1.0 PURPOSE

1.1 The purpose of this program is determine safe work practices necessary to minimize exposure to Inorganic Arsenic, Beryllium, Cadmium, Hexavalent Chromium, Lead, and other metal contaminants such as Manganese, as well as to outline the procedures followed to anticipate the potential for hazardous exposures, control exposures, and verify the effectiveness of control measures.

1.2 This program replaces previous MRD procedures RSW-SAF-014-DT (Lead Abatement) and RSW-SAF-036-DT (Hexavalent Chromium Standard).

2.0 APPLICATION

2.1 This plan applies to all Marathon Petroleum Company, Michigan Refining Division (MRD) employees and contract employees who have the potential for toxic metals exposure.

2.2 In general, the Occupational Safety and Health Administration (OSHA) Construction regulations would apply to turnaround and other “construction-type” operations. Construction means work involving alteration or repair, including painting and decorating, but does not include routine cleaning and repainting of surfaces where there is insignificant damage, wear or corrosion. Normal operations that are anticipated, routine, and regularly scheduled are generally considered under OSHA General Industry regulations.

3.0 RESPONSIBILITIES

3.1 The Safety Department is designated as the administrator of this standard and is responsible for its implementation, oversight, review and updates.

3.2 Maintenance / TAR / Construction planners are responsible for identifying work scopes that may have the potential to expose employees to toxic metals outlined in this program. Refer to Attachment E: Planning Work That May Contain Toxic Metals for an outline of responsibilities.

4.0 DEFINITIONS

4.1 ***Action Level (AL):*** An 8-hour time weighted average (TWA) airborne exposure limit to a contaminant, which if exceeded initiates additional exposure monitoring and medical surveillance requirements. Typically, OSHA sets the AL at 50% of the PEL. NOTE: There is no AL for Manganese set by OSHA.

Substance	**OSHA TWA AL**
Arsenic	0.005 mg/m^3
Beryllium	0.0001 mg/m^3
Cadmium	0.0025 mg/m^3
Hexavalent Chromium	0.0025 mg/m^3
Lead	0.03 mg/m^3
Manganese	N/A

4.2 ***Arsenic (As):*** This includes elemental arsenic and all inorganic compounds containing arsenic but excludes arsine gas. At MPC the most likely sources of arsenic are in crude oil and some catalysts, as well as in pressure treated lumber. Present in spent catalysts, storage tank scale, and refractory in heaters and vessels, arsenic may be released during the following activities:

- During hot work on carbon steel that was previously in service.
- During abrasive and CO2 pellet blasting of heater tubes.
- During removal/disturbance (cutting, chipping), and clean-up of refractory debris.
- During dumping of hydrotreater or isomerization catalyst, dumping of alky defluorinators desiccant, and removal of catalyst.

4.3 ***Beryllium (Be):*** – This includes Beryllium in all forms, compounds, and mixtures. For MPC operations, the most likely sources of Beryllium are contaminants in abrasive blasting agents and exotic metals.

4.4 ***Cadmium (Cd):*** *This includes Cadmium and Cadmium compounds, in all forms. For MPC operations, the most likely sources of Cadmium are in some catalysts and paint coatings.*

4.5 ***Ceiling:*** *OSHA has established an acceptable ceiling concentration for Manganese at 5 mg/m3, which is a level of exposure that must not be exceeded at any time.*

4.6 ***Covered Employee:*** *An employee included in a written exposure control plan when industrial hygiene monitoring of any work operation, which involves regular or periodic Arsenic, Beryllium, Cadmium, Lead or Hexavalent Chromium exposure, confirms results above the Action Level.*

4.7 ***HEPA****: High Efficiency Particulates Air Filtration (99.97% efficient) for respirable particulates such as asbestos, lead, silica, arsenic, dust, etc. HEPA filtration is used to prevent particulate emissions from vacuum systems used as local exhaust ventilation on handheld coating equipment (e.g. buffers, needle-guns & scalers). HEPA filtration is also used to prevent particulate emissions from general exhaust ventilation systems used to maintain negative pressure inside a contained work area during abrasive blasting of lead-containing coatings.*

4.8 ***Hexavalent Chromium (CrVI):*** *This includes chromium with a valence of positive six in any form and in any compound. At MPC the most likely sources of Cr(VI) are welding operations such as conducting hot work on chromium containing alloys; residual chromium on catalysts, refractory surfaces and furnace tubes; chromate-containing paints/primers, and residual chromium in old cooling tower wood supports and other pressure treated lumber.*

4.9 ***Hot Work:*** *Work involving electric or gas welding, cutting, brazing, or similar flame or spark-producing operations, including associated grinding.*

4.10 ***Lead****: Metallic (elemental) lead and all inorganic lead compounds are defined as "lead". Excluded from this program are all organic lead compounds, such as tetraethyl lead (TEL), which have their own distinct physical, chemical, and toxic properties and exposure control methods.*

4.11 ***Lead-Based Coating:***

4.11.1 Any paint, primer, or coating containing over 0.06% (600 ppm) lead by dry weight when quantified by laboratory analysis.

