

## RULES AND STANDING INSTRUCTIONS

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Section 12: Occupational Health Control Dept: Health & Safety	Title: 12-08: Heavy Metals Standard
Original Issue: 11/15/2017	Latest Revision: 09/22/2020
Steward: Industrial Hygienist; A. Insley	Next Review Date: 09/22/2023 Approved by: H&S Supervisor; M. Bennett

### Table of Contents

A.	PURPOSE .....	2
B.	APPLICABILITY .....	2
C.	REFERENCES .....	3
D.	DEFINITIONS .....	4
E.	RESPONSIBILITIES .....	8
	1. All Personnel .....	8
	2. H&S Department .....	9
	3. Operations Personnel.....	10
	4. Area Supervision .....	10
	5. Maintenance Personnel.....	10
	6. Maintenance/Turnaround Planning Department.....	11
	7. Inspections Department .....	11
	8. Warehouse .....	11
	9. Contract Personnel.....	11
	10. Medical Department .....	12
	11. Environmental Department.....	12
F.	PROCEDURES.....	13
	1. Recognition and Evaluation.....	13
	2. Exposure Control .....	14
	3. Engineering Controls.....	14
	4. Fire Box Enclosures/Welding Hooches/Welding Enclosures.....	17
	5. Administrative (Work Practice) Controls.....	18
	6. Personal Protective Equipment .....	21
	7. Medical Surveillance .....	22
	8. Training Requirements .....	22
	9. Record Retention .....	23

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### A. PURPOSE

This Martinez Refinery Rule and Standing Instruction (R&SI) assures that employee and contractor occupational exposures to toxic metals are evaluated and eliminated or controlled in a consistent manner to minimize the risk of injury. This document serves as the preapproved plan for all metals, except lead or lead containing materials, and is pursuant to relevant Cal-OSHA General Industry and Construction Industry standards for inorganic arsenic, beryllium, cadmium, hexavalent chromium, lead, and Table AC-1, Permissible Exposure Limits for Chemical Contaminants.

### B. APPLICABILITY

This R&SI is applicable to Martinez Refinery employees and contractors involved in tasks (including routine maintenance, demolition, construction, renovation, resurfacing, machining, abrasive blasting, welding and grinding, paint/primer, and/or other material changes) in which toxic metals could exceed associated Action Levels or, where an Action Level does not exist, occupational exposure limits.

Areas and tasks that are (1) characteristically below the Action Level based on air monitoring, (2) below the reportable bulk concentration for each metal (generally 0.1% for carcinogens and 1% for other substances), or (3) have been exempt by Cal-OSHA shall only follow the respiratory protection, ventilation, and permitting requirements, and do not have to submit a Metals Safety Plan to Health and Safety (H&S).

In general, where both a Cal-OSHA General Industry and a Construction Industry standard exist, the General Industry standard would apply to work that is anticipated, routine, and performed on a regularly scheduled basis to maintain the original condition of equipment, as well as "one for one" replacements, depending on the scale and complexity of the project. The Construction Standard would apply to turnaround operations and other large and complex maintenance projects, including work involving alteration or repair. This includes painting and decorating where there is significant damage, wear, or corrosion of existing toxic metal-containing paint, coating, or substrates.

For specific metal requirements in addition to the information found in this R&SI, please reference the attachments shown below. These attachment R&SIs are not intended to be used standalone, but must be used in conjunction with base requirements of R&SI 12-8:

1. [R&SI 12-8-A](#), Lead Work Requirements
2. [R&SI 12-8-B](#), Chromium VI Work Requirements
3. [R&SI 12-8-C](#), Cadmium Work Requirements
4. [R&SI 12-8-D](#), Nickel Carbonyl Work Requirements
5. [R&SI 12-8-E](#), Arsenic Work Requirements
6. [R&SI 12-20](#), Housekeeping

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### C. REFERENCES

#### Martinez Procedures and Standards

1. [MPC HLT-2017](#), Toxic Metals Exposure Control
2. [MAPLLC Intracompany Correspondence](#), Nickel Carbonyl (2/10/2004)
3. [R&SI 8-1](#), Permit to Work Process
4. [R&SI 8-4](#), Hot Work
5. [R&SI 8-4-C](#), Hot Work: Weld Bay Guidelines
6. [R&SI 11-1](#), Personal Protective Equipment General Requirements
7. [R&SI 11-7](#), Respiratory Protection Program
8. [R&SI 12-00](#), Industrial Hygiene Plan
9. [R&SI 12-02](#), Medical Surveillance Program

#### Governmental Regulations

1. [Cal-OSHA Title 8 §3204](#), Access to Employee Exposure and Medical Records
2. [Cal-OSHA Title 8 §5214](#), Inorganic Arsenic
3. [Cal-OSHA Title 8 §5205](#), Beryllium
4. [Cal-OSHA Title 8 §5207](#), Cadmium
5. [Cal-OSHA Title 8 §5206](#), Chromium (VI), General Industry
6. [Cal-OSHA Title 8 §1532.2](#), Chromium (VI), Construction Safety
7. [Cal-OSHA Title 8 §5198](#), Lead, General Industry
8. [Cal-OSHA Title 8 §1532.1](#), Lead, Construction Safety
9. NIOSH Publication No. 2005-149. NIOSH Pocket Guide to Chemical Hazards, [Nickel Carbonyl](#).
10. NIOSH Publication No. 77-184: "NIOSH Special Occupational Hazard Review and Control Recommendation for Nickel Carbonyl".
11. National Safety Council, Fundamentals of Industrial Hygiene, 3rd Edition.
12. U.S. Environmental Protection Agency (EPA), Chemical Emergency Preparedness and Prevention, Emergency First Aid Treatment Guide Nickel Carbonyl.

## RULES AND STANDING INSTRUCTIONS

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### D. DEFINITIONS

The following definitions provided in Table 1, Definitions, are applicable to this R&SI.

**Table 1. Definitions**

Term	Description
ACGIH	American Conference of Governmental Industrial Hygienists – a scientific organization which publishes a set of recommended exposure limits for chemical and physical agents
Action Level (AL)	An 8-hour time-weighted concentration set by Cal-OSHA. It is typically set at 50% of the PEL, without regard to the use of respirators.
Arsine	An inorganic compound with the formula AsH <sub>3</sub> that is a colorless, denser-than-air gas and is slightly soluble in water.
Arsenic (As)	Elemental arsenic and all inorganic compounds (measured as arsenic) containing arsenic, including copper acetoarsenite (Paris Green), with the exception of arsine gas. Any substance of a total inorganic arsenic content of 0.02 percent or less, by weight, is excluded from this definition. For Martinez operations, the most likely sources of arsenic are crude oil, refractory materials, and some catalysts.
Beryllium (Be)	Beryllium in all forms, compounds, and mixtures. For Martinez operations, the most likely sources of beryllium are contaminants in abrasive blasting agents and exotic metals.
Cadmium (Cd)	Cadmium and cadmium compounds in all forms. For Martinez operations, the most likely sources of cadmium are in some catalysts and paint coatings.
CAW	Carbon Arc Welding is a process which produces coalescence of metals by heating with an arc between a non-consumable carbon (graphite) electrode and the work-piece.
Covered Employee	An employee included in a written Exposure Control Plan when the Industrial Hygiene monitoring of any work operations, which involve regular or periodic arsenic, beryllium, cadmium, lead, or hexavalent chromium exposure, confirms results above the Action Limit
Covered Side	A side that reduces air flow or restricts air movement.
Dyspnea	Shortness of breath, difficult or labored breathing.
EGW	Electro-gas Welding is a continuous vertical position arc welding process, in which an arc is struck between a consumable electrode and the work-piece. Shielding gas can be used, but pressure is not applied.
Fire Box Enclosure	A temporary enclosure, normally build inside of a process area that is designed to contain welding slag and prevent adjacent workers from seeing the arc. The typical enclosure is a small custom built scaffold with fire blanket

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	<p>on the bottom and the sides. In some cases, the top of the firebox enclosure is also covered. These fire boxes enclosures are sometimes called <b>“hooches”</b> or <b>“spark enclosures”</b>.</p> <p>Any space with a volume &lt;10,000 ft<sup>3</sup> per welder, ceiling height &lt;16ft, or barriers that obstruct adequate cross ventilation.</p>
FCAW	Flux-cored arc welding is a semi-automatic or automatic arc welding process. FCAW requires a continuously fed consumable tubular electrode containing a flux and a constant voltage or, less commonly, a constant current welding power supply. An externally supplied shielding gas is sometimes supplied, but often the flux itself is relied upon to generate the necessary protection from the atmosphere.
GMAW	Gas Metal Arc Welding also known as, metal inert gas (MIG) welding or metal active gas (MAG) welding, is a semi-automatic or automatic arc welding process in which a continuous & consumable wire electrode & shielding gas are fed through a welding gun. A constant voltage, direct current power source is most commonly used with GMAW, but constant current systems, as well as alternating current, can be used.
GTAW	Gas tungsten arc welding or more commonly as tungsten inert gas (TIG) welding is an arc welding process that uses a non-consumable tungsten electrode to produce the weld. The weld area is protected from atmospheric contamination by a shielding gas (usually an inert gas such as argon), and a filler metal is normally used, though some welds, known as autogenous welds, do not require it. A constant-current welding power supply produces energy which is conductive across the air through a column of highly ionized gas and metal vapors known as plasma.
High Efficiency Particulate Air (HEPA) Filter	A filter that is at least 99.97% efficient in removing mono-dispersed particles of 0.3 micrometers in diameter
Hexavalent Chromium (Hex Chrome, CrVI, Chrome 6, or Cr <sup>+6</sup> )	Chromium with a valence of positive six in any form and in any compound. For Martinez operations, the most likely sources of hexavalent chromium are welding, arc-gouging, or torch cutting of chrome-containing alloy steel. In addition, hexavalent chromium may also be found in chromate-containing paints and pigments, refractory surfaces and furnace tubes, cooling tower water treatment chemicals, chromic acid, residual chromium on catalysts, chemical components with the word “chromate,” and residual chromium in old cooking tower wood supports.
Inconel ®	A registered trademark name of Special Metals Corporation referring to a family of austenitic nickel-based super alloys. Inconel® alloys are typically used in high temperature applications.
Lead (Pb)	Metallic lead, all inorganic lead compounds, and organic lead soaps (all other organic lead compounds are excluded from this definition)

