# ARSENIC, CADMIUM & LEAD EXPOSURE PROTECTION

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PART 1
TRAINING FOR WORKERS WHO MAY BE EXPOSED TO HEAVY METAL MATERIALS

J.T. Thorpe & Son, Inc will train all workers where there is a potential for exposure to heavy metal exposure. This training will be provided prior to allowing a worker to start on a project where the exposure to these materials (Lead, Cadmium, Arsenic, or Hexavalent Chrome) may exist.

a. All JTT workers who may be exposed to lead, cadmium, arsenic, or hexavalent chrome will be trained on the various OSHA regulations including Appendices A & B of the regulation. This information is detailed below in the program.

b. All affected employees are required to attend initial and annual training programs with test given that indicates who was trained, who trained and what date the training occurred.

c. The specific nature of the operations which could result in exposure to lead, cadmium, arsenic, or hexavalent chrome above the action level will be discussed.

d. Engineering controls found on projects to control these exposures will be outlined as a part of the training.

e. The purpose, proper selection, fitting, use, and limitation of respirators will be reviewed (See Section III training and information in this section for more information)

f. The purpose & a description of the medical surveillance program (that it will be under the direction of a licensed physician and medical removal programs as they relate to the various heavy metal exposures will be outlined (see medical monitoring information starting on page 17)

g. JTT will maintain and make available to JTT workers an accurate record of all employee exposure monitoring, medical surveillance and training records. If requested by proper legal authority, these records may be made available to others.
PART 2
IDENTIFICATION OF “REGULATED AREAS”

Regulated areas must be established when there is a possibility of an employee's exposure to Lead, Cadmium, Arsenic, or Hexavalent Chrom that may be or is expected to be in excess of the PEL. Regulated areas shall be marked with warning signs to alert employees. Access will be restricted to "authorized persons" only. To determine if a work process to be performed by need a “regulated area” follow the following steps.

A. Prior to starting work at any facility, the JTT project manager in charge must determine if the work to be performed involves exposure to arsenic, cadmium, lead, or Hex Chrome. Hex Chrome exposures occur when we are required to weld stainless steel generally to install anchors. The types of plants JTT works in that typically have exposure to lead, cadmium, or arsenic are as follows:

- Copper Smelters
- Lead Smelters
- Other Metal Smelters
- Battery Recycling operations
- Hazardous Waste Burners

B. If exposure assessments have been performed by the customer:

1. Obtain the extent of exposure and PPE requirements
   a. Determine if the exposures are over the PEL for arsenic, cadmium or lead.
   b. Determine if the exposures are over the action levels for arsenic, cadmium or lead.
   c. Determine the estimated length of the job.

C. If exposure assessments have not been performed by customer:

1. Coordinate with local IH technologist and company safety to set up hazard assessment testing.
2. Treat exposure as requiring full-face respirator protection.
3. Determine length of project, and rush lab results.
4. If job lasts longer than 30 days and exposure levels exceed established OSHA action levels, then implementation of program training, hygiene, respirator, records, and proper medical testing is required for affected workers.

D. JTT has performed IH testing for welding stainless steel PPE and job set up has been established (see below for controls). If over the PEL have warning signs in place.

E. If at all possible, engineering controls will be implemented to control any hazard. This will include controlling respiratory hazards prior to use of respiratory protection. Annual review of this program will be performed to determine if there any significant changes in JTT operations. All workers and their representatives will have access to these procedures. No employee will be exposed to limits over the PEL.

F. If work is being performed by others that is located next to our project and if this work creates a hazard to our workers, JTT management will remove our workers from the area until the exposure is controlled and it is safe to work.

G. In some instances our work will be performed in locations where these heavy metals Lead, Cadmium, Arsenic, or Hexavalent Chrome may be present, but not in concentrations above the action level. JTT workers will be advised of this at the time of hire (hazard awareness training) / prior to starting the work on the specific job. This training will include where these materials may be found on the project. Workers will be informed not to disturb
these materials. Refresher training on this requirement will be provided on an annual basis. This training will be
documented by the attached test and training checklist sheet, attachment

H. Proper PPE will be provided. This PPE could include controlling hazards from skin, eye contact, puncture
wounds or respiratory exposures. Gloves, aprons, coveralls, goggles, full or half face respirators, foot covers etc.
may be needed. Contaminated PPE will be removed at the end of the work shift. JTT is responsible for and will
clean, launder, repair and replace protective clothing as needed.

I. JTT will provide change rooms for decontamination. They will be set up to prevent cross-contamination.
Washing facilities shall be readily accessible to wash any heavy metal material from the skin. Workers must wash
their hands and face or any other potentially exposed skin before eating, drinking or smoking.

J. If ventilation systems are used to control the hazard of Heavy Metal dusts or fumes, the workers performing
maintenance on this system shall use proper PPE when cleaning vents or filters. This will include the use of full
face respirators with HEPA filters, tyvex, and gloves. The workers will use proper hygiene procedures that are
outlined in this program below.
PART 3
RESPIRATORY PROTECTION PROGRAM

POLICY

Many substances in the industrial environment can prove harmful to a person's respiratory system and overall health. We at J.T. Thorpe & Son, Inc. are committed to our moral and legal obligation to protect our employees from these substances and the serious effects they can have.

Some substances can be controlled through engineering techniques, such as ventilation systems. There are, however, situations where known engineering techniques cannot be applied. It is in these situations where respirator protective equipment becomes necessary. The respirator shall be used during the time period necessary to install or implement engineering or work practice controls and where engineering and work practice controls are insufficient and in emergencies.

J.T. Thorpe & Son, Inc. has established minimum standards for the use of respiratory protection equipment for certain conditions. These minimum standards are detailed below and equipment meeting or exceeding these standards must be used.

RESPERATORY HAZARDS

You must first identify and evaluate the hazards present before you can select the right respirator. Respiratory hazards come in the form of dusts, fumes, mists, vapors, and gases. The hazard comes from the presence—or in the case of oxygen, the lack—of a material. A respiratory hazard is when a material can enter the body by being inhaled and cause illness or bodily damage.

Types of respiratory hazards can be classified as either acute or chronic. Acute hazards are those that may be harmful after a relatively brief exposure. These include atmospheres immediately dangerous to life or health (IDLH), meaning that they can cause immediate harm or death (i.e., oxygen deficiency, H2S, chlorine). Chronic hazards are those that can cause permanent damage to health, following exposure over a period of time (e.g., asbestos, benzene).

In order to determine the proper respiratory protective equipment to use, the materials a worker may be exposed to must be classified into one of the categories listed below:

Dusts: Solid particles generated by handling, crushing, or grinding of organic or inorganic materials. Mixing of dry materials create dusts.

Fumes: Solid particles formed when a molten solid, such as a metal, cools and condenses. Welding is an example of this process.

Mists: Suspended liquid droplets generated from condensing gases to a liquid or from breaking up a liquid by splashing or spraying. Spray painting is an example of this process.

Vapors: The gaseous form of a substance normally in the solid or liquid state. Hazardous types include benzene and different types of solvents.

Gases: Normally formless fluid, which can only be changed to a liquid by combining pressure and temperature. Examples are H2S, chlorine, ammonia, S02, methane, and butane.

OXYGEN DEFICIENCY

The single respiratory hazard that poses the greatest problem and threat to life is oxygen deficiency. Normal air contains 21% oxygen by volume. Oxygen levels of 16% or less cannot safely support the respiratory needs of a person. This is why oxygen levels must always be taken into account when evaluating a worker’s respiratory protection equipment.
Oxygen levels must be at least 19.5% by volume if respiratory protective equipment is used. An oxygen-deficient atmosphere is a condition often found in poorly ventilated, confined spaces. This atmosphere is classified as immediately dangerous to life or health (IDLH). This atmosphere can occur in two (2) ways: oxygen may be used up by a chemical reaction (including combustion) or oxygen can be displaced by another gas.

EVALUATION OF THE HAZARD

Hazard evaluation must be performed by a qualified individual who is trained in the operation of the proper detection equipment provided in each office. If you are not qualified, contact the owner's personnel, or the local J.T. Thorpe & Son Manpower Safety representative to properly evaluate the hazard.

Those performing hazard identification and evaluation should advise you in writing of their findings (i.e., stated on the vessel entry permit).

RESPIRATORS AND THEIR LIMITATIONS

There are two categories of respirators we use in our work: air purifying respirators and air-supplied respirators.

AIR PURIFYING RESPIRATORS

Air purifying respirators do just what the words imply: they purify the air, but they do not supply oxygen if there is a deficiency. Air purifying respirators with filters are designed to remove particulate (dusts, mists, or fumes) from the air. We use this type of respirator for the majority of our work. The 3M half- and full-face, used with the different filter cartridges, are air- Process Safety/Work Order purifying respirators.

LIMITATIONS OF AIR PURIFYING RESPIRATORS

DO NOT USE AIR PURIFYING RESPIRATORS UNDER THE FOLLOWING CONDITIONS:

- In oxygen-deficient atmospheres
- In atmospheres immediately dangerous to life or health (IDLH)
- When airborne contaminant levels are higher than the OSHA PEL multiplied by the Assigned Protection Factor for the respirator (10 for half-mask and 50 for full-face mask).

BREAKTHROUGH

If a wearer of an air-purifying respirator begins to taste, smell, or be irritated by the contaminant, it is an indication that a “breakthrough” has occurred. This means that it is time to replace the cartridge or replace the respirator, provided that the wearer has a good seal or fit.

