended, chronic exposure to lower doses of lead. There is no sharp dividing line between rapidly developing acute effects of lead, and chronic effects which take longer to acquire. Lead adversely affects numerous body systems, and causes forms of health impairment and disease which arise after periods of exposure as short as days or as long as several years.

2) Long-term (chronic) overexposure.

Chronic overexposure to lead may result in severe damage to your blood-forming, nervous, urinary and reproductive systems. Some common symptoms of chronic overexposure include loss of appetite, metallic taste in the mouth, anxiety, constipation, nausea, pallor, excessive tiredness, weakness, insomnia, headache, nervous irritability, muscle and joint pain or soreness, fine tremors, numbness, dizziness, hyperactivity and colic. In lead colic there may be severe abdominal pain.

Damage to the central nervous system in general and the brain (encephalopathy) in particular is one of the most severe forms of lead poisoning. The most severe, often fatal, form of encephalopathy may be preceded by vomiting, a feeling of dullness progressing to drowsiness and stupor, poor memory, restlessness, irritability, tremor, and convulsions. It may arise suddenly with the onset of seizures, followed by coma, and death. There is a tendency for muscular weakness to develop at the same time. This weakness may progress to paralysis often observed as a characteristic "wrist drop" or "foot drop" and is a manifestation of a disease to the nervous system called peripheral neuropathy.

Chronic overexposure to lead also results in kidney disease with few, if any, symptoms appearing until extensive and most likely permanent kidney damage has occurred. Routine laboratory tests reveal the presence of this kidney disease only after about two-thirds of kidney function is lost. When overt symptoms of urinary dysfunction arise, it is often too late to correct or prevent worsening conditions, and progression to kidney dialysis or death is possible.

Chronic overexposure to lead impairs the reproductive systems of both men and women. Overexposure to lead may result in decreased sex drive, impotence and sterility in men. Lead can alter the structure of sperm cells raising the risk of birth defects. There is evidence of miscarriage and stillbirth in women whose husbands were exposed to lead or who were exposed to lead themselves. Lead exposure also may result in decreased fertility, and abnormal menstrual cycles in women. The course of pregnancy may be adversely affected by exposure to lead since lead crosses the placental barrier and poses risks to developing fetuses. Children born of parents either one of whom were exposed to excess lead levels are more likely to have birth defects, mental retardation, behavioral disorders or die during the first year of childhood.

Overexposure to lead also disrupts the blood-forming system resulting in decreased hemoglobin (the substance in the blood that carries oxygen to the cells) and ultimately anemia. Anemia is characterized by weakness, pallor and fatigability as a result of decreased oxygen carrying capacity in the blood.

3) Health protection goals of the standard.

Prevention of adverse health effects for most workers from exposure to lead throughout a working lifetime requires that worker blood lead (PbB) levels be maintained at or below forty micrograms per one hundred grams of whole blood (40 ug/100g). The blood lead levels of workers (both male and female workers) who intend to have children should be maintained below 30 ug/100g to minimize adverse reproductive health effects to the parents and to the developing fetus.

The measurement of your blood lead level is the most useful indicator of the amount of lead being absorbed by your body. Blood lead levels (PbB) are most often reported in units of milligrams (mg) or micrograms (ug) of lead (1 mg=1000 ug) per 100 grams (100g), 100 milliters (100 ml) or deciliter (dl) of blood. These three units are essentially the same. Sometime PbB's are expressed in the form of mg% or ug%. This is a shorthand notation for 100g, 100 ml, or dl.

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PbB measurements show the amount of lead circulating in your blood stream, but do not give any information about the amount of lead stored in your various tissues. PbB measurements merely show current absorption of lead, not the effect that lead is having on your body or the effects that past lead exposure may have already caused. Past research into lead-related diseases, however, has focused heavily on associations between PbBs and various diseases. As a result, your PbB is an important indicator of the likelihood that you will gradually acquire a lead-related health impairment or disease.

Once your blood lead level climbs above 40 ug/100g, your risk of disease increases. There is a wide variability of individual response to lead, thus it is difficult to say that a particular PbB in a given person will cause a particular effect. Studies have associated fatal encephalopathy with PbBs as low as 150 ug/100g. Other studies have shown other forms of diseases in some workers with PbBs well below 80 ug/100g. Your PbB is a crucial indicator of the risks to your health, but one other factor is also extremely important. This factor is the length of time you have had elevated PbBs. The longer you have an elevated PbB, the greater the risk that large quantities of lead are being gradually stored in your organs and tissues (body burden). The greater your overall body burden, the greater the chances of substantial permanent damage.

The best way to prevent all forms of lead-related impairments and diseases-both short term and long term- is to maintain your PbB below 40 ug/100g. The provisions of the standard are designed with this end in mind. Your employer has prime responsibility to assure that the provisions of the standard are complied with both by the company and by individual workers. You as a worker, however, also have a responsibility to assist your employer in complying with the standard. You can play a key role in protecting your own health by learning about the lead hazards and their control, learning what the standard requires, following the standard where it governs your own actions, and seeing that your employer complies with provisions governing his actions.