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LEL or LFL	Lower Explosive Limit or Lower Flammable Limit, is the minimum concentration of a flammable vapor or gas in air that will burn or explode in the presence of an ignition source. Normally rated at ambient temperature and atmospheric pressure. Concentrations below the LEL are too lean in material to burn.
Local Exhaust Ventilation, LEV	LEV is an air moving device, normally placed within 1 foot of the source of emission, which is designed to capture the contaminant and remove it from the workspace before the contaminant disperses.
Manganese	All valance states and compounds of manganese. For Martinez operations, the most likely sources of manganese are welding and grinding operations
Monel®	A trademark of Special Metals Corporation referring to a series of rustless (stainless) metal alloys, primarily composed of up to 67% nickel and copper, with some iron and other trace elements. It is resistant to corrosion and acids, and some alloys can withstand a fire in pure oxygen. It is commonly used in applications with highly corrosive conditions. Small additions of aluminum and titanium form an alloy with the same corrosion resistance, but with very high strength.
NIOSH	National Institute for Occupational Safety and Health is a US federal agency responsible for conducting research and making recommendations for the prevention of work-related injury and illness. NIOSH is part of the Centers for Disease Control and Prevention (CDC) in the Department of Health and Human Services.
Occupational Exposure Limit (OEL)	A time-weighted average that represents the concentration for a compound that cannot be exceeded over the averaging time. This includes both MPC internal OELs and Cal-OSHA 8-hour permissible exposure limits (PELs), 15-minute short term exposure limits (STELs), and 10-minute ceiling limits.
Oxy-fuel cutting	A Process similar to Oxy-fuel welding, using a different type of gas torch, called a blowtorch. (But, colloquially, many people also call a welding torch a blowtorch). Here the metal is heated until it glows orange, and then a long lever on the torch is pressed to blow a blast of excess of oxygen into the gas mixture, to burn and melt the metal with the resulting extra heat, and blow it out of the cut. Much of this heat comes from the metal burning rather than from the gas burning. Sometimes a metal-cutting blowtorch is colloquially called a gas-axe or hot wrench. Warning no bottles can be greater than 15 psi, this will create too great a potential for an explosion. All equipment must have back-flow prevention.
Oxy-fuel welding	Commonly called oxyacetylene welding since acetylene is the predominant choice for a fuel, or often simply gas welding; alternates include oxypropane, and oxypropylene. In gas welding and cutting, the heat needed to melt the metal comes from a fuel gas burning with oxygen in a torch. Warning no bottles can be greater than 15 psi, this will create too great a potential for an explosion. All equipment must have back-flow prevention.

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Personal Four Gas Monitor	A portable electronic device, normally worn by a worker, which detects LEL, oxygen, carbon monoxide, and H <sub>2</sub> S and displays a visual, audible, and/or tactile warning.
Personal Sample	A quantitative exposure measurement designed to assess an employee's exposure to a given contaminant(s) over a full work shift or over the duration of specific work task(s). Personal samples designed to assess full shift exposure should be at least 7 hours in duration, and they must include those periods of work that are expected to produce the highest exposures. For welders, personal samples shall be taken in the welders breathing zone, preferably inside the welder's hood.
Plasma arc-welding	An arc welding process similar to Gas tungsten arc welding (GTAW). The electric arc is formed between an electrode (which is usually but not always made of a sintered tungsten) and the work-piece. The key difference from GTAW is that in PAW, by positioning the electrode within the body of the torch, the plasma arc can be separated from the shielding gas envelope. The plasma is then forced through a fine-bore copper nozzle which constricts the arc and the plasma exits the orifice at high velocities (approaching the speed of sound) and a temperature approaching 20,000 °C.
Pulmonary Edema	The accumulation of fluid in lung tissues and alveoli.
Qualified Individual	A designated person who as a result of sufficient formal education and/or job experience is able to accurately evaluate and assess welding operations and exposure data to determine/assign exposure sampling strategies, engineering and administrative controls and PPE, necessary to the protection of human health.
Regulated Area	Work areas where personnel exposure may exceed the PEL for a toxic metal or where no previous data exists to indicate that levels are less than the PEL
Resistance Welding	Refers to a group of welding processes that produce coalescence of faying surfaces where heat to form the weld is generated by the resistance of the flow of welding current through the work-pieces. Small pools of molten metal are formed at the weld area as a high amount of current (1000–100 000 A) is passed through the metal.
SMAW	Shielded Metal Arc Welding, also known as manual metal arc (MMA) welding or informally as stick welding, is a manual arc welding process that uses a consumable electrode coated in flux to lay the weld. An electric current, in the form of either alternating current or direct current from a welding power supply, is used to form an electric arc between the electrode and the metals to be joined. As the weld is laid, the flux coating of the electrode disintegrates, giving off vapors that serve as a shielding gas and providing a layer of slag, both of which protect the weld area from atmospheric contamination.

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Stud Welding	A form of spot welding where a bolt or specially formed nut is welded on to another metal part. The bolts may be automatically fed into the spot welder. Weld nuts generally have a flange with small nubs that melt to form the weld. Studs have a necked down, unthreaded area for the same purpose.
Temporary Fabrication Area	A designated area, normally located outside the battery limits, where welders fit and fabricate their work prior to final installation in the operating unit. These temporary fabrication areas are sometimes referred to as weather breaks or wind breaks.
TWA	Time Weighted Average is a common method of measuring full shift exposure to chemical and physical agents. The TWA is mathematically expressed as a sum of the measured concentrations multiplied by the times each concentration was measured divided by the total time of the sample duration of the time length of the full shift.
Welding Fume	A complex aerosol of fumes, gasses, and particulates generated in the course of joining materials, usually metals (such as steel, aluminum, brass, stainless steel, etc.) or thermoplastics, by melting the work pieces and/or a filler material to form a pool of molten material ( <i>the weld puddle</i> ) that cools to become a strong joint. The composition will vary depending upon the process and materials involved.  In addition to toxic metals, other hazards that exist from welding are carbon monoxide, fluorides, nitrogen oxides, phosgene, ozone, and total particulates from metal work. Also, welding on corroded metals can create hydrogen, resulting in explosive atmospheres.
Welding Shop	A building designated for the purpose of processing material by cutting, grinding, welding, or similar process.

### E. RESPONSIBILITIES

#### 1. All Personnel

- 1.1 Adhere to the requirements of this procedure.
- 1.2 Treat all metals as regulated materials until tested or proven otherwise (i.e. SDS, air sampling, bulk testing, etc.)
- 1.3 Follow PPE and respiratory requirements for work with toxic metals as described in R&SI 11-1, 11-7, and 12-8 and Attachments.
- 1.4 Not cross barrier tape unless wearing appropriate PPE, and have had the appropriate Hazcom chemical specific annual training.
- 1.5 Not perform tasks that involve disturbing and handling lead or chromium unless certified to do so.



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- 1.6 Notify medical if you suspect an uncontrolled exposure to any regulated metal above the PEL or STEL.
- 1.7 All personnel must immediately report to supervision any non-compliance with and/or problems with this standing instruction.

## 2. H&S Department

- 2.1 The Industrial Hygienist will
  - 2.1.1 Using the exposure assessment process outlined in R&SI 12-00, determine where there is regular or periodic exposure to toxic metals and identify where materials containing toxic metals are located.
  - 2.1.2 Communicate to employees the health hazards associated with metals and establish requirements for safe work practices and the use of appropriate personal protective equipment.
  - 2.1.3 Review SDSs as needed for metals work, to determine alloy type, paint ingredients, etc., to assist with functionality with this document.
  - 2.1.4 Coordinate bulk sampling analysis for metal content, absorbent material, dust, fines, concrete component, and within paint.
  - 2.1.5 Evaluate worker exposure to airborne concentrations of metals to determine appropriate controls are provided to minimize actual employee exposures.
  - 2.1.6 Notify the Medical Department of a monitoring result that triggers medical surveillance.
  - 2.1.7 Establish and audit protocols for engineering, administrative, and PPE to protect workers and the public from metal exposure.
  - 2.1.8 Develop a written exposure control plan for all measured overexposures to a toxic metal
  - 2.1.9 Develop and maintain a written compliance program for work involving lead, hexavalent chromium, cadmium, nickel, nickel carbonyl, arsenic, beryllium, manganese and other metals exposure.
  - 2.1.10 Surveil and evaluate work involving permits that require sampling for metals in order to detect the following:
    - Increases or decreases in contaminant concentrations
    - Establish new procedures for metal work
- 2.2 Coordinate the establishment of a Regulated Area using barricades and signs in order to prevent unauthorized entrance into potentially contaminated areas.
- 2.3 Obtain and verify contractor records for toxic metal training and medical surveillance
- 2.4 Monitor work involving hot work permits in order to identify jobs that may need to be managed with this document.

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### 3. Operations Personnel

- 3.1 Those that will come into contact with toxic metals will ensure that they are familiar with the requirements of applicable Cal-OSHA standards and that they will adhere to the requirements of applicable Martinez Refinery standards. This includes engineering, administrative, and PPE controls required in within this document, R&SI 12-8 A through E, and R&SIs 11-1, 11-7 and 12-00.
- 3.2 Ensure that operations employees are trained in the required sections of the standards and the techniques necessary to minimize airborne exposures to metals.
- 3.3 Ensure exclusion zones are set up with the proper tape/signage, at the proper distance from the work, according to the hazard. Exclusion zones requirements for common work areas involving toxic metals are shown in Appendix 1.
- 3.4 Respond to Medical Department for all exposures from air sampling or emergency response to determine medical surveillance requirements. If you do not wish to be medically tested, fill out the form in in each applicable metal(s) attachments, and provide it to medical for documentation in your medical record.

### 4. Area Supervision

- 4.1 Utilize this procedure, Safety Data Sheets (SDS), or a H&S representative to identify the appropriate actions for the tasks.
- 4.2 Ensure a permit is used in conjunction with work type. Reference R&SI 8-1 and R&SI 8-4.
- 4.3 Validate appropriate controls are implemented based on task type, and environment, based on Work Permit, R&SI 12-8 and attachments, or other applicable site documentation.
- 4.4 Call the site IH for air sampling or an exposure assessment.