AIR-SUPPLIED RESPIRATORS

On occasion we must work in environments that require the use of air-supplied respirators. No one is allowed to use air-supplied respirators until specifically trained on the equipment, including the emergency escape pack.

RESPIRATOR EQUIPMENT PURCHASE

All respirator equipment must be "approved" equipment for the protection against the particular contaminant found. All respirator equipment must have NIOSH approval certification. For the purpose of continuity between the J.T. Thorpe & Son offices, all J.T. Thorpe respirators will be 3M, unless the customer requires a different type. This allows workers fit tested in one office to be able to use the respirator assigned from another.

EMPLOYEE SCREENING
OSHA guidelines require that employees wearing respiratory protection first pass a medical/physical examination that demonstrates their ability to wear the equipment without it being a threat to their health. All employees must pass a pre-placement physical exam prior to being issued any respiratory equipment. An exam must meet the specifications established by OSHA. The physical covers lung capacity, cardiovascular system, and any physical problems that would prevent proper fit of the respirator.

ISSUANCE OF RESPIRATORY EQUIPMENT

Half-face respirators are assigned to each worker. Equipment should not be transferred from one worker to another. If workers request a new respirator, we provide them with one.

RESPIRATOR FIT TEST

Fit tests are essential to ensure that respirator masks form a good seal against the wearer's face to prevent contaminants from leaking into the mask.

When a respirator is first issued, the wearer should try a variety of sizes to get a comfortable fit. A JTT employee certified to perform fit testing will administer a qualitative test using irritant smoke.

All JTT workers are also be trained to perform a Negative pressure fit and Positive pressure fit test each time they put on a respirator.

MINIMUM RESPIRATORY EQUIPMENT STANDARDS

The following is a list of respirators, which are designated as the minimum protection for the specified exposure:

Note (1): Some customers may require the use of different respirators when performing work. When stricter than J.T. Thorpe & Son policy, the customer policy will be followed.

Note (2): If material being installed is Man Made Ceramic Fibers (MMCF), if tear-out performed on MMFC that has been heated above 1800 degrees Fahrenheit resulting in the formation of cristobalite, or if the material being installed or torn out contains cristobalite, additional personal protective equipment consisting of paper coveralls and gloves must be worn. Be aware that a site-specific safety plan may be written, and if so, must be followed.

A. Welding in a confined space where positive ventilation can be achieved, non stainless steel. 3M Half-Face Respirator 6,000 series with HEPA P100 series filters

B. Welding stainless steel in a confined space requires 3M ½ Face Air-supplied Respirators with HEPA P100 series filters or full-face respirators with HEPA filters

C. Tear-out in confined space where positive ventilation cannot be achieved. 3M Full-Face Respirators 7,000 series with HEPA P100 series filters

D. Material mixing operations. 3M Half-Face Respirators 6,000 series with HEPA P 100 series filters. If mixing in enclosure mix man wears 3M full face 7,000 series with HEPA P100 filters

E. Gunite operations, mixing or shooting. 3M Half-Face Respirators 6,000 series with HEPA P100 series filters.
The above guidelines have been established to assist field management in the proper selection and use of respirator equipment on the job site. This information ensures that respirator protection meets or exceeds the requirements of Cal OSHA, UOSH, and OSHA for any given exposure. However, there may be instances where there are special requirements; the client mandates that a different type of respirator be used; or after careful reevaluation by J.T. Thorpe & Son, Inc. management in consultation with J.T. Thorpe safety, a change in the level of protection may be necessary.

It is also necessary to be familiar with the various Material Safety Data Sheets (MSDS's) for any chemicals or construction products requiring the use of respiratory protection. Generally speaking, the equipment and exposures listed cover over 90% of the job sites that are a part of J.T. Thorpe & Son's operations.

Except as stated above, the proper respirator for a specific exposure depends on the PEL of the contaminant and the “Assigned Protection Factor” for the type of respirator. The airborne concentration must not exceed the PEL times the “Assigned Protection Factor” from the table below (from the OSHA Respirator Standard):

<table>
<thead>
<tr>
<th>Type of respirator¹,²</th>
<th>Half-mask</th>
<th>Full facepiece</th>
<th>Helmet/hood</th>
<th>Loose-fitting facepiece</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Air-Purifying Respirator</td>
<td>10³</td>
<td>50</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>2. Powered Air-Purifying Respirator (PAPR)</td>
<td>50</td>
<td>1,000</td>
<td>25/1,000⁴</td>
<td>25</td>
</tr>
<tr>
<td>3. Supplied-Air Respirator (SAR) or Airline Respirator</td>
<td>10</td>
<td>50</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>• Demand mode</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Continuous flow mode</td>
<td>50</td>
<td>1,000</td>
<td>25/1,000⁴</td>
<td>25</td>
</tr>
<tr>
<td>• Pressure-demand or other positive-pressure mode</td>
<td>50</td>
<td>1,000</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>4. Self-Contained Breathing Apparatus (SCBA)</td>
<td>10</td>
<td>50</td>
<td>50</td>
<td>N/A</td>
</tr>
<tr>
<td>• Demand mode</td>
<td>N/A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Pressure-demand or other positive-pressure mode (e.g., open/closed circuit)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:
¹Employers may select respirators assigned for use in higher workplace concentrations of a hazardous substance for use at lower concentrations of that substance, or when required respirator use is independent of concentration.
²The assigned protection factors in Table 1 are only effective when the employer implements a continuing, effective respirator program as required by this section (29 CFR 1910.134), including training, fit testing, maintenance, and use requirements.
³This APF category includes filtering facepieces, and half masks with elastomeric facepieces.
⁴The employer must have evidence provided by the respirator manufacturer that testing of these respirators demonstrates performance at a level of protection of 1,000 or greater to receive an APF of 1,000. This level of performance can best be demonstrated by performing a WPF or SWPF study or equivalent testing. Absent such testing, all other PAPRs and SARs with helmets/hoods are to be treated as loose-fitting facepiece respirators, and receive an APF of 25.
EQUIPMENT MAINTENANCE

JTT employees are trained how to inspect, clean and maintain their half-face respirator for the worker administering the fit test. Workers must store their respirators in the plastic bag provided. Prior to placing the face piece in the bag, workers must clean the face piece with the supplied wipes and remove the filters. If there is any question about the cleanliness of the respirator, the worker must be assigned a new face piece.

All full-face respirators must also be stored in the provided plastic bag. The respirator must be wiped clean and filters removed prior to storage.

If the full-face respirator has been damaged, contaminated, or the worker is finished with the assigned respirator, it must be turned into the tool room to be sent back to the JTT yard. The respirator is then cleaned and inspected, prior to being prepared to be sent out to the job. This work must be done by an employee who has been properly trained and approved to perform respirator maintenance work.

After maintenance and cleaning, the full-face respirator is placed in a sealed plastic bag and stored in the proper designated area, away from sunlight, in the warehouse.
PART 4
SAFE WORK PROCEDURES & PROTECTIVE CLOTHING

Personal Protective Equipment Requirements:

A. Coveralls
   1. Coveralls are provided to all employees required to work in a regulated area.
   2. Coveralls are not allowed to be removed from the site.
   3. All coveralls are changed in the JTT change room.
   4. Coveralls are stored in lockers in the JTT change room.
   5. Coveralls are cleaned by a cleaning service twice a week.

B. Hardhats
   1. Hardhats are used at all times in the unit.
   2. A wash area for hardhats is provided.
   3. Workers are required to wash hardhats if they remove them from the site.
   4. Employees are trained on the need to wash the hardhat before they remove the hat from site.

C. Steel Toe Boots
   1. Steel toe boots must be worn at all times.
   2. Wash area for boots is provided.
   3. All workers are required to wash off their boots any time they leave the site, including for lunch and at the end of the day.
   4. Employees are trained on the need to wash their boots before they leave the site.

D. Hearing Protection
   1. Due to noise levels in the work areas, all workers must wear hearing protection when entering.

E. Gunite Hoods (cloth head and neck covers)
   1. All workers must wear Gunite hoods when they perform work in a "Regulated Area."
   2. Gunite hoods are not allowed to be removed from the site.
   3. Gunite hoods are changed in the JTT change room.
   4. Gunite hoods are stored in lockers in the JTT change room.
   5. Gunite hoods are cleaned by a cleaning service twice a week.

F. Gloves
   1. All workers must wear Gloves when working in a "Regulated Area."
   2. Gloves are not allowed to be removed from the site.
   3. Gloves are changed in the JTT change room.
   4. Gloves are stored in lockers in the JTT change room.
   5. Gloves are not washed; they are disposed of per company procedures.

G. All PPE listed is provided at no cost to the JTT Worker.
PART 5
HYGIENE FACILITIES

A. Wash Facilities

1. Lunch and End of the Day
   a. All workers are required to remove coveralls, hoods, and gloves in the JTT change room prior to leaving for lunch or end of the day.
   b. All workers are required to wash face and hands prior to leaving for lunch or the end of day. This must be done after removal of contaminated clothing, at the wash facilities located next to the change room.
   c. All workers must wash boots and hardhats prior to leaving wash facilities for lunch or at the end of the work day.
   d. All employees must be trained in this procedure.