4) Reporting signs and symptoms of health problems.

You should immediately notify your employer if you develop signs or symptoms associated with lead poisoning or if you desire medical advice concerning the effects of current or past exposure to lead on your ability to have a healthy child. You should also notify your employer if you have difficulty breathing during a respirator fit test or while wearing a respirator. In each of these cases your employer must make available to you appropriate medical examinations or consultations. These must be provided at no cost to you and at a reasonable time and place.

The standard contains a procedure whereby you can obtain a second opinion by a physician of your choice if the employer selected the initial physician.

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Lead & the Workplace

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Lead & the Workplace

Lead & the Workplace

For thousands of years, lead has been known to be hazardous. However, for many years, relatively little was done to adequately protect U.S. workers from the hazardous effects of lead exposure. This changed in November 1978, when the Occupational Safety and Health Administration (OSHA) issued an improved lead standard. OSHA estimated that 835,000 workers, including many thousands of CWA members, would be protected by the standard. Affected CWA members are primarily employed in manufacturing and telecommunications cable splicing and outside plant technician jobs.

Health Effects

Lead exposure can result in workers experiencing headaches, fatigue, irritability, nervousness, high blood pressure, sleeplessness, pain in joints, aching muscles, poor appetite, stomach pains, and constipation. If a worker should notice any of these symptoms, she/he should see a doctor.

Even more severe effects of lead exposure such as damage to the nervous system, kidney damage, sterility and birth defects, anemia, and interference with the body's blood forming mechanism may afflict some workers.

Since all of these health problems may either appear slowly or be caused by other reasons, lead can be easily overlooked as the cause. Some workers with these problems will have them for many years, but the health effects will not get much worse. Others will either suddenly or gradually develop the disabling or life threatening effects of lead poisoning.

Lead can enter your body in two ways-- by breathing or swallowing. Up to 70% of the lead dust or fumes that one breathes is/are absorbed into the body; whereas, approximately 30% of the lead one swallows is absorbed into the body.

Medical Tests

There are several examinations by which the amount of lead in an individual's body may be determined. The preferred test is known as zinc protoporphyrn (ZPP). This procedure measures the amount of lead in the entire body including the bones, tissues, and other organs.

Other blood tests such as amino levulnic acid (ALA) and amino levulnic acid dehydratase (ALAD) may also be used to determine the harmful bodily effects of lead. However, they are both more difficult to perform and more time consuming than ZPP. Blood lead concentration tests that only identify the amount of lead in the blood or urine tests that only measure the lead being removed from the body should be avoided. These tests measure only the most recent exposure to lead, not long-term exposure.

To best assess the effects of lead exposure upon the body, a complete physical examination, preferably conducted by an occupational physician, must be performed. Such an exam will determine the degree of lead poisoning and functional damage to the body.

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Treatment for Lead Poisoning

Lead poisoning is preventable through the development of controls at the workplace.
In cases where a worker has been overexposed to lead, exposure should be stopped and controls should be introduced to prevent any recurrence.

In instances where workers have been severely exposed, medical treatment known as chelation can be given to help the body get rid of the lead. The most common chelating agents are calcium disodium versanate or versine (Ca Na(2) EDTA), penicillamine, and British anti-Lewisite (BAL). Since chelation treatment may have harmful side effects, treatment should only be administered by proper medical personnel in a hospital setting.

Controlling the Hazard

Lead poisoning can best be controlled by removing the lead from the workplace. However, in many cases, this is not possible. An example would be working on lead encased cables.

Lead should be kept out of the air you breathe. Lead usually enters the air as a fume or dust. Fumes are tiny particulates that boil-off when lead is heated. Lead dust may be formed during grinding, filing, and many other operations. Also, a fine film of lead sub-oxide dust can form on the surface of molten lead. This nearly invisible dust can get into the air whenever the surface is agitated.
Protective procedures and methods that must be provided by the employer to prevent lead exposure include:

Local Exhaust Ventilation- Local exhaust ventilation uses hoods, ducts, fans, and filters to remove lead fumes and dust at the point where they are produced.

Personal Protective Equipment- This includes the use of gloves, goggles, clothing protection, boots, and where necessary, respirators.

Personal Hygiene- Personal cleaning materials such as waterless cleaners and paper towels must be made available to all workers at their work locations.

All workers who work with lead should be provided and use these protective materials.

OSHA's Lead Standard

OSHA's Lead Standard, CFR 1910.1025, requires employers with lead operations and processes to conduct industrial hygiene air monitoring to determine the level of lead exposure. The standard sets a permissible exposure level (PEL) of 50 ug/m(3) (micrograms of lead per cubic meter of air) averaged over an eight-hour work shift or period. If the industrial hygiene monitoring results identify lead levels that exceed the permissible exposure limit, the employer must initiate periodic personal sampling or air monitoring tests, as well as instituting engineering, administrative and work practice, as well as personal protective controls to ensure that workers are not exposed to hazardous lead levels. In addition, the employer must provide medical surveillance and, if necessary, medical removal protection for all affected workers. These procedures must be continued until the employer can demonstrate adherence to the OSHA standard.