### 5. Maintenance Personnel

- 5.1 Those that will come into contact with toxic metals will ensure that they are familiar with the requirements of applicable Cal-OSHA standards and that they will adhere to the requirements of applicable Martinez Refinery standards. This includes engineering, administrative, and PPE controls required in within this document, R&SI 12-8 A through E, and R&SIs 11-1, 11-7 and 12-00.
- 5.2 Ensure that maintenance employees are trained in the required sections of the standards and the techniques necessary to minimize airborne exposures to metals.
- 5.3 Adhere to the requirements for areas and/or tasks based on exposure data or objective data for similar work.
- 5.4 Ensure exclusion zones are set up with the proper tape/signage, at the proper distance from the work, according to the hazard. Exclusion zones are shown in attachment 1, based on type of work.
- 5.5 Comply with all air sampling requirements set by the Site Industrial Hygienist.

## RULES AND STANDING INSTRUCTIONS

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- 5.6 No lead work can be performed by Martinez employees. This includes galvanized metal work that hasn't been abated.
  - 5.7 Respond to the Medical Department following all exposures based on air sampling or emergency response judgment to determine potential medical surveillance requirements. If you do not wish to be medically tested, a waiver must be completed and documented in your medical record.
- 6. Maintenance/Turnaround Planning Department**
- 6.1 Ensure that R&SI 8-4 is followed, including that all hot work utilizes continuous monitoring.
  - 6.2 Ensure the Site Industrial Hygienist has approved contractor work scope and training for work with inorganic arsenic, beryllium, cadmium, hexavalent chromium, and lead.
  - 6.3 Ensure all maintenance workers use the appropriate PPE and follow exclusion zone requirements for regulated metals.
- 7. Inspections Department**
- 7.1 Utilize proper PPE when performing inspection of a vessel, including decontamination procedures
  - 7.2 Complete training on the hazards of toxic metal safe work practices, as outlined in R&SI 12-8 and associated attachments.
- 8. Warehouse**
- 8.1 Maintain supply of warning tape, labels, housekeeping material, consumable PPE, etc.
  - 8.2 Ensure all protective equipment used by MPC employees for daily maintenance or turnaround is available. Identify a secondary plan if the site needs additional equipment.
  - 8.3 Accept only labeled and sealed contaminated equipment.
- 9. Contract Personnel**
- 9.1 Those that will come into contact with toxic metals at the Martinez Refinery will ensure that they are familiar with the requirements of applicable Cal-OSHA standards and that they will adhere to the requirements of applicable Martinez Refinery standards. This includes engineering, administrative, and PPE controls required in within this document, R&SI 12-8 A through E, and R&SIs 11-1, 11-7 and 12-00.
  - 9.2 Adhere to the requirements for areas and/or tasks based on exposure data or objective data for similar work.
  - 9.3 Ensure that contract employees are trained in the required sections of Cal-OSHA standards and the techniques necessary to minimize airborne exposures to heavy

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metals. Training records will be made available to Martinez Refinery personnel upon request.

- 9.4 Provide air sampling results that document reasoning towards the reduction in PPE to the Site Industrial Hygienist for review and authorization.
- 9.5 Report any air sampling results performed by a 3rd party to the Martinez Refinery IH within one month of receiving the results.
- 9.6 Provide your own hygiene facilities (washrooms, change rooms, and showers). These facilities will comply with all requirements found within Martinez R&SIs
- 9.7 Respond to the Medical Department following all exposures based on air sampling or emergency response judgment to determine potential medical surveillance requirements. If you do not wish to be medically tested, a waiver must be completed and documented in your medical record.

### 10. Medical Department

- 10.1 The Martinez Refinery shall institute a medical surveillance program consisting of routine and emergency biological monitoring (where they exist) for toxic metals, in accordance with R&SI 12-02, Medical Surveillance Program and HLT-2025, Medical Surveillance Examinations.
- 10.2 All medical surveillance must be conducted by or under the supervision of the Martinez Refinery Medical Department, as directed by the MPC Corporate Medical Director.
- 10.3 Employees have the right to refuse any heavy metals medical surveillance analysis, but must sign a waiver for documentation in medical records.
- 10.4 Provide employees a written medical report within 30 days of the examination performed to the employee. This report must contain:
  - Examination results
  - Medical condition(s) that would increase risk to health
  - Limitations
  - A statement that the employee should be examined by a specialist (if deemed necessary based on monitoring results)

### 11. Environmental Department

- 11.1 Facilitate proper disposal of any waste generated from handling heavy metals, including used PPE.
- 11.2 Coordinate pickup of contaminated waste to the proper locations.
- 11.3 Respond for environmental concerns, and emergency responses for contamination reduction.
- 11.4 Provide training and equipment for proper waste disposal.

## RULES AND STANDING INSTRUCTIONS

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Section 12: Occupational Health Control Dept: Health & Safety	Title: 12-08: Heavy Metals Standard
Original Issue: 11/15/2017	Latest Revision: 09/22/2020
Steward: Industrial Hygienist; A. Insley	Next Review Date: 09/22/2023 Approved by: H&S Supervisor; M. Bennett

### F. PROCEDURES

#### 1. Recognition and Evaluation

- 1.1 Determination on the applicability of this standard to work area and work practices will be performed by the Industrial Hygienist, in coordination with Operations, Maintenance, and Contractor staff. Materials are assumed to contain toxic metals until bulk laboratory analysis or other documentation determined otherwise
- 1.2 Air sampling methods, data analysis, employee notification, and documentation for metals must be performed in accordance with requirements of R&SI 12-00.
- 1.3 All air sampling for metals will be in coordination with a Qualified Individual. A job site visit and understanding between the IH and Qualified Individual is paramount.
- 1.4 Exposure limits of specific metals included in this R&SI are provided in Table 2, Occupational Exposure Limits. Where OELs conflict, the more stringent OEL is applied.

**Table 2. Occupational Exposure Limits**

Hazard	MPC TWA OEL	Cal-OSHA TWA PEL	Action Level	MPC STEL OEL	Cal-OSHA STEL
<b>Inorganic Arsenic</b>	0.01 mg/m <sup>3</sup>	0.01 mg/m <sup>3</sup>	0.005 mg/m <sup>3</sup>	N/A	N/A
<b>Beryllium</b>	0.00005 mg/m <sup>3</sup>	0.0002 mg/m <sup>3</sup>	0.0001 mg/m <sup>3</sup>	N/A	0.002 mg/m <sup>3</sup> (0.025 mg/m <sup>3</sup> ceiling)
<b>Cadmium</b>	0.005 mg/m <sup>3</sup>	0.005 mg/m <sup>3</sup>	0.0025 mg/m <sup>3</sup>	N/A	N/A
<b>Chromium VI</b>	0.005 mg/m <sup>3</sup>	0.005 mg/m <sup>3</sup>	0.0025 mg/m <sup>3</sup>	(0.002 mg/m <sup>3</sup> ceiling)	0.1 mg/m <sup>3</sup>
<b>Inorganic Lead</b>	0.05 mg/m <sup>3</sup>	0.05 mg/m <sup>3</sup>	0.03 mg/m <sup>3</sup>	N/A	N/A
<b>Manganese</b>	0.2 mg/m <sup>3</sup>	0.2 mg/m <sup>3</sup>	N/A	(5 mg/m <sup>3</sup> ceiling)	3 mg/m <sup>3</sup> , as fume
<b>Nickel</b>	1 mg/m <sup>3</sup>	0.5 mg/m <sup>3</sup>	N/A	N/A	N/A
<b>Nickel Carbonyl</b>	0.007 mg/m <sup>3</sup>	0.007 mg/m <sup>3</sup>	N/A	0.4 mg/m <sup>3</sup> ceiling)	N/A
<b>All other metals</b>	3 mg/m <sup>3</sup>	5 mg/m <sup>3</sup>	N/A	N/A	N/A

## RULES AND STANDING INSTRUCTIONS

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Section 12: Occupational Health Control		Title: 12-08: Heavy Metals Standard	
Dept: Health & Safety			
Original Issue: 11/15/2017	Latest Revision: 09/22/2020	Next Review Date: 09/22/2023	
Steward: Industrial Hygienist; A. Insley		Approved by: H&S Supervisor; M. Bennett	

- 1.5 Information on metal content of materials at the Martinez Refinery and potential risk of exceeding applicable OELs can be found by utilizing:
  - 1.5.1 SDSs or HMWSs
  - 1.5.2 Vessel metallurgy documentation
  - 1.5.3 Bulk and air sampling results
  - 1.5.4 If the potential may exist for toxic metals, a material should be assumed to contain toxic metals until proven otherwise

### 2. Exposure Control

- 2.1 The type and severity of controls for reducing or eliminating exposure to toxic metals is determined using:
  - Bulk content of materials (as identified on SDS and/or through bulk sampling)
  - Martinez Refinery air monitoring results
  - Third party air monitoring results: as permitted by the regulations, objective data from industry studies have been used to determine what protective measures are required for metals work, welding, arc-gouging, and torch cutting activities.
- 2.2 Substitution
  - 2.2.1 Investigate alternatives to materials containing toxic metals in order to minimize the extent that toxic metals-containing materials are used, without compromising quality or integrity of operations
- 2.3 Engineering and work practice (administrative) controls will be used to maintain personnel exposure below the OEL. Where exposures cannot be maintained below the OEL, use engineering and work practice controls to reduce exposures to the lowest feasible level, then provide personnel with appropriate respiratory protection and PPE
- 2.4 Environmental Considerations
  - 2.4.1 If visible emissions of dust from lead, chromium VI, cadmium, beryllium, arsenic may be generated by using methods that do not minimize or capture emissions, the immediate work area shall be tented off with a barrier (i.e. visqueen). A minimum 6 mil polyethylene used to contain metal and prevent contamination to the environment.
  - 2.4.2 The Waste Handling Group may be consulted to determine how the waste materials should be managed.

### 3. Engineering Controls

- 3.1 Natural Ventilation
  - 3.1.1 A natural air draft from one enclosure opening to another or being outdoors causes the hazard to be sufficiently diluted in the breathing zone to protect the worker.