2. Smoke Breaks
   a. There is no smoking in any regulated area at any time.
   b. Smoking is only allowed in non-regulated areas.
   c. No employees may smoke until they have completely washed hands and face.
   d. All employees must be trained in this procedure.

3. Lavatory Facilities
   a. Lavatory facilities are provided by the customer.
   b. All employees are trained on the need to wash their hands prior to using the lavatory.

4. Offices, Lunchrooms, and Changing rooms (See housekeeping section for cleaning requirements.)

5. Provide a trash bag for Tyvex outside any confined space where stainless steel welding is performed. Tyvex must be disposed of in a trash bag to prevent the possible spread of Hex Chrome dust.
PART 6
HOUSEKEEPING PROGRAM

The need to control exposure to airborne dust containing arsenic, cadmium, and lead is a critical component of this program. Due to this need these housekeeping procedures are to be followed at all times during the tear-out phase of any project:

I. NEVER USE COMPRESSED AIR TO CLEAN UP DUST

II. Keep debris in concentrated areas until you are ready to put the debris into dumpsters.

III. Only place debris in dumpsters that are designated by the customer.

IV. Use shovels to clean up debris as much as possible. Minimize sweeping.

V. Surfaces shall be maintained as free as practicable of accumulation of heavy metal dusts.

VI. All spills and releases of heavy metal contaminated material shall be cleaned promptly. Methods of cleaning include HEPA filtered vacuums, dry or wet sweeping, shoveling or other methods to minimize exposure.
PART 7
TRAINING PROGRAM
“How to Protect Yourself From Possible Adverse Health Effects from Exposure to Arsenic, Cadmium, Lead and Hexavalent Chromium”

Arsenic, cadmium, lead and chrome are naturally occurring materials that are known as “Heavy Metals.” Like any material, exposure to too much of this material can be hazardous and there are short-term, acute, exposures that must be controlled. Hexavalent Chromium for the purpose of work performed by JTT occurs during the welding of stainless steel such as anchors. These materials can be found in industrial operations. This material is released as a part of the weld fume. Hexavalent Chrome is also a heavy metal.

Heavy metals are so hazardous because they are difficult for the body's cleaning systems to remove. These metals build up in the body and become toxic. Symptoms can occur slowly and the affected individual may not even know they are having a problem. They may only think they are tired or have the flu.

This training program will be provided to all employees who may be exposed to these materials including at the time of hire, during orientation and assignment to the job. Update training will be given annually thereafter.

The training will advise of the hazards associated with arsenic, cadmium, and lead, how you can be exposed to the material, how much of the material you can be exposed to and still be safe, and how you can protect yourself from this exposure. It also covers the symptoms of overexposure and the medical monitoring done to ensure you will not have health problems caused by Arsenic, Cadmium, Lead, or Hexavalent Chrome. Records will be maintained. Training records will include date of training, who was trained and who did the training. The records will be kept for at least one year.

1. OSHA Standards

B. 29 CFR (Code Of Federal Regulations) 1910.1027 Cadmium
C. 29 CFR (Code Of Federal Regulations) 1910.1025 Inorganic Lead
D. California Code of Regulation Title 8, Subchapter 7. General Industry Safety Orders 5214 Inorganic Arsenic
E. California Code of Regulation Title 8, Subchapter 7. General Industry Safety Orders 5207 Cadmium
F. California Code of Regulation Title 8, Subchapter 7. General Industry Safety Orders 5216 Lead
H. 29 CFR (Code Of Federal Regulations) 1926.1126 Hexavalent Chromium (Construction)

Potential Health Risks

A. Inorganic Arsenic

1. Acute Health Effects (develop rapidly)
   a. Respiratory tract, skin and eye irritation
   b. Stomach pain
   c. Headache
   d. Extreme weakness
   e. Vomiting
   f. Shock and possible death

   Note: Acute health effects occur when a person is exposed to “very high” concentrations of arsenic, not what would occur under normal work conditions or when proper PPE is used.

2. Chronic health Effects (develop slowly over time)
a. Potential lung or skin cancer  
b. Unexplained weight loss  
c. Nausea  
d. Diarrhea alternating with constipation  
e. Skin pigmentation change  
f. Skin irritation and/or eruptions  
g. Peripheral Neuritis (irritations of the nerves)  
h. Eye irritations and possible conjunctivitis (inflammation of the mucous membrane lining of the eyelid)  
i. Perforation of the nasal septum (burn on the inside of the nose)

B. Cadmium

1. Acute Symptoms & Effects
   a. Flu-like symptoms; chills, fever, and muscle pain in the back and limbs  
   b. Pulmonary edema (fluid build-up in the lungs)  
   c. Lung fibrosis (thickening of the linings)  
   d. Vascular changes  
   e. Fluid build-up in kidneys

2. Chronic Symptoms & Effects
   a. Perforation of nasal septum  
   b. Loss of smell  
   c. Chronic bronchitis  
   d. Progressive emphysema  
   e. Anorexia  
   f. Fatigue  
   g. Pallor  
   h. Anemia (low blood or hemoglobin counts)  
   i. Kidney damage  
   j. Bone demineralization (bones have no strength)  
   k. Lung fibrosis (loss of the lung’s efficiency, which allows you to breathe)  
   l. Possible lung and or prostate cancer

Note: Acute health effects occur when a person is exposed to "very high" concentrations of cadmium, not what would occur under normal work conditions or when proper PPE is used.

C. Inorganic Lead

1. Acute Symptoms & Effects
   a. Seizures  
   b. Coma  
   c. Cardio respiratory arrest  
   d. Death  
   e. Possible brain disease (Encephalopathy)

2. Chronic Symptoms & Effects
   a. Loss of appetite  
   b. Metallic taste in mouth  
   c. Anxiety  
   d. Constipation/Diarrhea  
   e. Nausea and or colic abdominal pain  
   f. Excessive tiredness & insomnia
g. Muscle and joint pain  
h. Numbness and or headache  
i. Dizziness  
j. Blood disorders  
k. Blood Enzyme disturbances  
l. Anemia  
m. Shortened red cell survival  

n. Neurological disorders  
   • Irritability  
   • Vertigo  
   • Fatigue  
   • Tremors and or convulsions  
   • Depression  
   • Hallucinations and/or delirium  
   • Coma  

o. Gastrointestinal Disorders  
   • Colic  
   • Severe abdominal pain  
   • Constipation  
   • Anorexia  
   • Nausea and/or Vomiting  

p. Renal (Kidney) Disorders  
   • Advanced kidney fibrosis  
   • Impaired kidney function  

q. Reproductive disorders  
   (For Males)  
   • Decreased sex drive  
   • Impotence  
   • Sterility  
   • Decreased sperm production  
   (For Females)  
   • Menstrual disturbances  
   • Sterility  
   • Genetic egg damage  
   • Failure of egg to implant  
   • Premature births  
   • Spontaneous miscarriages  
   • Still births  
   • Birth defects  
      (higher mortality rates, lowered birth weights, slower growth, nervous system disorders & learning disabilities)  

Note: Acute health effects occur when a person is exposed to “very high” concentrations of inorganic lead, not what would occur under normal work conditions or when proper PPE is used. No JTT employee will be allowed to be exposed to lead at concentrations greater than fifty micrograms per cubic meter of air averaged over an 8-hour period.  

D. Hexavalent Chromium  

1. Acute Symptoms & Effects  
   a. Irritation of eyes  
   b. Irritation of nose
c. Irritation of throat
d. Runny nose
e. Sneezing
f. Coughing

2. Chronic Symptoms & Effects
   a. Sores in nose
   b. Nose bleeds
   c. Nasal Septum perforation
d. Possible asthma symptoms
e. Contact dermatitis rash
   f. Chrome ulcers
g. Lung cancer
   h. Damage to eyes

**Exposure Limits & Monitoring**

A. Arsenic (Permissible Exposure Limits PEL)
   1. 10 micrograms / cubic meter

B. Cadmium (Permissible Exposure Limits PEL)
   1. 5 micrograms / cubic meter

C. Lead (Permissible Exposure Limits PEL)
   1. 50 micrograms / cubic meter

Note: PEL is time weighted standard set by OSHA as to the amount of material an average person can be exposed to in an 8 hour period.

D. Hexavalent Chrome (Permissible Exposure Limit PEL)
   1. 5 micrograms / cubic meter
   2. Employees will not be exposed over the PEL, engineering controls and or PPE if engineering controls cannot be installed will be implemented to control the exposure to below the PEL for the workers.

E. Arsenic (Action Limits)
   1. 5 micrograms / cubic meter
   2. Action Limit
      a. A time weighted average set by OSHA
      b. Exposure level must be met or exceeded for 30 days or more in a year.
      c. Specific Medical Evaluations must be done if this level is exceeded.
      d. The employee shall receive annual medical evaluations
      e. Semi-annual examinations shall be provided if the employee is 45 years of age or more,

F. Cadmium (Action Limit)
   1. 2.5 micrograms / cubic meter
2. **Action Limit**
   a. A time weighted average set by OSHA
   b. Exposure level must be met or exceeded for 30 days or more in a year.
   c. Specific Medical Evaluations must be done if this level is exceeded.
   d. The employee shall receive annual medical evaluations
   e. Semi-annual examinations shall be provided if the employee is 45 years of age or more.