In addition, the standard includes an "Action Level" of 30 ug/m(3) averaged over an eight-hour period. If the "Action Level" is met or exceeded (as determined by conducting the required industrial hygiene monitoring tests), the employer must institute personal sampling procedures and medical surveillance procedures for all affected workers. Such monitoring must continue to be periodically conducted until the employer demonstrates

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that lead levels do not meet the "Action Level." Also, medical surveillance procedures must be provided until adherence with the standard is achieved.

Further, the standard provides for engineering controls, administrative controls, safe work practices, better housekeeping, clean lunchrooms, special washing facilities and lockers, employer-supplied personal protective clothing and safety equipment (including respirators), information and training regarding the toxicity of and safe and healthful procedures when working with lead, and, as noted, medical surveillance and medical removal protection for workers removed from the job because of exposure to lead.

The standard's provisions for medical removal protection require employers to provide workers who are determined to have high blood lead levels with full earnings, seniority protection, and other employment rights and benefits for a period up to eighteen months per occasion as though the worker had not been removed from exposure to lead. The lead standard is one of the few OSHA standards that provides for medical removal protection.

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Lead Molding Instructions

DESIGN, FABRICATION AND INSTALLATION
CORROSION AND ABRASION RESISTANT PRODUCTS AND SERVICES

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Lead Molding Instructions

Before melting lead, read and understand all of these important safety rules!

Some Safety Tips

1. Always wear gloves and eye protection.
2. Always work in a well ventilated area! Use strong vapor extraction equipment!
3. Keep the work area around the molten metal dry and free of moisture. This includes the crucible. Moisture expands when it comes into contact with hot metal. This expansion can cause "splatter" of the hot metal, and can cause serious burns.
4. NOTICE: We recommend a light coat of Vaseline on your hands, arms, and face. This will help prevent burns if "splatter" does occur.
5. Always wear a long sleeved shirt, long pants, and shoes.
6. Pre-heat all tools that come into contact with lead.

** See bottom of this page for additional important safety information! **

Let's Get Started!

Pure lead melts at 621 degrees F., so you must be extremely careful. Lead is alloyed with tin which melts at slightly less temperature. Most lead is alloyed with antimony, which melts at slightly more temperature. The best lead to use is "caulking lead." Try to obtain as pure a lead as possible (not to exceed 6% antimony content). You will mold better quality parts, especially on smaller jigs.

Melting Lead

Do not use an acetylene torch. You may melt your tools and cause an accident!
The most desirable and safest way is to use a quality lead melting furnace.

Pre-Heating and Smoking Mold

Place your mold on top of the furnace to pre-heat the mold while the lead is melting. Mold should sit on the mold sides with both sides in contact of the furnace. Take extra caution not to melt your plastic handles. These handles are made of PVC and are very strong, but will melt at high temperatures. If you melt your handles, it's your responsibility. Next, you may want to smoke your mold. This process is done with a candle and will enable your parts to be released from the mold easily. The mold cavities should be ugly black when properly smoked. Now let's check and clean the parting surface of your mold. Carefully inspect for dirt or lead build-up on the parting surface. Close mold and hold up to light to make sure mold closes completely or your parts will have "flash". Next, you must check to make sure your hooks, wires, and eyelets fit the mold and the mold closes completely. Hilts Molds are machined very precise. Hook numbers are on every mold. Our inserts fit our molds. If you use other inserts make sure they fit properly or we disclaim our warranty.

Warming Your Mold

Do not use Acetylene Torch. You must pre-heat your mold and all tools to produce quality parts.

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This is easiest done by placing the mold over your lead pot.

Casting Parts

Now close your mold and make some trial parts (without any inserts). Do this 2 or 3 times until your mold produces a good finished part. A good finished part is a part without visible fracture lines in the lead. Be careful, without inserts your mold may leak through!
Now put your insert in place. After closing the mold you may lay the mold on your table and gently tap with a piece of lead to seat inserts or hooks. Make a casting. As soon as your mold is full you can open it. Lead cools quickly and will not run out.
Any time you stop casting metal for more than 2 minutes, put your mold back over the lead furnace (as in pre-heating) to keep the mold warm.

Tips

Eyelets sometimes are hard to load into mold. Rub a bar of soap on eyelet cavity. This will hold eyelet perfectly.
After using your mold a while, it is normal to have lead build up on the parting surface. Remove this with a file. Be sure the file lays flat. Do not remove any of the mold material.
The lead will load your file. Clean the file by rubbing the edge of a penny from side to side on it.

Removal and Trimming Molded Parts

Casting with larger hooks (spinner baits, larger jigs): These can easily be grabbed by hand and pulled out. Do not grab newly molded lead! If you cannot grab the hook or wire by hand, pliers must be used to grab the casting at the gate area and remove. Do not use screwdriver or pry casting loose with anything. You may damage your mold.
Molding small jigs from a bottom pour pot: Bring the mold in firm contact with the spout- lift the handle- count 1-2-3-4 - release- and open the mold.