## RULES AND STANDING INSTRUCTIONS

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Section 12: Occupational Health Control  
Dept: Health & Safety

Title: 12-08: Heavy Metals Standard

Original Issue: 11/15/2017

Latest Revision: 09/22/2020

Next Review Date: 09/22/2023

Steward: Industrial Hygienist; A. Insley

Approved by: H&S Supervisor; M. Bennett

- 3.1.2 If an enclosure is constructed with four sides, there must be a 1-foot gap between the floor and/or ceiling and each of the sides. If this is not possible, the enclosure will be considered a confined space for purposes of determining respiratory protection
- 3.1.3 Natural ventilation is only appropriate for protecting workers against non-hazardous material, to ensure the environment does not become oxygen deficient, and to prevent accumulation of asphyxiates or flammable mixtures. It is not to prevent IDLH environments.
- 3.1.4 All natural ventilation will be induced using a mechanical air mover (i.e. electric fan, pneumatic fan, mechanical fan).
- 3.2 Pneumatic Mechanical Ventilation
  - 3.2.1 Mechanical ventilation will be utilized for all confined spaces, poorly ventilated spaces, or any hot work enclosure, unless localized exhaust ventilation has shown to protect the worker in conjunction with natural ventilation.
  - 3.2.2 Ventilation shall be positioned in such a way that no air is blown into the space. Air shall always be pulled from the space, unless an electric fan is used.
  - 3.2.3 Alarms or sirens need to be connected to the flow rates of the ventilation system used to protect the worker. If the air flow is reduced (i.e. 10%) the employees are alerted to the system failure through audible alarms.
- 3.3 Local Exhaust Ventilation (LEV)
  - 3.3.1 Is required for all welding, in all positions, for all metals, and all welding types, unless no LEV is approved by H&S, or that proper cross ventilation sufficiently protects the worker, based on air sample or metal composition.
  - 3.3.2 Welding shops/bays (temporary or permanent) shall be equipped with at least one local exhaust ventilation per welding area (welding puddle).
  - 3.3.3 HEPA filtered portable system (example shown in attachment 2)
    - These devices are best suited for use in weld bays, grinding areas, and some hooches.
  - 3.3.4 Hooches and other outdoor enclosures are best used with an educator and ducting. Requirements are found below in section e.
  - 3.3.5 The ventilation system distance is based on velocity measurements of the LEV. This evaluation must occur by approved personnel in order for the LEV to be effective, and validated with appropriate air sampling. Minimum distance required must be written on the permit. If H&S has not measured the LEV, minimum distance is 1 foot away from work. Distance is mandatory so that the weld puddle does not receive greater than 100 fpm in air flow. Excess air flow will damage the integrity of the weld (porosity).

## RULES AND STANDING INSTRUCTIONS

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Section 12: Occupational Health Control  
Dept: Health & Safety

Title: 12-08: Heavy Metals Standard

Original Issue: 11/15/2017

Latest Revision: 09/22/2020

Next Review Date: 09/22/2023

Steward: Industrial Hygienist; A. Insley

Approved by: H&S Supervisor; M. Bennett

- 3.3.6 All filters shall be changed using half mask, P100 cartridge, appropriate Tyvek, nitrile gloves, and have a 5 foot exclusion zone during change out.
- 3.3.7 All workers using LEV must be trained on proper setup and demobilization of system by an approved H&S member.
- 3.4 Air Horn with an extendable or flexible hose
  - 3.4.1 This device shall be used only in welding hooch enclosures.
  - 3.4.2 Shall have a "Sock" attached to the back end to encapsulate the captured particulates.
  - 3.4.3 The device should be placed in a way to remove the fumes or particulates from the breathing zone of the worker, outside the enclosure. The device may not blow into the wind.
  - 3.4.4 Must have a trunk attached so that the welder can use system as a LEV.
  - 3.4.5 The ventilation system distance is based on velocity measurements of the LEV. This evaluation must occur by H&S in order for the LEV to be effective. Minimum distance required must be written on the permit. If H&S has not measured the LEV, minimum distance is 1 foot away from work. Distance is mandatory so that the weld puddle does not receive greater than 100 fpm in air flow. Excess will damage the integrity of the weld (porosity).
- 3.5 HEPA vacuum for power tools
  - 3.5.1 All spark producing (grinding, flapper wheel, etc.), machine sanding, abrasive blasting, excessive dry sanding or scrapping, each require a HEPA vacuum for operations with regulated metals found above;
  - 3.5.2 Follow the manufacturers recommended tool operation procedures;
  - 3.5.3 Check the air dryer/lubricator for oil and make sure it is connected to the tool;
  - 3.5.4 Attach the tool to the vacuum:
  - 3.5.5 Use the needle gun on narrow or uneven surfaces and small diameter pipe;
  - 3.5.6 Keep grinder wheels over work surfaces; avoid working near edges;
  - 3.5.7 Avoid using grinders on pipe diameters less than two times the wheel diameter;
  - 3.5.8 Avoid using the 2" grinder except for small jobs in difficult to reach areas.
  - 3.5.9 Do not attempt to clean/remove/replace any vacuum filters without training.
  - 3.5.10 Ground vacuums prior to starting them;
  - 3.5.11 Obtain a Work permit per Martinez Refinery R&SI section 8-1 for lead abatement;
  - 3.5.12 HEPA vacuum loose dust, debris and paint chips off coveralls before leaving the regulated (taped-off) area. Do not create airborne metal by agitating



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Section 12: Occupational Health Control  
Dept: Health & Safety

Title: 12-08: Heavy Metals Standard

Original Issue: 11/15/2017

Latest Revision: 09/22/2020

Next Review Date: 09/22/2023

Steward: Industrial Hygienist; A. Insley

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clothing. Replace the worn grinder pads while wearing PPE. Dispose of worn grinder pads with used coveralls as hazardous waste. Contact the Waste Handling Coordinator for disposal bags.

3.5.13 Follow R&SI 11-1-F for proper doffing of PPE;

3.5.14 Wash hands and face before eating, drinking, or smoking.

3.5.15 Changing HEPA Vacuum filters must be done according to manufacturer's recommendations. Use caution when opening the vacuums or tools. Dust will be present and pose a health hazard. All filters shall be changed using half face respirator with P100 cartridge, FR Tyvek, nitrile gloves, and within a 10-foot exclusion zone.

3.6 Cutting Material using a Wet Method: cutting metal, concrete, or refractory, using a blade that is equipped with integrated water delivery system that continuously feeds water to the blade.

3.7 Caustic Stripping Agents: Methylene Chloride paint strippers are NOT authorized on this facility.

#### 4. Fire Box Enclosures/Welding Hooches/Welding Enclosures

4.1 Follow R&SI 8-23, Facility Siting, Portable and Permanent Structures, if building a new welding structure

4.2 Enclosures are considered a non-permit required confined space if the enclosure has 4 or more covered sides connected with less than 1 feet gap (the roof and bottom is included). Further, if the enclosure is made with curved walls, and the walls curve more than  $\frac{1}{2}$  the diameter, the space is considered a non-permit required confined space

4.3 Enclosures are considered an open space/partial enclosure if one of the following is met:

- 3 sides at maximum can touch or be less than 1 foot in separation (i.e. 2 vertical walls, and the floor).
- 3 vertical walls, with a 1-foot gap between the vertical walls and the flooring.
- 4 vertical walls, the walls touching, 1 wall with a 1-foot offset form verticals and 1 foot gap between all vertical walls and flooring).

4.4 The attendant must be able maintain visual contact with the workers inside the enclosure. Therefore, if the enclosure prevents the attendant from visual contact, one wall must be made of a transparent flash protective screen.

4.5 **All enclosures must be made as to provide 100% spark control, not 100% spark containment, AND allow air movement above and below the wall.**

- Area 3 ft. outside of the welding screens/boundaries shall remain free of combustible material or, mitigated by the use of a fire blanket/water fog to control sparks.

## RULES AND STANDING INSTRUCTIONS

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Section 12: Occupational Health Control  
Dept: Health & Safety

Title: 12-08: Heavy Metals Standard

Original Issue: 11/15/2017

Latest Revision: 09/22/2020

Next Review Date: 09/22/2023

Steward: Industrial Hygienist; A. Insley

Approved by: H&S Supervisor; M. Bennett

- 4.6 Respiratory protection is to be required for all metal work inside of an enclosure regardless of the metal type.
- Only exception is if localized exhaust ventilation is used in conjunction, and the site Industrial Hygienist has provided the proper distance measurements for the ventilation from the work. This may not be feasible from a safety point of view, because of the amount of hooches that are built, and the amount of extra equipment needed, that can fall, or fail.
- 4.7 If mechanical ventilation is used for enclosures, the ventilation system shall include an appropriate gate valve or switch that is under the direct control of the welder. The welder shall adjust the position and rate of the ventilator so that:
- Excessive fumes are removed from the work area;
  - Slag is not ejected from the enclosure to an unprotected area
  - Weld quality is maintained;
  - No more than 100 fpm at the source of the weld.
  - Welding fumes are not discharged into the breathing zone of nearby workers.
  - Entry to confined spaces shall be restricted during welding to those employees necessary to the welding tasks.
  - All welders and helpers entering a confined space during welding, arc-gouging, and cutting operations will use the at least the minimum respiratory protection as defined within R&SI 11-7.

### 5. Administrative (Work Practice) Controls

#### 5.1 Regulated Area Exclusion Zones

- 5.1.1 All areas with in maintenance, shops, enclosures, and confined spaces where metal work occurs that may have the potential to cause exposure over the OEL to any metal (or where no data exists), required to have demarcation with the appropriate tape, and labels every 25 feet stating the hazard.
- 5.1.2 The minimum exclusion zone for metal work is: 10 feet radius from the source of exposure (with the exception of lead work and excluding torch cutting), or to cordon off for public safety for non-permanent structures or unsafe permanent structures. This distance will increase based on the type of metal being worked. This rule does not apply to permit required confined space entries; rather, confined spaces will be permitted as a single space, regardless of size, unless consultation with the Industrial Hygienist determines otherwise. Air sampling must verify prior to downgrading PPE.
- 5.1.3 Over exposure potential is implied based on the requirement to wear respiratory protection. An exclusion area is needed in order to display where the safe area is located, and PPE is or isn't required.