G. **Lead (Action Limit)**

1. 30 micrograms / cubic meter

2. **Action Limit**
   a. A time weighted average set by OSHA
   b. Exposure level must be met or exceeded for 30 days or more in a year.
   c. Specific Medical Evaluations must be done if this level is exceeded.
   d. The employee shall receive annual medical evaluations
   e. Semi-annual examinations shall be provided if the employee is 45 years of age or more.
   f. If initial air monitoring is above the action level, monitoring will conducted every six months until two consecutive results are below the action level?

H. **Hexavalent Chromium (Action Limit)**

1. 2.5 micrograms / cubic meter

2. **Action Limit**
   a. A time weighted average set by OSHA
   b. Exposure level must be met or exceeded for 30 days or more in a year.
   c. Specific Medical Evaluations must be done if this level is exceeded.
   d. The employee shall receive annual medical evaluations
   e. Semi-annual examinations shall be provided if the employee is 45 years of age or more.

**Medical Monitoring**

A. **OSHA Requirements**

1. **Arsenic**
   a. Occupational and medical health history
   b. Posterior and Anterior (Back & Front) chest X-ray
   c. Nasal and Skin examination
   d. Other examinations as deemed appropriate by physician:
      - Respiratory tract
      - Lymph nodes
      - Nervous system
      - Liver
      - Sputum (salvia) cytology exam.

2. **Cadmium**
   a. Occupational & Medical history
   b. Respirator clearance exam
   c. Exam of renal, cardiovascular, respiratory and hematopetic systems
   d. Blood and urine tests
   e. Depending on findings frequency of tests may change
   f. Workers may be removed from work if medical tests reveal findings of cadmium too high in the body

3. **Lead**
   a. Medical and occupational history
   b. Evaluation of teeth
c. Evaluation of gums
d. Evaluation of hematological, GI, renal cardiovascular and neurological systems
e. If it is anticipated that the employee shall be exposed over the action level for 30 days each year
the medical exams are to be performed every 6 months.
f. Depending on lead blood levels, medical exams will be performed more often.

4. Hexavalent Chromium
a. Workers exposed to action level of material 30 or more days a year must receive medical
monitoring.
b. Health history must be obtained.
c. Physical examination with focus on skin and respiratory track must be given.
d. Other tests as deemed necessary by physician

B. Medical monitoring will be done for all JTT workers who are exposed above the PEL for 30 days or exhibit any
signs of over exposure at no cost to the worker. The tests will be performed by the local industrial clinic identified
for the job.

Medical records will be provided to all employees when requested. J.T. Thorpe shall keep the medical records of
employees on file for 40 years.

Exposure Control

A. How are you exposed to Arsenic, Cadmium, Lead, or Hexavalent Chromium?

1. Ingestion (Eating the material)
a. Eating food without washing your hands
b. Smoking without washing hands
c. Any time you place your hands to your lips without washing

2. Inhalation
a. Going into an area where arsenic, cadmium, and lead dust, or stainless steel welding fumes, are
present without respirator.
b. Improper storage of respirator:
   • Outside the bag
   • Stored in bag with contaminated filters
   • Leaving respirator around neck, not on your face
c. Improper fit of respirator (straps around hard hat)
d. Leaving one set of straps unhooked
e. Having improper respirator for concentrations of arsenic, cadmium, or lead (half-face instead of
full face)

B. Controls

1. Proper hygiene (wash and clean-up of face and hands)

2. Proper protective clothing
   a. Hoods
   b. Gloves
   c. Coveralls
   d. Tyvex

3. Changing clothing at work & removing Tyvex at site
   a. Not bringing dust home
   b. Tyvex to be removed at work site and disposed in proper container
4. Washing shoes before you leave the site
5. No smoking or eating in regulated areas
6. Washing before smoking or eating
7. Proper respirator protection
8. Testing to be sure protective equipment meet requirements to control exposures (I.H. testing)
9. Medical testing to ensure your health is satisfactory
10. Housekeeping including the cleaning of surfaces (vacuum with HEPA filter, sweeping, wash down of surfaces or other means to prevent buildup on surfaces.

D. Identification of Regulated Areas

1. Signs normally will be posted and warnings must be followed.

2. Arsenic signs
   a. Danger
   b. Inorganic Arsenic
   c. Cancer Hazard
   d. Authorized Personnel Only
   e. No Smoking or Eating
   f. Respirator Required

3. Cadmium signs
   a. Danger
   b. Cadmium
   c. Cancer Hazard
   d. Can Cause Lung And Kidney Disease
   e. Authorized Personnel Only
   f. Respirators Required In This Area

4. Lead signs
   a. Warning
   b. Lead work area
   c. Poison
   d. No smoking or eating

5. If arsenic, cadmium, or lead are present, but the concentrations are not known, the area will be treated as a regulated area.
   a. All respirators and PPE will be used.
   b. I.H. Testing will be performed, with results rushed to determine exposure level.

6. If welding stainless steel, the area where the welding is performed is considered the regulated area.

7. If JTT employees working immediately adjacent to a lead abatement activity are exposed to lead due to the inadequate containment of such job, project management will either remove the workers from the area until the enclosure breach is repaired or it can be proven that the exposure is below the PEL / Action Limit.
SECTION 8
MEDICAL SURVEILLANCE

I. Length of Employee Exposure to Regulated Areas: Lead, Cadmium, Hexavalent Chrome and Arsenic

A. All new employees will be required to fill out a questionnaire.
   1. Estimated days of exposure will be determined.
   2. Location of exposure will be identified and actual exposure determined if possible. All employees required to work in regulated areas will be identified. (See attachment 111)
   3. Number of days exposed will be identified.

II. JTT will use our usual and customary medical clinic for all medical services.

A. Health Histories will be obtained that include occupational and past medical information meeting OSHA standards.

B. All medical examinations will include, but not necessarily limited to:
   1. Posterior - anterior chest X-ray
   2. Nasal and skin examinations
   3. Respiratory tract
   4. Lymph nodes
   5. Nervous system
   6. Liver
   7. Sputum cytology examination
   8. Renal system
   9. Cardiovascular system
   10. Respiratory system
   11. Hemeopoetic system
   12. Cadmium levels in the blood
   13. Cadmium level in urine
   14. B-Z microglobulin in urine
   15. Lead and zinc protoporphyrin levels
   16. Blood urea nitrogen count
   17. Motragem count
   18. Serum Creatine count
   19. Hemoglobin count

C. Medical examinations will be performed annually for all workers that work in regulated areas for 30 days or more.

D. Arsenic Medical exams will be performed every 6 months for all workers 45 years of age or greater that have been exposed to arsenic above the action level for 10 years or more.

E. If any worker is found to have Cadmium levels as below, an additional medical evaluation will be performed within 90 days and a workplace analysis will be performed to determine how the exposure occurred.
   1. Cadmium in urine (CdU) is above 3 ug/g CR
   2. Cadmium in blood (CdB) is above 5 ug/lwb
   3. B-Z microglobulin in Urine (B-2M) is above 300 ug/g Cr

F. Employees will be removed from work and receive follow-up medical examinations if the Cadmium levels reach:
   1. Cadmium in urine (CdU) is above 7 ug/g CR
   2. Cadmium in blood (CdB) is above 10 ug/lwb
3. Z microglobulin in Urine (B-2M) is above 750 ug/g Cr
4. When the Cadmium levels drop to the levels listed in E 1, 2, & 3 the employees may return to work.

G. Employees will receive medical exams every 6 months if they are exposed to lead dust over the action levels for 30 days or more each year.

H. Employees will receive medical exams every 2 months if their lead blood level reaches 40 ug / dl of blood.

1. Thorpe management will analyze the employee's work area to determine why the worker's lead blood level has risen. Procedures will be implemented to control the exposure.

I. Employees will be removed from work and receive medical examinations on a monthly basis if their lead blood level reaches 50 ug/dl of blood.

J. Hexavalent Chrome medical monitoring shall be performed if IH results are above PELs and symptoms identified below are noted.

1. Medical surveillance shall be provided when an employee experiences signs or symptoms of the adverse health effects of Hexavalent Chromium (dermatitis, asthma, bronchitis, etc). Medical evaluations will be provided at no cost to employees. Examinations will be performed by or under the supervision of a physician or other licensed health care professional

2. Workers will be notified in writing if exposure over the PEL occurs. See letter format on page 31. Procedures to control the exposure will be explained in the letter

3. IH testing will be performed every 6 months until exposures are below PELs. The test will be done at start of shift and worse case exposure will be used as a test to do monitoring.

III. Medical Records
A. The results of all medical testing will be sent to the employees within 5 working days from when they are received.

B. Medical records for workers will be kept on file for 40 years.

IV. Accessibility to Records
A. All medical, exposure testing, and training records will be maintained by JTT management. These records will be made available when requested, maintaining employee confidentiality requirements for medical surveillance.
SECTION 9
EXPOSURE LIMITS & MONITORING

Note: No JTT worker will be allowed to work in any environment in which the exposure to a heavy metal will be greater than permissible PELs. Engineering controls, PPE or a combination of both will be implemented to insure the PELs are not exceeded.

A. Arsenic (Permissible Exposure Limits PEL)
   1. 10 micrograms / cubic meter

B. Cadmium (Permissible Exposure Limits PEL)
   1. 5 micrograms / cubic meter

C. Lead (Permissible Exposure Limits PEL)
   1. 50 micrograms / cubic meter

Note: PEL is time weighted standard set by OSHA as to the amount of material an average person can be exposed to in an 8 hour period.