## RULES AND STANDING INSTRUCTIONS

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Section 12: Occupational Health Control		Title: 12-08: Heavy Metals Standard	
Dept: Health & Safety			
Original Issue: 11/15/2017	Latest Revision: 09/22/2020	Next Review Date: 09/22/2023	
Steward: Industrial Hygienist; A. Insley		Approved by: H&S Supervisor; M. Bennett	

5.1.4 All personnel within exclusion zones must wear the same PPE, regardless of distance to work, wind direction, or work type. If work doesn't allow for an exclusion zone to be barricaded, than all workers within 10 feet of the source must be in the same PPE.

### 5.2 Arc Flash Screen

5.2.1 In all welding shops/bays (temporary or permanent), non-combustible arc flash screens shall be provided and used during welding and cutting activities in shops, so that adjacent workers will not be visually exposed to the arc.

5.2.2 These screens shall allow at least two feet of open space at the bottom and the top to facilitate vertical air flow.

5.2.3 If the enclosure around the fabrication area includes a top, then

- The side walls must have an opening of at least 2 feet near the top of the wall and/or
- Mechanical ventilation should be provided and used at all times when welding, cutting, or grinding is taking place.

5.2.4 Titanium dioxide paint (white) is the American Welding Standard for painting walls so that the walls are not reflective. Consider if reflection of arc flashing becomes an issue.

### 5.3 Housekeeping

5.3.1 Reference R&SI 12-20, Housekeeping, for basic housekeeping protocols.

5.3.2 Reference chemical specific housekeeping requirements found in R&SI 12-8 A through E.

### 5.4 Hygiene Facilities

5.4.1 Food (including chewing gum) and beverages may not be present or consumed, tobacco products may not be present or consumed, and cosmetics may not be applied in areas where the airborne concentration of heavy metals is or may be greater than the PEL. A means to separate welding environment from the eating area shall be installed based on distance (100 feet minimum) or using sufficient barriers to prevent cross-contamination of eating area (trailer/positive pressure).

5.4.2 Always keep clothes to be worn home separated from work clothes. Never wear home any clothing which contacted any painted surface or clothes worn while at work.

5.4.3 After leaving the work area, employees must wash their hands and faces before eating, drinking, handling tobacco products or applying cosmetics.

- Employees shall utilize shower rooms available in the refinery or Chemical Plant if they were engaged in tasks that have or may have exposed them to airborne concentrations of metals above the PEL.

## RULES AND STANDING INSTRUCTIONS

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Section 12: Occupational Health Control  
Dept: Health & Safety

Title: 12-08: Heavy Metals Standard

Original Issue: 11/15/2017

Latest Revision: 09/22/2020

Next Review Date: 09/22/2023

Steward: Industrial Hygienist; A. Insley

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- ALL METALS (excluding Lead, and hexavalent chromium): Hand washing areas are in each M&C area, the carpenter shop and various other areas, and must exist within 100 feet of work, and be used before entering a break area.
- 5.4.4 Showers are provided to Martinez employees at the M&C change room for end of shifts or jobs.
- 5.4.5 Employees shall place contaminated equipment that were utilized in work area in a bag inside of a hazardous waste drum located within the exclusion zone. Upon completion of the job, the waste bag must be sealed and labelled with appropriate danger language (see R&SI 12-8 Attachments for specific language based on metal) and coordinate with Waste Handling for disposal. All PPE shall be removed inside the taped off area whenever the workers must leave the area.
- 5.4.6 If the coveralls must be taken to an outside laundry for cleaning, the coveralls will be placed in sealed plastic bags and the bags shall be labeled according to the specific hazards found in appropriate R&SI 12-8 Attachment.
- 5.4.7 All non-regulated metals (e.g. lead-free, chromium VI free, beryllium-free, or cadmium free) – do not require specific wording to warn the laundry facility, or special treatment.
- 5.4.8 Employees shall only utilize lunch rooms or eating areas provided by the refinery and shall not eat or drink with in the exclusion zone.
- 5.4.9 Do not use pure oxygen to clean. Oxygen used to clean clothes from oxy-acetylene bottles, creates an environment where if a spark is applied after use, a fire will ensue underneath ones FR clothing.
- 5.4.10 Do not use compressed air to clean.
- 5.5 Decontamination Area
- 5.5.1 Follow R&SI 11-1-F for proper doffing of PPE.
- 5.5.2 Metals shall not be removed from PPE or equipment by blowing, shaking, sweeping or other means which will disperse heavy metals into the air. Methods that are allowed are contamination removal with a vacuum cleaner equipped with a HEPA filters and washing person or equipment. Caution must be taken not to spread heavy metals contamination with any allowed method.
- 5.5.3 Description of arrangements made among contractors on multi-contractor sites with respect to informing affected employees of potential exposure to lead and with respect to responsibility for compliance.
- 5.5.4 Perform basic decontamination such as vacuuming, Hudson spraying, rinsing, or disposing of equipment prior to exiting the exclusion zone.
- 5.5.5 Doff Tyvek if used in the appropriate hazardous waste receptacle, prior to leaving the work are for break, eating, or leaving for the day.

## RULES AND STANDING INSTRUCTIONS

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Section 12: Occupational Health Control  
Dept: Health & Safety

Title: 12-08: Heavy Metals Standard

Original Issue: 11/15/2017

Latest Revision: 09/22/2020

Next Review Date: 09/22/2023

Steward: Industrial Hygienist; A. Insley

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5.5.6 Once Tyvek is doffed, wash face and hands if work is with lead or chromium VI containing materials.

5.5.7 Impound the water utilized for decontamination in order to determine the amount of hazard within water, to ensure proper disposal of the contaminated water.

5.6 Job rotation is a prohibited means of obtaining compliance with the OEL

### 6. Personal Protective Equipment

#### 6.1 Requirements

6.1.1 All minimum respiratory requirements are found in R&SI 11-7 and are based on task, excepting hot work, which is based on metal type, welding technique, and confined-space or open space.

6.1.2 When wearing a supplied air respirator for protection against fumes or particulates, workers do not need to wear an egress bottle, unless the work environment is considered IDLH.

6.1.3 Respiratory protection may be reduced, if effective local exhaust ventilation is used at the point of operation. Details of effective local exhaust ventilation can be found above in engineering controls.

6.1.4 In addition to following R&SI 11-1 PPE requirements, the following list is the minimum PPE required for work that could result in exposures above the PEL.

- FR Disposable coveralls with hood
- Suits shall not be worn outside of exclusion zone.
- Disposable shoe coverlets or chemical resistance work boots that may be decontaminated.
- Shoes shall not be worn outside of exclusion zone
- Disposable chemical resistant gloves
- Appropriate eye and hearing protection for the task.

6.1.5 Gloves and booties shall be taped to the coveralls. For additional donning procedures follow donning doffing PPE procedures found in R&SI 11-1-F.

#### 6.2 Laundry Facilities

6.2.1 Our current laundry company will not accept coveralls contaminated with toxic metals

6.2.2 To facilitate laundering of coveralls, all work with regulated toxic metals covered by this R&SI will be conducted with the appropriate Tyvek suit as the outermost garments.

## RULES AND STANDING INSTRUCTIONS

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Section 12: Occupational Health Control Dept: Health & Safety		Title: 12-08: Heavy Metals Standard	
Original Issue: 11/15/2017	Latest Revision: 09/22/2020	Next Review Date: 09/22/2023	
Steward: Industrial Hygienist; A. Insley		Approved by: H&S Supervisor; M. Bennett	

6.2.3 Work with the potential to generate metal dust which may result in contaminated clothing. OSHA stated in their preamble to 1901.1026 that such contamination is not likely from welding activities. The following guidelines can be applied to work that may cause clothing contamination. Or such contamination may be prevented following procedures similar to those used to prevent lead clothing contamination, including use of disposable coveralls and decontamination facilities such as change rooms. If contamination of clothing that will be re-worn does occur, the following applies:

- Contaminated PPE and clothing shall be laundered or disposed of in such a way as to minimize potential exposure;
- When laundering reusable clothing, the release of metal dusts must be controlled below the PEL. Water soluble dissolvable bags are available to minimize exposure to laundry personnel. In the field work area, clothing in dissolvable bags can be inserted into plastic bags. The inner dissolvable bags can be removed intact with contained clothing at laundry. Commercial laundry services must be notified of the presence of the regulated metal. An example laundry notification letter is included as in the appropriate metal hazard R&SI 12-8 A through E.

### 7. Medical Surveillance

- 7.1 When personnel exposure has the potential to exceed the AL for 30 or more days per year (according to Table 2), personnel will be considered a covered employee and enrolled in appropriate medical surveillance
- 7.2 Medical surveillance requirement does not apply to manganese or nickel

### 8. Training Requirements

- 8.1 All personnel working at the Martinez Refinery will receive awareness level training for toxic metals. This training will include:
- Locations where toxic metals compounds are present
  - Information on the hazards associated with toxic metals
  - Measures established to control exposure
- 8.2 All personnel that may be exposed to toxic metals over the AL must receive training on the hazards associated. This training includes the following:
- Hazard communication, including where the chemical is found, health hazard data, and signs and symptoms of overexposure
  - Proper use of engineering, administrative, and PPE controls;
  - Relevant portions of the applicable Cal-OSHA standard;

## RULES AND STANDING INSTRUCTIONS

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Section 12: Occupational Health Control Dept: Health & Safety		Title: 12-08: Heavy Metals Standard	
Original Issue: 11/15/2017	Latest Revision: 09/22/2020	Next Review Date: 09/22/2023	
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- Protecting adjacent personnel by work practices such as barricading and posting areas where airborne concentrations of specific heavy metals may exceed the PEL;
  - Medical surveillance and requirements;
  - Summary of exposure monitoring results for specific heavy metals,
  - Personal hygiene as a method of reducing exposure, and,
  - Access to industrial hygiene and medical records
- 8.3 See applicable attachment for metal specific training and work practices from this R&SI.
- 8.4 The Site IH is responsible for developing and/or providing training for all refinery employees exposed to heavy metals above the AL, but is not responsible for providing this training to contractors.
- 8.5 Each employee has access to Cal-OSHA applicable General Industry or Construction Industry standards for all toxic metals covered by this R&SI. Access can be obtained through the hyperlink in the references section or by contacting the Industrial Hygienist.
- 8.6 Annual refresher training will be given to employees with the potential for exposures above the action level, and to their supervisors.

### 9. Record Retention

- 9.1 All industrial hygiene air monitoring exposure results will be kept for 30 years
- 9.2 All medical surveillance results will be kept for 30 years following the end of employment
- 9.3 Access to industrial hygiene and medical records will be provided in accordance with R&SI 12-2, Medical Surveillance Program.

## RULES AND STANDING INSTRUCTIONS

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Section 12: Occupational Health Control Dept: Health & Safety	Title: 12-08: Heavy Metals Standard
Original Issue: 11/15/2017	Latest Revision: 09/22/2020
Steward: Industrial Hygienist; A. Insley	Next Review Date: 09/22/2023 Approved by: H&S Supervisor; M. Bennett

### Attachment 1. Metal Work Layout Requirements

Work Location/Task:	Weld Bay	
Process Description:	Metal work in a non-confined space or enclosure	
Metal Hazards	Lead, Chromium VI, Cadmium, Nickel, Arsenic, Manganese or other heavy metals.	
	<b>Description</b>	<b>Yes/Maybe/No</b>
Engineering Controls:	Environmental Issues*	Yes for lead Consult with Environmental Department for all other metals
	Natural Ventilation*	Yes
	Pneumatic Mechanical Ventilation*	Yes
	Localized Exhaust Ventilation*	Yes for lead Maybe; to reduce respiratory requirement
	HEPA Vacuum for Power Tools	Yes for lead
Administrative Controls:	Exclusion Zone:	Yes;
	Housekeeping*:	Yes
	Hygiene Facilities*:	Yes
	Decontamination area*:	Yes
	Laundry requirements*:	Yes
PPE Controls:	Respiratory Protection:	Yes
	Shade number requirement:	Yes
	Tyvek	Yes for lead
	FR Tyvek	Maybe
	Welding Leathers	No
	Leather gloves	Yes
	Disposable nitrile gloves	No
Booties	Maybe	



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Section 12: Occupational Health Control  
Dept: Health & Safety

Title: 12-08: Heavy Metals Standard

Original Issue: 11/15/2017

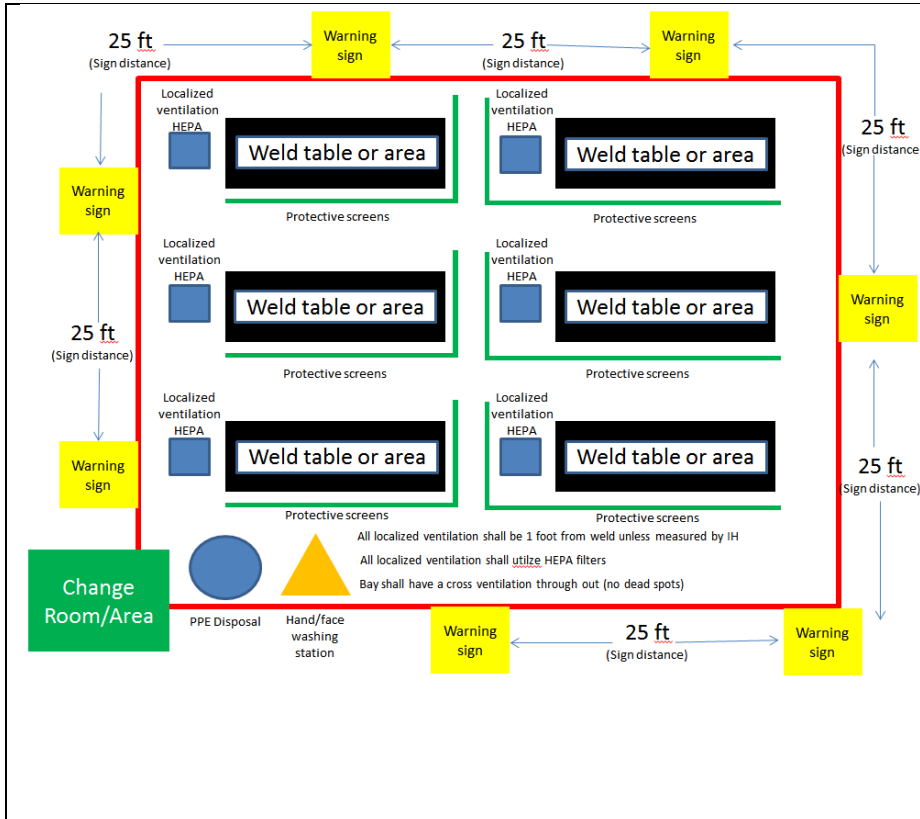
Latest Revision: 09/22/2020

Next Review Date: 09/22/2023

Steward: Industrial Hygienist; A. Insley

Approved by: H&S Supervisor; M. Bennett

### Facility Design:



- Mechanical Ventilation needed
- 1 ft. gap between floor/ceiling and sides
- Can reduce gaps and mechanical ventilation if LEV is used.
- Eye wash station not required, but fectogoggles (spoggles) required
- Fire extinguishers needed within 50 feet
- Bottom 4 feet of walls need fire blanket for the walls
- Verify appropriate lighting, cable housekeeping, and GFCI.
- All PPE and wash water must be labeled as CrVI containing

**\*Information is found the Section 2, Controls, found in R&SI 12-8.**

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Steward: Industrial Hygienist; A. Insley	Approved by: H&S Supervisor; M. Bennett	

Work Location/Task:	Fire Box Enclosure/Welding Hooches/Welding Enclosure	
Process Description:	Welding in a non-confined or enclosed space	
Metal Hazards	Chromium VI, Cadmium, Nickel, and other heavy metals.	
	Description	Yes/Maybe/No
Engineering Controls:	Environmental Issues*	Yes
	Natural Ventilation*	Yes; otherwise enclosed space
	Pneumatic Mechanical Ventilation*	Yes
	Localized Exhaust Ventilation*	Maybe; to reduce respiratory requirements
	HEPA Vacuum for Power Tools	No
Administrative Controls:	Exclusion Zone:	Yes
	Housekeeping*:	Yes
	Hygiene Facilities*:	Yes
	Decontamination area*:	Yes
	Laundry requirements*:	No
PPE Controls:	Respiratory Protection:	Yes
	Shade number requirement:	Yes
	Tyvek	Maybe
	FR Tyvek	Yes (only if Confined space)
	Welding Leathers	Yes
	Leather gloves	Yes
	Disposable nitrile gloves	No
	Booties	No

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### Facility Design:



To reduce respirators, need LEV, mechanical ventilation, and training

All LEV systems will exhausted to a HEPA filtered system

Mechanical ventilation (air horn) needs a sock to capture particulates/fumes; unless LEV is used

**If mechanical ventilation/filters, and socks are not feasible,**

Natural ventilation combined with the minimum respiratory protection is based on R&SI 11-7 for appropriate RP selection

Must have a 1 foot gap around the entire bottom/top of hooch

One wall must be transparent for fire watch to see worker

3 feet outside of hooch must be free of combustibles

A minimum of 10 feet exclusion zone is needed from the worker. Welding screens/fire blanket should be built inside the exclusion zone.

All sides must be covered to ensure arc flashing doesn't occur

Hand and face washing stations within 15 feet of boundary.

**\*Information is found the Section 2, Controls, found in R&SI 12-8.**

All enclosures must allow air flow above and below the walls.  
All enclosures must provide spark control.  
All enclosures must allow the attendant to see the welder

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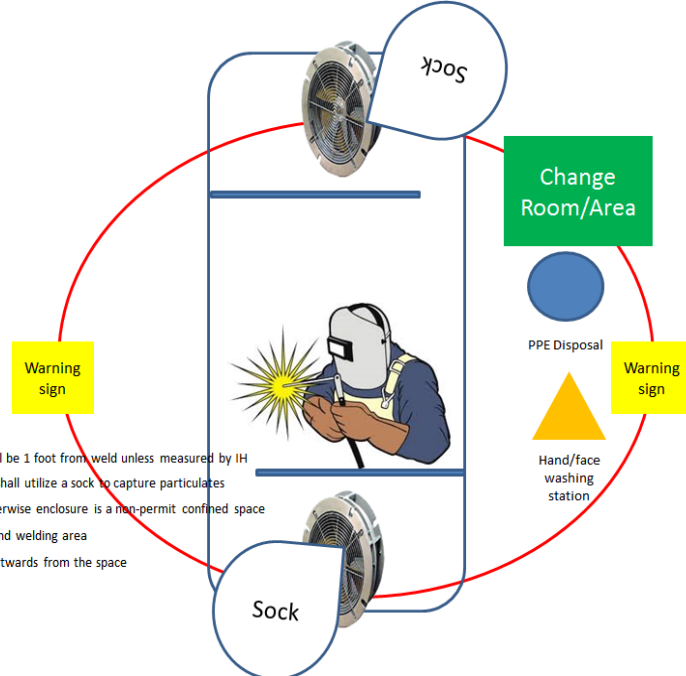
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Work Location/Task:	Welding in a confined Space or non-permit required Confined Space		
Process Description:	Confined space, or non-permit required confined space welding environment inside of structures.		
Potential Hazards	Chromium VI, Cadmium, Nickel, and other heavy metals		
	<b>Description</b>	<b>Yes/Maybe/No</b>	
Engineering Controls:	Environmental Issues*	Maybe; if particulates are escaping	
	Natural Ventilation*	Yes	
	Pneumatic Mechanical Ventilation*	Yes	
	Localized Exhaust Ventilation*	Maybe; to reduce respiratory requirements	
	HEPA Vacuum for Power Tools	No	
Administrative Controls:	Exclusion Zone:	Maybe	
	Housekeeping*:	Yes	
	Hygiene Facilities*:	Yes	
	Decontamination area*:	Yes	
	Laundry requirements*:	Yes	
PPE Controls:	Respiratory Protection:	Yes	
	Shade number requirement:	Yes	
	Tyvek	Yes; based on location	
	FR Tyvek	Yes; based on location	
	Welding Leathers	Yes	
	Leather gloves	Yes	
	Disposable nitrile gloves	No	
	Booties	Yes	
Facility Design:			
		<b>Confined Space</b>	<b>Non Permit Confined Space</b>
		Exclusion zone is total space; unless approved by H&S air samples	Exclusion zone is 10 feet from weld puddle