D. Hexavalent Chrome (Permissible Exposure Limit PEL)
   1. 5 micrograms / cubic meter

E. Arsenic (Action Limits)
   1. 5 micrograms / cubic meter
   2. Action Limit
      a. A time weighted average set by OSHA
      b. Exposure level must be met or exceeded for 30 days or more in a year.
      c. Specific Medical Evaluations must be done if this level is exceeded.
      d. The employee shall receive annual medical evaluations
      e. Semi-annual examinations shall be provided if the employee is 45 years of age or more.

F. Cadmium (Action Limit)
   2. 2.5 micrograms / cubic meter
   2. Action Limit
      a. A time weighted average set by OSHA
      b. Exposure level must be met or exceeded for 30 days or more in a year.
      c. Specific Medical Evaluations must be done if this level is exceeded.
      d. The employee shall receive annual medical evaluations
      e. Semi-annual examinations shall be provided if the employee is 45 years of age or more.

G. Lead (Action Limit)
   1. 30 micrograms / cubic meter
   2. Action Limit
      a. A time weighted average set by OSHA
      b. Exposure level must be met or exceeded for 30 days or more in a year.
c. Specific Medical Evaluations must be done if this level is exceeded.
d. The employee shall receive annual medical evaluations
e. Semi-annual examinations shall be provided if the employee is 45 years of age or more.

H. Hexavalent Chromium (Action Limit)

1. 2.5 micrograms / cubic meter

2. Action Limit
   a. A time weighted average set by OSHA
   b. Exposure level must be met or exceeded for 30 days or more in a year.
   c. Specific Medical Evaluations must be done if this level is exceeded.
   d. The employee shall receive annual medical evaluations
   e. Semi-annual examinations shall be provided if the employee is 45 years of age or more.

I. On Going IH monitoring

1. Additional IH monitoring will be performed every 6 months if the exposure limit for the PEL is exceeded (PPE protection factors will be taken into consideration for this analysis)

2. A monitoring process demonstrating results in excess of the PELs will result in a letter being written to the worker explaining what will be done to reduce the exposure level.
SECTION 10
EXPOSURE ASSESSMENT SYSTEM/MONITORING

Testing standards:

A. All exposure assessment testing will be performed by a Certified Industrial Hygienist (CIH) or by a trained Industrial Hygiene Technologist (IHT) under the direction of the CIH.

B. All laboratory work will be performed by certified laboratory.

C. All published reports will meet legal requirements, reflect good Industrial Hygiene practice, and satisfy the Code of Ethics of the American Industrial Hygiene Association. The tests for heavy metal exposures will be representative of an 8 hour exposure at worse case expected for the work.

Certified Industrial Hygienist / Industrial Hygiene Technologist:

A. J.T. Thorpe & Son, Inc. is a member of the Contractors Industrial Hygiene Consortium. All I.H. work done for the consortium is performed under the direction of Hank McDermott CIH.

B. The IHTs' will be Thorpe employees. In Kentucky and Missouri the IHT is Ryan Hieneman. Doyle Tyree is the IHT for all other areas.
   1. The IHTs will be trained and certified by Hank McDermott to be able to perform field-testing.
   2. All results of IHTs testing will be reviewed and certified as meeting legal requirements and good Industrial Hygiene practice. by Mr. McDermott.

Results of all findings for all I. H. testing will be communicated to the employee and to our customer. On going testing will be performed if any project lasts more than 6 months and the action level for the exposure to the heavy metal is exceeded.

A. A form letter, see Attachment 1, to employees will communicate the findings.
   1. Testing results are above or below the PEL for material tested.
   2. Testing results are above or below the PEL for the material tested with protection provided.
   3. Testing results are above or below the action level for material tested.
   4. Additional necessary medical examinations, if needed, to be provided by Thorpe.
   5. This information will be communicated in writing back to the employees tested within 15 working days of the results being known.

B. Results of IH testing performed at job site, see attached I.H. reports, will be communicated to the customer.

Emergency Procedures

A. All employees will be trained on site specific emergency procedures prior to starting to work.

B. If no emergency procedures are established by the customer, a formal written site specific emergency plan will be developed for the job prior to the job starting. All JTT workers will be trained on this plan prior to their starting on the project.
SECTION 11
PROGRAM AND SITE EVALUATIONS

Periodic inspections and safety surveys will be performed to insure that the necessary respiratory program is effectively being implemented in the field. If surveys indicate that changes are required, they will be made.

This auditing program will also review for the effective implementation of the personal hygiene program and housekeeping procedures. Any adjustments identified as being needed by the audits will be made.

Ongoing reviews of each medical exam and industrial hygiene report will be made. If any readings are found above the normal ranges in the medical reports formal investigations will be made. The causal factors will be identified and the program will be adjusted to properly control the exposure.

Each job will be analyzed to determine if any engineering means can be identified to reduce the exposure levels to lead, cadmium and arsenic dust, and Hexavalent chrome in welding fumes. If any process such as ventilation or filtration systems can be identified, they will be used. A site specific plan will be developed that identifies procedures to reduce the exposure and IH monitoring to be done to control the exposure. The work order will identify any work signs, labeling or work procedures to be followed at the plat. The initial orientation training for the site will outline this information for all workers. Insure that the workers understand that following these procedures are required. This plan will be reviewed and updated, as needed, prior to starting work on the project, or at least annually.

Each medical exam will be reviewed by Thorpe Safety. The purpose of the review is to identify any medical report that did have results in the "normal range". Formal investigations will be performed for any report outside of the "normal range" and procedures will be developed to control the exposure.

Since each job site is different, hazard identification must be coordinated with the owner. Proper respirator selection must be based on Thorpe hazard surveys and the owner’s requirements. Reviews of the various JTT job sites and project work orders where heavy metals may be found will be performed on an annual basis. This program will be updated as needed to address these issues.
ATTACHMENT I: EMPLOYEE NOTIFICATION LETTER

Note: **Affected employees shall be notified of the results of any monitoring performed within 15 working days individually in writing.** Whenever the results indicate that the employee exposure, without regard to respirators, exceeds the permissible exposure limit, in the written notice will included a statement that the permissible exposure limit was exceeded and a description of the corrective action taken or to be taken to reduce exposure to or below the permissible exposure limit (see example below).

Date

Name
Address

Dear ____________:

A medical examination triggered by your exposure to (Arsenic, Cadmium, Lead, and Hexavalent Chrome) was performed on (DATE). The results of this examination show levels (above/within) action levels established by OSHA. (NO) Further medical exams are needed. (If over) We will be contacting you to set up additional testing and try to determine why these levels became elevated. JTT has implemented the following procedures to reduce the exposure in the future:

If you have any questions, please call us at your convenience.

Very truly yours,

J.T. Thorpe & Son, Inc.

Manpower & Safety Manager
ATTACHMENT II: COMPETENCY QUIZ FOR SAFETY TRAINING

Name: _______________________________ Date: ________________

Trainer: _____________________________

Signature: ___________________________

Safety Quiz Lead, Cadmium, Arsenic and Hexavalent Chrome

Question 1

Lead, Cadmium, Arsenic and Hexavalent Chrome are heavy metals that can have chronic health effects if proper controls are not followed.

TRUE FALSE

Question 2

If you work in a "regulated work area" you will be required to:

A. Wear proper protective clothing.
B. Be approved by OSHA representatives for entry into the area.
C. Undergo medical testing if you work in the area over 30 days a year.
D. Pay particular attention to personal hygiene.
E. All the above are correct.
F. Only A, C, and D are correct.

Question 3

The primary exposures to Lead, Cadmium, Arsenic, and Hexavalent Chrome occur through inhalation and ingestion.

TRUE FALSE
Lead, Cadmium, or Arsenic dust on your work clothes, boots, or hardhat are not a concern because this material is not a health hazard off the job.

TRUE   FALSE

Question 5

Your Thorpe coveralls must be turned into Thorpe for proper cleaning and may never be taken off the premises.

TRUE   FALSE

Question 6

A half- or full-face respirator with a HEPA filter will normally be the type of respirator provided for possible exposure to Lead, Cadmium, or Arsenic dust.

TRUE   FALSE

Question 7

Before you can wear a respirator you must:

A. Be given a medical evaluation.
B. Be clean shaven.
C. Be trained how to use the respirator.
D. Have a fit test for the respirator to be used.
E. Only A & D are correct.
F. All the above are correct.

Question 8

Hexavalent Chrome fume can be a result of welding stainless steel.

TRUE   FALSE
ATTACHMENT III: ELEMENTS OF A LEAD SAFETY PROGRAM PRESENTATION NOTES

1. The three goals of a lead safety program are the following:

   To protect workers from lead poisoning.
   To protect workers' families against take-home lead contamination.
   To prevent contamination of the job site and surrounding environment.

2. When do you need a lead safety program?

   • Lead paint has been widely used on all kinds of steel structures--for example, bridges, water tanks, elevated freeway structures, ships, building structures and some furnaces. Lead is also found in some equipment such as batteries. Process such as smelters may create lead fumes and dust.

   • Workers who disturb this paint when welding, torch cutting, abrasive blasting or grinding can be exposed to very high amounts of airborne lead paint dust or lead-containing fume (smoke). Without protection, this can lead to rapid and severe cases of lead poisoning. Working where lead dust or fume is present also creates this exposure.