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 <p style="font-size: small;">All localized ventilation shall be 1 foot from weld unless measured by IH All mechanical ventilation shall utilize a sock to capture particulates 4 sides are a minimum otherwise enclosure is a non-permit confined space 10 foot exclusion zone around welding area Air mover shall only blow outwards from the space</p>	Mechanical Ventilation needed	LEV is recommend
	LEV isn't feasible	Bottom 4 feet of walls need fire blanket for the walls,
	Eye wash station not required, but fectogoggles (spoggles) required	
	Fire extinguishers needed within 50 feet	
	Verify appropriate lighting, cable housekeeping, and GFCI.	One wall must be transparent for fire watch to see worker
<b>*Information is found the Section 2, Controls, found in R&amp;SI 12-8.</b>		

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Work Location/Task:	Mechanical Removal top material in open area (metal or material containing lead, nickel, chromium VI, galvanized material)	
Process Description:	Non-confined space or open environment. Needle gun, spark producing (grinding, flapper wheel, etc.), machine sanding, abrasive blasting, excessive dry sanding or scrapping	
Potential Hazards	Lead, Nickel, chromium VI, zinc, and other heavy metals	
	<b>Description</b>	<b>Yes/Maybe/No</b>
Engineering Controls:	Environmental Issues*	Yes; for lead Maybe; for all other metals
	Natural Ventilation*	Yes
	Pneumatic Mechanical Ventilation*	Yes
	Localized Exhaust Ventilation*	Yes; for Lead Maybe; for other metals
	HEPA Vacuum for Power Tools	Yes; lead only
Administrative Controls:	Exclusion Zone:	Yes; 25 feet from source for lead Yes; 10 feet from source for other metals
	Housekeeping*:	Yes
	Hygiene Facilities*:	Yes
	Decontamination area*:	Yes; Lead/CrVI only
	Laundry requirements*:	Yes: Lead/CrVI only
PPE Controls: Always tape PPE together	Respiratory Protection:	Yes
	Shade number requirement:	Yes
	Tyvek	Yes; based on location
	FR Tyvek	Yes; based on location
	Welding Leathers	No
	Leather gloves	Yes

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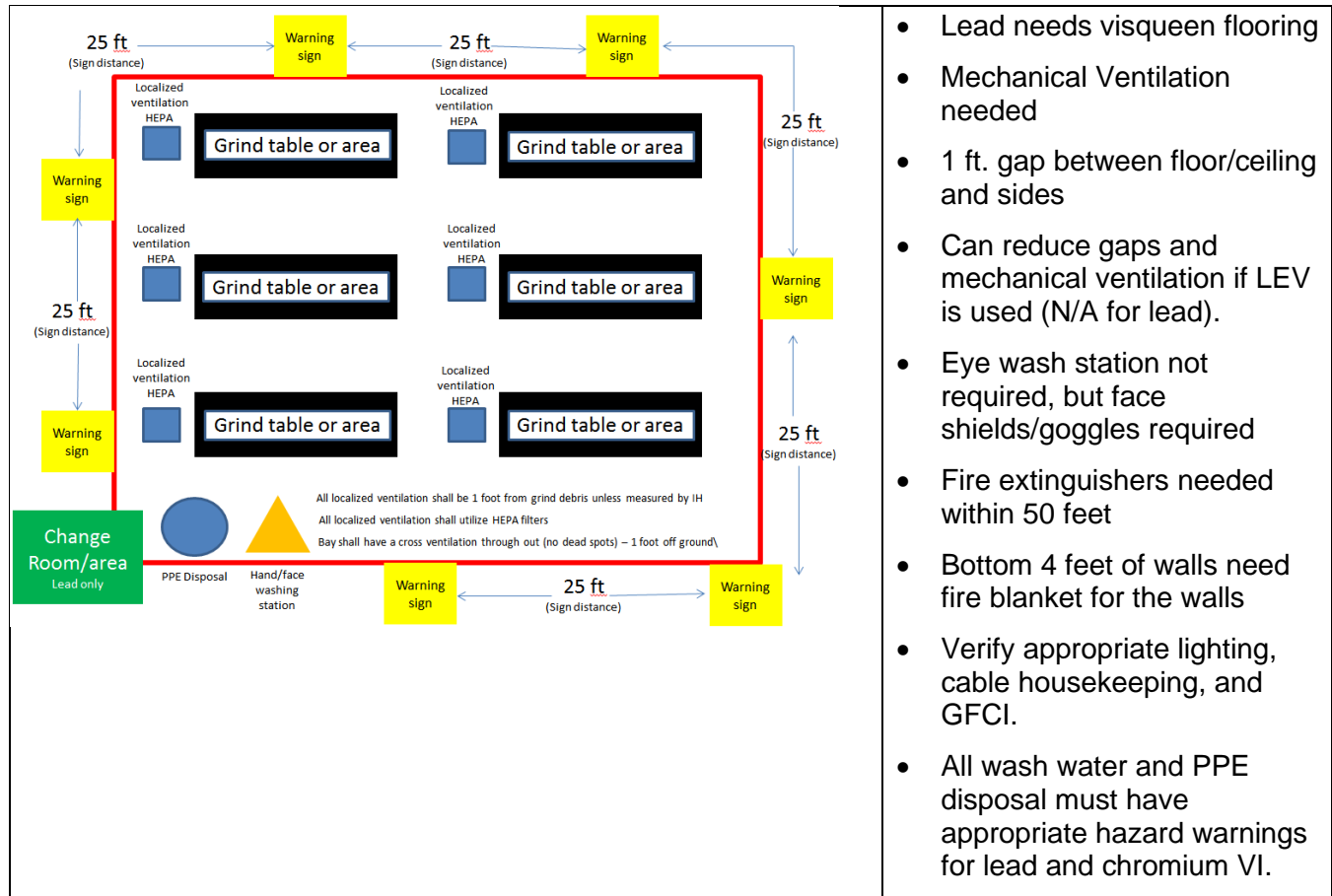
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Approved by: H&S Supervisor; M. Bennett

Disposable nitrile gloves	Yes
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Booties	Yes
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### Facility Design:



- Lead needs visqueen flooring
- Mechanical Ventilation needed
- 1 ft. gap between floor/ceiling and sides
- Can reduce gaps and mechanical ventilation if LEV is used (N/A for lead).
- Eye wash station not required, but face shields/goggles required
- Fire extinguishers needed within 50 feet
- Bottom 4 feet of walls need fire blanket for the walls
- Verify appropriate lighting, cable housekeeping, and GFCI.
- All wash water and PPE disposal must have appropriate hazard warnings for lead and chromium VI.

**\*Information is found the Section 2, Controls, found in R&SI 12-8.**

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Work Location/Task:	Mechanical removal of top material in confined spaces or non-permit confined space (metal or material containing lead, nickel, chromium VI, or galvanized material)	
Process Description:	Confined spaces or structures with greater than 4 sides blocked (including bottom). Needle gun, spark producing (grinding, flapper wheel, etc.), machine sanding, abrasive blasting, excessive dry sanding or scrapping	
Potential Hazards	Lead, Nickel, chromium VI, zinc (galvanized), and other heavy metals	
	Description	Yes/Maybe/No
Engineering Controls:	Environmental Issues*	Yes; for lead Maybe; for all other metals
	Natural Ventilation*	Yes
	Pneumatic Mechanical Ventilation*	Yes
	Localized Exhaust Ventilation*	Yes; Lead only Maybe; for other metals
	HEPA Vacuum for Power Tools	Yes; lead only
Administrative Controls:	Exclusion Zone:	Yes
	Housekeeping*:	Yes
	Hygiene Facilities*:	Yes
	Decontamination area*:	Yes; lead/CrVI Only
	Laundry requirements*:	Yes; lead/CrVI only
PPE Controls: Always tape PPE together	Respiratory Protection:	Yes
	Shade number requirement:	Yes
	Tyvek	Yes; based on location
	FR Tyvek	Yes; based on location



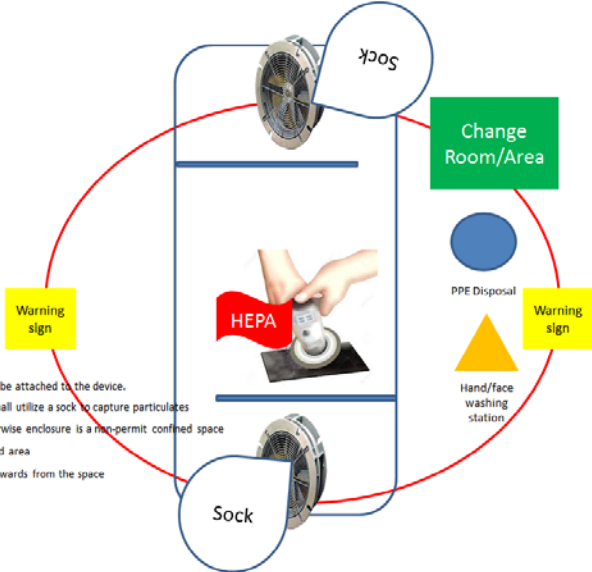
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	Welding Leathers	No
	Leather gloves	Yes
	Disposable nitrile gloves	Yes
	Booties	Yes

### Facility Design:

 <p style="font-size: small;">All localized ventilation shall be attached to the device. All mechanical ventilation shall utilize a sock to capture particulates 4 sides are a minimum otherwise enclosure is a non-permit confined space 10 foot exclusion zone around area Air mover shall only blow outwards from the space</p>	<b>Confined Space</b>	<b>Non Permit Confined Space</b>
	Exclusion zone is total space; unless approved by H&S air sampling	Exclusion zone is 10 feet from source; Lead requires a 25 foot exclusion from source
	Mechanical Ventilation needed	LEV is recommend; for lead LEV is required, unless glove bag is used
	LEV isn't feasible (glove bag for lead)	Bottom 4 feet of walls need fire blanket for the walls
	Eye wash station not required, but fectogoggles (spoggles) required; lead requires goggles	
	Fire extinguishers needed within 50 feet	
	Verify appropriate lighting, cable housekeeping, and GFCI.	One wall must be transparent for fire watch to see worker

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Work Location/Task: Heat treatment of lead or hexavalent paint in an Open Area												
Process Description:	Heat treating in an environment inside of structures that is not considered a confined space or less than 4 sides blocked (including bottom).											
Potential Hazards	Lead, Nickel, chromium VI, galvanized metal											
	<table border="1" style="width: 100%;"> <thead> <tr> <th style="width: 70%;">Description</th> <th style="width: 30%;">Yes/Maybe/No</th> </tr> </thead> <tbody> <tr> <td>Environmental Issues:</td> <td>Yes; for lead Maybe; for Chromium VI</td> </tr> <tr> <td>Natural Ventilation:</td> <td>Yes</td> </tr> <tr> <td>Pneumatic Mechanical Ventilation</td> <td>Yes</td> </tr> <tr> <td>Localized Exhaust Ventilation</td> <td>Yes; for Lead Maybe; for other metals</td> </tr> <tr> <td>HEPA Vacuum for Power Tools</td> <td>Yes; lead only</td> </tr> </tbody> </table>	Description	Yes/Maybe/No	Environmental Issues:	Yes; for lead Maybe; for Chromium VI	Natural Ventilation:	Yes	Pneumatic Mechanical Ventilation	Yes	Localized Exhaust Ventilation	Yes; for Lead Maybe; for other metals	HEPA Vacuum for Power Tools
Description	Yes/Maybe/No											
Environmental Issues:	Yes; for lead Maybe; for Chromium VI											
Natural Ventilation:	Yes											
Pneumatic Mechanical Ventilation	Yes											
Localized Exhaust Ventilation	Yes; for Lead Maybe; for other metals											
HEPA Vacuum for Power Tools	Yes; lead only											
Engineering Controls:	Exclusion Zone:	Yes; 25 feet from source for lead Yes; 10 feet from source for all metals										
	Housekeeping Plan:	Yes										
	Hygiene Facilities:	Yes										
	Decontamination area:	Yes										
	Laundry Facilities:	Yes										
Administrative Controls:	Respiratory Protection:	Yes										
	Face/eye protection:	Yes										
	Tyvek	Yes; based on location										
	FR Tyvek	Yes; based on location										
	Welding Leathers	No										
	Leather gloves	Yes										
	Disposable nitrile gloves	Yes										
PPE Controls:	Booties	Yes										

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### Facility Design:

**None Displayed**

**Where the metal does not require post-weld stress relieving, the paint must be removed at least four inches on both sides of the heat-affected zone (i.e. weld, cut, or grinding). When supplied air respiratory protection is required the above removal requirement is waived. Where the metal does require post-weld heat stress relieving, the paint must be removed at least twelve inches on both sides of the heat-affected zone.**

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### Work Location/Task: Heat treatment of lead or hexavalent chromium paint in a Confined Space or Non-Permit Confined Space

Process Description:	Heat treating in an environment inside of structures. (Greater than 4 sides blocked (including bottom)).	
Potential Hazards	Lead, Nickel, chromium VI	
	<b>Description</b>	<b>Yes/Maybe/No</b>
Engineering Controls:	Environmental Issues:	Yes; for lead Maybe; for Chromium VI
	Natural Ventilation:	Yes
	Pneumatic Mechanical Ventilation	Yes
	Localized Exhaust Ventilation	Yes; for Lead Maybe; for other metals
	HEPA Vacuum for Power Tools	Yes; lead only
Administrative Controls:	Exclusion Zone:	Yes; the entire space
	Housekeeping Plan:	Yes
	Hygiene Facilities:	Yes
	Decontamination area:	Yes
	Laundry Facilities:	Yes
PPE Controls:	Respiratory Protection:	Yes
	Face/eye protection:	Yes
	Tyvek	Yes; based on location
	FR Tyvek	Yes; based on location
	Welding Leathers	No
	Leather gloves	Yes
	Disposable nitrile gloves	Yes
	Booties	Yes

#### Facility Design:

**None Displayed**

**Where the metal does not require post-weld stress relieving, the paint must be removed at least four inches on both sides of the heat-affected zone (i.e. weld, cut, or grinding). When supplied air respiratory protection is required the above removal requirement is waived. Where the metal does**

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**require post-weld heat stress relieving, the paint must be removed at least twelve inches on both sides of the heat-affected zone.**

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Work Location/Task:	Torch Cutting on Lead or Chromium VI paint or material	
Process Description:	Using propane (replaced for oxy/acetylene), or plasma cutters to cut through base metal or coated metal that is primarily lead or hexavalent chromium.	
Potential Hazards	Lead, Nickel, and other heavy metals, Carbon monoxide, Carbon dioxide.	
	Description	Yes/Maybe/No
Engineering Controls:	Environmental Issues*	Yes; for lead Maybe; for Chromium VI
	Natural Ventilation*	Yes
	Pneumatic Mechanical Ventilation*	Yes
	Localized Exhaust Ventilation*	Yes; for Lead Maybe; for other metals
	HEPA Vacuum for Power Tools	Yes; lead only
Administrative Controls:	Exclusion Zone:	Yes; 25 feet from source for lead Yes; 10 feet from source for all metals
	Housekeeping*:	Yes
	Hygiene Facilities*:	Yes
	Decontamination area*:	Yes
	Laundry requirements*:	Yes
	Respiratory Protection:	Yes
PPE Controls:	Shade number requirement:	Yes
	Tyvek	Yes; based on location
	FR Tyvek	Yes; based on location
	Welding Leathers	No
	Leather gloves	Yes
	Disposable nitrile gloves	Yes
	Booties	Yes



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Work Location/Task:		Nickel Carbonyl Catalyst replacement (Confined Space)
Process Description:	Nickel Catalyst replacement	
Potential Hazards	Nickel Carbonyl, Carbon Monoxide, Nitrogen (low Oxygen), and heat.	
	<b>Description</b>	<b>Yes/Maybe/No</b>
Engineering Controls:	Environmental Issues	Yes
	Natural Ventilation	No
	Pneumatic Mechanical Ventilation	Maybe
	Localized Exhaust Ventilation	Yes
	HEPA Vacuum for Power Tools	No
Administrative Controls:	Exclusion Zone:	Yes
	Housekeeping Plan:	Yes
	Hygiene Facilities:	Yes
	Decontamination area:	Yes
	PPE Disposal	Yes
PPE Controls:	Laundry Facilities:	Yes
	Respiratory Protection:	Yes
	Tyvek	No
	FR Tyvek	Yes
	Welding Leathers	No
	Leather gloves	No
	Disposable nitrile gloves	Yes
Booties	Yes	
<b>Facility Design:</b>		



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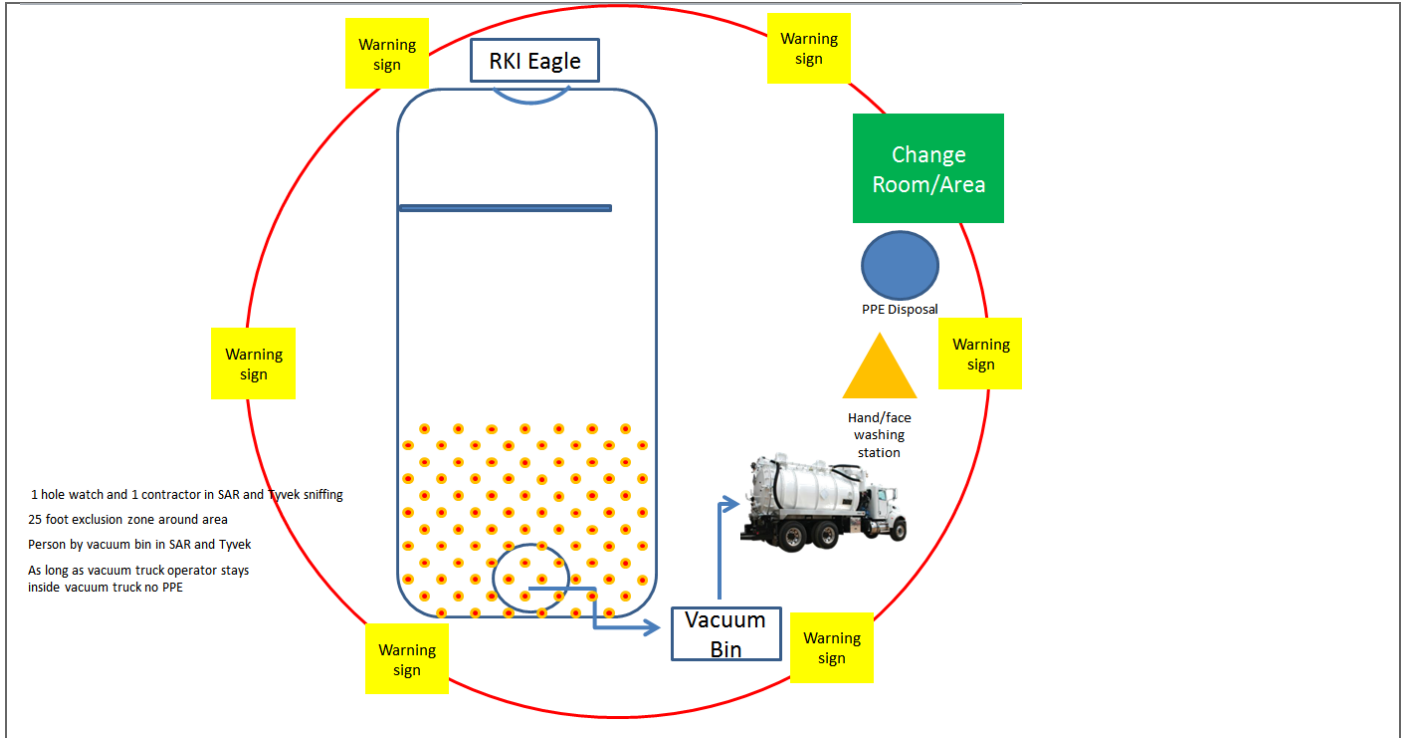
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### Appendix 2. Local Exhaust Ventilation examples

Portable ventilation system	Array of ventilation trunks	Air Horn