3. Surveying Paint or other material for Lead Content

   • Make sure you know whether there is lead paint on the structure or in the furnace before you start work.

   • JTT management must make sure that someone has done a sufficient survey testing the paint or other materials in the areas we will be working.

   • Preferably, the owner has conducted a survey of the paint or other materials before we start the work. Note: Commonly, a consultant is hired to survey the paint history on the parts of the structure or other materials to be worked on, and documents whether lead was found, and if so, where and how much.

   • Testing can be done using an XRF instrument. An XRF instrument determines chemical content by shooting x-rays through the paint layers and reading the type of radiation that bounces back. In this way, many areas can be tested quickly and the results can be had immediately.

   • A "low tech," but very reliable alternate method is simply scraping a sample of all the layers of paint into a zip-loc bag and sending it to an analytical lab.

   • Industrial Hygiene testing is performed to determine if air borne concentrations of dust or fume is found in an operation.

4. Protecting Workers from Inhaling and Ingesting Lead

   • To protect workers against lead poisoning you must prevent both the inhalation and the accidental ingestion of lead; neither can be ignored.
The primary means of protecting workers from lead poisoning is to avoid work methods that produce very high amounts of lead dust or fume (smoke). Respirators are important protection, but they are the second line of defense.

- Dust/ Fume Controls
- Respirators

5. Protecting Workers by Using Low Exposure Work Methods

There are four ways of getting the job done while producing less airborne lead:

- For hot work, it is best to first strip the paint back from the area where the welding or cutting will be done.
- Using an entirely different work method that produces less airborne lead.
- Changing the tool in a way that leads to less exposure for the worker.
- Using mechanical ventilation to control the amount of airborne lead in the worker's "breathing-zone."

- All workers will abide by the warnings of signs labels or assessment reports indicating the presence of lead. The appropriate work practices outlined by these requirements will be followed.

6. Stripping Back of Lead Paint Prior to Hot Work

- If you don't strip back the paint, the lead will boil-off the steel into the worker's face. This can be the source of very high lead exposures.
- Title 8, Section 1537 of the Cal/OSHA regulations requires that the paint be stripped back at least 4 inches from the weld or cut line.
- The amount of paint you should strip back depends on the amount of heat you are applying and for how long. Your judgment will be guided by—and will improve with—experience. Generally, if the edge of the paint is blistering or discolored, then not enough paint has been stripped off.
- Of course, it makes no sense to strip back the paint using a high exposure method. In the past, ironworkers would burn back or grind back the paint prior to the weld or cut. Using a caustic paste paint stripper is one effective way to do this.
- Stripping the paint back may leave a very clean looking surface, but there will still be lead in the profile of the steel which has not been removed and will result in some, however greatly reduced, exposure.

7. Change of Work Method or Tool

In demolition, long handled torches allow the worker to stand further away from the plume of smoke, reducing exposure. When possible, the worker can also try to stand upwind.

Where possible, using mechanical shears instead of torch cutting virtually eliminates lead exposure.

There are also a number of traditional tools that have been equipped with vacuum exhaust attachments. The tool is attached to a high-efficiency vacuum that exhausts the head of the tool and collects the lead paint dust: for example, vacuum-attached needle guns, vacuum-attached abrasive blasting, vacuum attached grinders, etc. Vacuum attachments are available for many of industrial coating removal tools.

There are a number of new alternatives to traditional dry abrasive blasting that have been designed to produce less dust. One example is so-called "slurry blasting," or turbo blasting, which uses small amounts of water, mixed well.
with the abrasive media. Other lower-exposure blasting methods that are being promoted are ultra high pressure water blasting, ice blasting, and dry ice.

8. Effective Use of Mechanical Ventilation

- The classic example of this is ventilated containment of abrasive blasting.
- Another example is using a fan to blow welding fume away from the worker.
- Portable exhaust units can also be used to capture lead-containing welding fume and draw it away from the welder's breathing zone.

9. Using Respirators

Many of these controls reduce lead exposures ten or even a hundred fold, but, in most cases, do not reduce exposures to the point where workers can forgo wearing respiratory protection. Typically, control measures must be supplemented with respiratory protection.

- For many tasks, the half-mask respirator with P-100 filters provides enough protection. These are inexpensive, light, and easy to care for. (See "Use Half-Mask Respirators..." in the packet of materials.)
- For very high exposure tasks such as dry abrasive blasting, the positive pressure airline respirator is necessary.
- Workers need to be medically evaluated to see if they can wear a respirator, they need to be matched with a size and brand of respirator that fits well, and they need to be trained in good respirator use. Cal/OSHA requires that employers have a written respiratory protection program.

10. Personal Air Monitoring

The kind of respiratory protection the worker should use initially depends on the kind of work they are doing, but the ultimate choice depends on the results of personal air monitoring.

- Personal air sampling means that workers wear a sampling pump for the entire working shift. The sampling pump is battery-operated and attached to the worker's belt. It pulls air through a filter that is set close to the worker's mouth. Lead in the air from which the worker is breathing is collected on the filter.
- Many companies hire an industrial hygiene consultant to do the personal exposure monitoring for them. While this is something that contractors can do for themselves, it is best to hire an industrial hygiene consultant to properly train someone on your staff.

11. Good Hygiene Controls

- Workers can also take in lead by accidental ingestion. This happens by eating, drinking, or smoking in the work area or with contaminated hands.

<table>
<thead>
<tr>
<th>Inhale</th>
<th>Worker</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead</td>
<td></td>
</tr>
</tbody>
</table>

Good Job Site Hygiene
• Workers should always leave the work area to eat, drink, or smoke. Food, drinks, and cigarettes should always be stored in a clean place away from the work area.

• Workers should always wash hands and face thoroughly before all breaks and lunch. The employer is required to provide facilities for this.

12. Protecting workers’ families against take-home lead contamination

This is very important, since young children and pregnant or nursing mothers are very sensitive to lead poisoning. In addition to an ethical responsibility, the employer has potential legal liabilities that he/she should avoid.

• Ensure that lead-exposed workers wear work clothes and shoes that stay on the job site. Coveralls can be made of disposable paper or laundered cotton.

• For high-exposure work such as abrasive blasting, Cal/OSHA requires that clean clothing be provided daily. This can be arranged through a commercial laundry service.

• Employers should provide a clean changing area, where street clothes and shoes can be stored during work.

• In addition, employers should ensure that highly exposed workers (> 50 ug/m³) shower at the end of the shift. This is required by the Cal/OSHA standard.

• Decontamination trailers are commercially available. These are equipped with lockers, a shower and a wash-up sink.

• Where exposures are not high enough to warrant showers, (< 50 ug/m³), a simple changing shed with a place to store street clothes, and a closed container for contaminated work clothing, is adequate. A good wash-up sink to clean exposed skin (hands, arms, and face) with warm water and soap remains necessary.

• Essentially, work site lead contamination should not leave the job site on workers’ body or clothes, nor contaminate personal vehicles, the home, or other non-work area.

13. Protecting Other Trades and the Environment.

It is important that contractors take simple precautions to prevent their work from exposing other contractors on the job, and that they do not contribute to the environmental contamination of the area surrounding the job site.

• Control access to your work area and only allowing trained and protected personnel to enter.

• Establish containment to prevent the spread of contamination outside the immediate work area. The kind of containment you need depends on the work and the “sensitivity” of the surroundings.

• For example, for the traditional dry abrasive blasting, you need a full, tightly-constructed, ventilated containment.

• For less dusty methods— for example, vacuum blasting,—looser shrouding can be adequate.

• If you use a turbo type slurry blasting method, a drop cloth and netting is often adequate.

• For vacuum-attached power tools, a simple drop cloth with vertical shrouding is often enough.

• When using chemical paint stripper, a simple plastic drop cloth is adequate.

• During the job, it is important to inspect the containment and to clean up any debris that has found its way through the containment.
• After the job is over, additional clean-up is sometimes necessary. This should be done using methods that effectively pick up the contamination. Cal/OSHA prefers the use of HEPA vacuuming.

14. Summary

In summary, contractors can begin to construct an effective lead safety program by focusing on basic, common sense elements.

• Protect workers by selecting low exposure work methods, supplement with adequate respiratory protection, provide wash-up facilities and emphasize good hygiene practices.

• Protect workers’ families by making sure that work clothing and shoes don’t go home. And provide shower facilities where required by Cal/OSHA.

• Protect other trades and the environment by controlling access to your work area, using appropriate containment and cleaning up regularly.
ATTACHMENT IV: SUMMARY OF CAL/OSHA’S LEAD IN CONSTRUCTION STANDARD  
(TITLE 8 CCR SECTION 1532.1)

NOTE: This standard originally became effective on November 4, 1993, shortly after the federal standard (29 CFR 1926.62). California’s standard has since been revised; revisions that represent the additional requirements in California are highlighted by underlining. A copy of the complete Cal/OSHA standard, in a reformatted, easier-to-read version, is available from the Occupational Lead Poisoning Prevention Program at (510) 622-4332. The federal standard is available from Federal OSHA Publications office at (415) 744-7112.

(a) Scope

This standard covers all construction work where an employee may be exposed to lead, including metallic lead, inorganic lead compounds, and organic lead soaps, but not organic lead standard.

(b) Definitions

An airborne lead level of 30 microgram/m$^3$ is called the Action Level (AL). Having lead concentrations at or above the AL trigger certain health and safety measures described in this standard.

(c) Permissible Exposure Limit (PEL)

The 8-hour Permissible Exposure Limit (PEL) is 50 microgram/m$^3$ of airborne lead. If the workday is longer than 8 hours, the PEL is 400/number of hours worked per day. The employer must ensure that no employee is exposed to lead at concentrations over the PEL.

(d) Exposure Assessment

Exposure assessment must be performed in all workplace where employees may be exposed to lead.

(d)(1) Protection of Employees During Assessment of Exposure

Three sets of specified tasks (often referred to as “trigger tasks”) trigger basic protective measures where lead is present, until the employer performs an employee exposure assessment. (Exposure assessment is an initial determination via air monitoring, or previous monitoring of a very similar job within the last 12 months.)

For all three sets of tasks, employers are required to provide the following basic protective measures until air monitoring indicates exposure levels are at or below the PEL:

- Appropriate respiratory protection (type of respirator is specified according to assumed airborne lead level and requirement of Table 1 at the end of this section)
- Appropriate personal protective equipment—clean work clothes such as coveralls at least weekly (daily if greater than 200 microgram/m$^3$ lead in air); gloves, hats, shoes or disposable shoe coverlets, face shields, vented goggles or other appropriate equipment.
- Change areas with separate storage facilities for work and street clothes—the employer shall assure that employees do not leave the workplace with work clothes or equipment.
- Hand washing facilities—the employer shall assure that employees wash their hands and face at the end of each work shift.
- Biological monitoring—consisting of initial or baseline blood sampling for lead and zinc protoporphyrin (ZPP).
- Training—including Hazard Communication, respirator and lead training.

Lowest Exposure Trigger Tasks:
Assume exposures greater than 50 and up to 500 microgram/m$^3$ unless proven otherwise.

Where lead coatings or paint are present:

- Manual demolition of structures
- Manual scraping (dry)
- Manual sanding (dry)
- Heat gun applications
- Power tool cleaning with dust collection system
- Spray paint with lead
- Any other task where the employer has reason to believe employees may be exposed over the PEL.

**Medium Exposure Trigger Tasks:**

Assume exposures greater than 500 and up to 2,500 microgram/m$^3$ unless proven otherwise:

- Use of lead-containing mortar
- Lead burning
- Where lead coatings or paint are present
- Rivet busting
- Power tool cleaning without dust collection systems
- Cleanup of dry expendable abrasives
- Abrasive blasting enclosure movement and removal

**Highest Exposure Trigger Tasks:**

Assume exposures greater than 2,500 microgram/m$^3$ unless proven otherwise.

Where lead coatings or paint are present:

- Abrasive blasting
- Welding
- Cutting
- Torch burning

**(d)(2) Exposure Assessment (Air monitoring)**

When air monitoring is conducted, the employer shall collect full-shift personal samples representative of an employee’s regular, daily exposure to lead. Monitoring should include at least one sample for each job classification in each work area, either for each shift or for the shift with the highest exposure level. (For the initial determination, the employer may monitor only those employees expected to have the highest exposure levels.)

**(d)(3) Basic of Initial Determination**

The basis of initial determination, or initial assessment of employee exposure, will be employee exposure monitoring results and relevant considerations (e.g., observations, complaints), with the following exceptions:

- Where the employer has objective data, demonstrating that a particular product or material containing lead or specific process, operation or activity involving lead cannot result in an employee exposure to lead at or above the AL during processing, use or handling, the employer may rely upon such data instead of implementing initial monitoring. Objective data confirming that materials or surface coatings contain less than 0.06% (600 ppm) of lead may be used to demonstrate that employee exposure will not exceed the AL, as long as every unique surface or material has been sampled and analyzed.
Note – Objective data are not permitted to be used for exposure assessment in connection with any of the trigger tasks listed under subsection (d)(1).

(d)(4) Frequency of Exposure Assessment

If the initial determination shows exposures less than the AL, no further assessment is needed until there has been a change of equipment, process, control, personnel or a new task has been initiated.

If the initial determination is above the PEL, then monitoring shall be done quarterly.

(d)(5) Employee Notification

Within 5 days after completion of the exposure assessment, the employer shall notify each employee, in writing, of the results of employee’s airborne lead exposure.

(e) Methods of Compliance

Exposures over the PEL shall be reduced through engineering, work practice, and administrative controls, to the extent feasible. Respirators may be used to supplement other controls.

Prior to the commencement of any job where exposures may reach the PEL, the employer shall establish and implement a written compliance program, describing the lead-emitting activities and the means by which exposures will be controlled.

The compliance program shall provide for frequent, regular jobsite inspections by a person capable of identifying lead hazards and authorized to take prompt corrective measures.

Where mechanical ventilation is used, the employer shall evaluate the performance as necessary to maintain effectiveness.

(f) Respiratory Protection

Where respirators are used, they shall be selected on the basis of air monitoring results, with the minimum level of respirator as indicated in Table 1 at the end of this section. Until monitoring results are available, the appropriate respirator is determined according to the assumed exposure associated with the task being performed, as per subsection (d)(2).

A Summary of Cal/OSHA’s Lead in Construction Standard
Title 8 CCR Section 1532.1

If an employee exhibits difficulty breathing with the respirator, the employer shall make available a medical examination to determine whether the employee can wear a respirator safely while performing the work. PAPRs (powered air purifying respirators) must be provided to any employee who requests one, where a PAPR would provide adequate protection as per Table 1.

Where respirators are used, the employer shall institute a complete, written respiratory protection program in accordance with Cal/OSHA’s Respiratory Protection Standard, §5144. The program shall outline procedures for selection, use, training, cleaning, sanitizing, storage, inspection, and maintenance of respirators. The program shall be evaluated by regular inspections.

§5144 requires that any respirators used shall be certified by NIOSH. Also, employers shall perform quantitative or qualitative fit testing of respirators at the time of initial fitting, and at least annually thereafter, for employees wearing tight-fitting face piece respirators.

(g) Protective Work Clothing and Equipment
When an employee is exposed to lead above the PEL (without regard to whether a respirator is worn), or to lead compounds which may cause irritation, the employer shall provide and ensure that the employee uses appropriate protective work clothing, such as coveralls or other full-body work clothing, gloves, hats, shoes or shoe coverings, and face shields, goggles or other protective equipment as needed. Work clothing shall be provided at least weekly for employees exposed over the PEL, except when it must be provided daily for those exposed at levels higher than 200 gg/M3.

The employer shall provide for the cleaning or disposal of protective clothing and equipment fit. Clothing to be laundered must be placed in a closed container, labeled to indicate it contains lead, and the launderer must be notified of the potentially harmful effects of lead exposure. Cleaning of protective clothing or equipment by blowing, shaking, or any other means that disperses lead into the air is prohibited.

(h) Housekeeping

All surfaces shall be maintained as free as practicable of accumulations of lead. Vacuums equipped with toxic dust-removing HEPA filters are the preferred method of cleaning surfaces where lead accumulates. Other types of vacuums may not be used.

Shoveling, brushing, and dry or wet sweeping may be used only where HEPA vacuuming has been tried and found to be ineffective. Use of compressed air for cleaning is prohibited, unless there is a ventilation system to capture the dust created by the compressed air.

(i) Hygiene Facilities, Practices and Regulated Areas

The employer shall ensure that all employees exposed to lead above the PEL wash their hands and face prior to eating, drinking, smoking or applying cosmetics.

The employer shall provide adequate hand washing facilities for ALL employees exposed to lead and ensure (in the absence of shower facilities) that employees wash their hands and face at the end of the work shift. In areas where employees are exposed to lead above the PEL, the employer shall ensure that food or beverages are not present or consumed, tobacco products are not present or used, and cosmetics are not applied.

Employees exposed to lead above the PEL shall be provided with clean change areas with separate storage facilities for work and street clothing, in order to prevent cross-contamination.

The employer shall ensure that employees do not leave the workplace wearing any protective clothing or equipment worn during the work shift. Shower facilities, soap, and towels shall be provided, where feasible, for employees exposed to lead above the PEL, and the employer shall ensure that these employees shower at the end of the work shift.

Employees exposed to lead above the PEL shall be provided with a clean lunchroom or eating area.

The employer shall ensure that the lunch area is kept free from lead accumulation and that employees do not enter the lunch area with protective work clothing or equipment that has not been cleaned by vacuuming or other method that limits dispersion of lead dust.

Employers shall establish regulated areas, where feasible, wherever employees are exposed above the PEL or performing trigger tasks (subsection (d)(2)). Warning signs shall be posted (subsection (m)), and access shall be restricted to authorized persons. Appropriate protective equipment shall be provided to and worn by employees and other persons who enter the regulated area.

(j) Medical Surveillance

The employer shall ensure that the lead medical program (including all medical examinations and procedures performed) is under the supervision of a licensed physician.
The employee has the right to seek a second medical opinion regarding the lead medical evaluation, at the expense of the employer, and if necessary, a third physician may be requested to resolve any disagreements between the first two.

Prophylactic chelation, the routine use of chelating drugs to lower blood lead levels in persons occupationally exposed to lead, is prohibited.

(j)(1) Biological Monitoring

Initial blood sampling and analysis for blood lead levels (BLL) and zinc protoporphyrin (ZPP) are required for employees performing any of the specified trigger tasks, or for any employee exposed to an air lead level at or above the AL for at least 1 day.

Employees who are or may be exposed at or above the AL for more than 30 days in any consecutive 12 months, must be enrolled in a medical surveillance program, including BLL and ZPP at least every 2 months for the first 6 months, and every 6 months thereafter.

Any employee with a BLL at or above 40mg/dl shall have a BLL and ZPP every two months until two consecutive samples are less than 40 mg/dl.

Any employee with a BLL above 50mg/dl shall receive a follow-up BLL within 2 weeks after the employer receives the results of the first test.

- For employees temporarily removed from jobs involving lead exposure (see subsection (k), Medical Removal Protection), a BLL and ZPP must be provided every month during the removal period.

All analyses of blood samples shall be conducted by a laboratory approved by OSHA. The employer shall notify all employees, in writing, or their blood sampling results within 5 working days after receipt of the results.

(j)(2) Medical Examinations and Consultations

A medical exam shall be provided annually for all employees who had a BLL at or above 40mg/dl during the preceding 12 months.

A medical exam shall be provided to any employee who reports signs or symptoms related to lead poisoning, desires medical advice regarding the effects of lead exposure on the employee's ability to produce a healthy child, is pregnant, or has difficulty breathing while wearing a respirator.

A medical exam shall be provided as medically appropriate to any employee removed from his/her usual job involving exposure to lead.

A medical exam shall be provided as medically appropriate to any employee removed from his/her usual job involving exposure to lead.

A medical exam shall include the following:

- detailed work history, with particular attention to past lead exposure
- history and physical exam, with particular attention to teeth, guns, hematologic, gastrointestinal, renal, cardiovascular, neurological systems, and pulmonary system if respirators are used
- blood pressure measurement
- blood sample and analysis including BLL, ZPP, hemoglobin and hematocrit determinations, red cell indices, examination of peripheral smear morphology, blood urea nitrogen, serum creatinine
- urinalysis with microscopic examination
- pregnancy or male fertility evaluation, if requested by the employee or the local J.T. Thorpe & Son Manpower Safety representative to properly evaluate the hazard.

- any other test deemed necessary by the physician.
(k) Medical Removal Protection (MRP)

The employer shall remove an employee from work involving exposure to lead at or above the AL whenever a BLL and follow-up test is at or above 60 micrograms/100 grams of whole blood.

(k)(1) Temporary Medical Removal and Return

An employee who has been removed due to an elevated BLL can return to his/her former job after having two consecutive BLLs at or below 40 micrograms/100 grams of whole blood.

Determination will result in a medical finding, determination, or opinion that the employee has a detected medical condition, which places the employee at increased risk of material impairment to health from exposure to lead.

An employee who has been removed due to a final medical determination can return to his/her former job when a subsequent medical determination indicates he/she no longer has a medical condition which places that employee at increased risk of health impairment from exposure to lead.

(k)(2) Medical Removal Protection Benefits

As long as the job the employee was removed from continues, the employer shall provide up to 18 months of MRP benefits on each occasion that an employee is removed from exposure to lead.

MRP benefits are defined as normal earnings, seniority and other employment rights, and benefits, as though the employee had not been removed from the former job.

(l) Employee Information, Training and Certification

The employer shall provide information about lead hazards, according to the Hazard Communication Standard (Section 5194), to all employees exposed to lead.

For all employees exposed to lead at or above the AL on any day, exposed to lead compounds that cause eye or skin irritation, or who perform any of the specified trigger tasks, the employer shall provide initial (pre-placement) training that includes the following:

- the content of this standard and appendices
- the operations that may cause lead exposure at or above the AL
- the purpose, proper selection, fitting, use and limitations of respirators
- the purpose and description of the medical surveillance program, including the adverse health effects of lead exposure (especially on reproduction)
- the engineering controls and work practices relevant to the employee’s job assignment the contents of any compliance plan in effect
- the location of regulated areas
- the prohibition against routine use of chelation agents
- the employee’s right of access to records

For all employees exposed to lead at or above the AL on any day, the above training must be provided annually.

(l)(1) Training and Certification for Residential and Public Buildings

All employees and supervisors who are engaged in lead-related construction in residences or buildings generally accessible to the public, and who are shown to be exposed to lead at or above the PEL, shall be trained by state-accredited training providers and certified by the California Department of Health Services (CDHS)

(Call 1-800-597-LEAD for information about accredited training providers and CDHS certification.)

(m) Signs
In regulated area (work areas where employee exposure is above the PEL and/or trigger tasks are performed), the employer shall post a warning sign with the words:

**WARNING: LEAD WORK AREA
POISON–NO SMOKING OR EATING**

**(n) Record Keeping**

The employer is required to maintain detailed records on exposure assessment, including any objective data used for exemption from air monitoring requirements, medical surveillance, and medical removals.

**(o) Observation of Monitoring**

The employer shall provide affected employees or their designated representatives an opportunity to observe any monitoring of employee lead exposure. Observers shall be provided and must use protective equipment if required in the area, as well as receive an explanation of the measurement procedures, observe all steps related to monitoring, and receive copies of the results.
### Table 1: Respiratory Protection for Lead Aerosols

<table>
<thead>
<tr>
<th>Airborne Lead Concentration</th>
<th>Required Respirator</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lowest exposure</strong></td>
<td><strong>Trigger tasks, or</strong> Not&gt;500 microg/m$^3$ (up to 10 x PEL)</td>
</tr>
<tr>
<td></td>
<td>Not&gt;1,250 microg/m$^3$ (up to 50 x PEL)</td>
</tr>
<tr>
<td><strong>Medium exposure</strong></td>
<td>Not&gt;2,500 microg/m$^3$ (up to 50 x PEL)</td>
</tr>
<tr>
<td></td>
<td>Not&gt;50,000 microg/m$^3$ (up to 1,000 x PEL)</td>
</tr>
<tr>
<td><strong>Highest exposure</strong></td>
<td>Not&gt;100,000 microg/m$^3$ (up to 2,000 x PEL)</td>
</tr>
<tr>
<td></td>
<td>&gt;100,000 microg/m$^3$ (&gt;2,000 x PEL)</td>
</tr>
</tbody>
</table>

### Glossary of Symbols, Units of Measure, and Abbreviations

- **>** Symbol meaning “greater than.”
- **x** Symbol meaning “times,” as in 50 x PEL (50 times the PEL).
- **ppm** Parts per million – The units used to specify the concentration of lead in a material such as a paint chip sample. 1% is equivalent to 10,000 ppm.
- **microg/dl** Micrograms per deciliter – The units used to specify the amount of lead in a person’s blood sample, i.e., the weight of lead in a deciliter or whole blood.
- **microg/m$^3$** Micrograms per cubic meter – The units used to specify the concentration of lead and other heavy metal dust or fume in air. These units are used to express the results of personal air monitoring. “Microgram” is also abbreviated “µg” (1000 µg = 1 milligram).
- **mg/m$^3$** Milligrams per cubic meter – The units used to specify the concentration of less toxic dust or fume in air.
- **AL** Action Level – A concentration of lead in air of 30 mg/m$^3$ averaged over an 8-hour shift.
| **BLL** | Blood lead level – A measurement of how much lead is in a person’s blood. |
| **HEPA** | High efficiency particulate air – A type of filter that efficiently captures very small particles and is used in respirators, vacuums, and ventilations systems for toxic dusts as lead. |
| **PARP** | Powered air-purifying respirator – A respirator equipped with a battery-powered blower, which draws air through filters and into the face piece. |
| **PEL** | Permissible Exposure Limit – A concentration of lead in air of 50 mg/m$^3$ averaged over an 8-hour shift. |
| **SCBA** | Self-contained breathing apparatus – Respirator with clean air tank worn on the wearer’s back. |
| **ZPP** | Zinc protoporphyrin – A blood test that can indicate an effect of lead on the blood-forming system. This test is required whenever a BLL is done, and is analyzed from the same blood sample. |
ATTACHMENT V.
J.T. Thorpe & Son Safety Training

Name: ___________________              Signature: ____________________________

Check boxes to indicate subjects covered

X____ IIPP                          X____ Benzene

X____ Substance Abuse             _____ MSHA Training

X____ Respirator                  X____ Bloodborne Pathogens

X____ Hazard Communication       X____ Rotating Wheel

X____ Chemical Handling           X____ H2S Awareness

X____ Confined Space              X____ Flammables/Combustibles

X____ Lock out / Tag out          X____ Compressors/Pneumatic/Hand & Portable Tools

X____ Fall Protection            X____ Stop Work Authority

X____ Hearing Conservation       X____ Hot Work (Welding, Grinding)

______ Subcontractor              X____ Ladder Awareness

X____ First Aid & Medical Procedures  X____ PPE Training

X____ Emergency Action Plan      X____ Scaffold

X____ Fire Prevention & Awareness X____ Electrical Grounding & Safety

______ Forklift Training & Certification       _____ Contaminated Acid Brick

X____ Hazard Waste                X____ Assured Grounding

______ Office Safety              X____ Safety Program

X____ Asbestos Awareness          _____ Caustic Lime

______ Arsenic, Cadmium, Lead, Hex Chrome X____ Harness & Lanyard

______ Short Service Employee     Equipment training type trained__________

Name Trainer (Print): ____________________    Signature Trainer: ___________________

Date of Training: _______________________________________

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