4.11.2 Any paint, primer, or coating containing over 0.1 milligrams of lead per square centimeter (mg/cm^2) of coating surface when analyzed using a portable XRF.

4.12 ***Manganese (Mn):*** This includes all valence states and compounds. At MPC the most likely sources of manganese are welding and grinding operations.

4.13 ***MPC Occupational Exposure Limits (OEL):*** Marathon's internal OELs inclusive of OSHA PELs, ALs and ceiling limits.

Substance	MPC TWA OEL	OSHA TWA PEL	MPC Ceiling OEL	OSHA Ceiling PEL
Arsenic	0.01 mg/m^3	0.01 mg/m^3	N/A	N/A
Beryllium	0.00005 mg/m^3	0.0002 mg/m^3	0.002 mg/m^3 (STEL)	0.002 mg/m^3 (STEL)
Cadmium	0.005 mg/m^3	0.005 mg/m^3	N/A	N/A
Hexavalent Chromium	0.005 mg/m^3	0.005 mg/m^3	N/A	N/A
Lead	0.05 mg/m^3	0.05 mg/m^3	N/A	N/A
Manganese	0.2 mg/m^3	N/A	5 mg/m^3	5 mg/m^3

4.14 ***N100, R100 and P100 Air Purifying Respirator Cartridges:*** Classifications of HEPA respirator cartridges with respect to resistance to degradation when used in a work environment in the presence of oily dust or mist.

N for ***N****ot* resistant to oil
R for ***R****esistant* to oil
P for oil ***P****roof*

4.15 **Permissible Exposure Limit (PEL)*:*** An 8-hour time weighted average (TWA) airborne exposure limit to a contaminant.

4.16 ***Regulated Areas:*** Work areas where employee exposures may exceed the PEL for a Toxic Metal, or where no previous data exists to indicate levels are less than the PEL.

4.17 ***Time-Weighted Average (TWA):*** An 8-hour average exposure limit of a contaminant.

4.18 ***Toxic Metals:*** For the purposes of this standard, includes Arsenic, Beryllium, Cadmium, Hexavalent Chromium, Lead, and Manganese.

5.0 REQUIREMENTS

5.1 Toxic Metals Determination

5.1.1 Based on the Marathon Exposure Assessment Methodology (EXAM), determine where there is regular or periodic exposure to Toxic Metals and identify where materials containing Toxic Metals are located. Evaluations of potential exposures may be conducted quantitatively and analyzed to ensure statistical validity per the Marathon Exposure Assessment Methodology (EXAM) as described in **HLT-2001**.

5.1.2 Materials are assumed to contain toxic metals until bulk analysis, documentation, or other known resources determine otherwise.

5.1.3 Determination of the Lead Content of a Coating

5.1.3.1 Operations such as abrasive blasting, welding, cutting, burning or soldering on coated surfaces may cause the generation of inorganic lead dust or fumes. Perform an initial hazard assessment, including chemical spot tests (lead check)

and bulk sampling prior to disturbing the surface to determine the amount of lead present in the following situations:

a. Where the potential for exposure to inorganic lead during such operations is unknown (or the lead content is unknown)
b. Where it is unknown if there was a previous coating on the surface
c. Where there is visible scaling or rust.

5.1.3.2 Bulk Sample Collection – Obtain samples from representative areas by scraping an approximately one square inch area of the coating down to the base metal with a sharp chisel. Seal each sample in its own labeled plastic bag or other container that prevents the sample from being contaminated.

5.1.3.3 Laboratory Analysis - An accredited laboratory conducts analyses for lead content using either inductively coupled plasma atomic emission spectroscopy (ICP-AES) or atomic absorption spectroscopy (AAS). Report analytical results in micrograms per grams (microgram/gm) or percent by weight.

5.1.3.4 The use of X-Ray Flourescence (XRF) devices may be used to determine positive lead content but may not be used to determine negative lead content. If results are < 0.1 mg/cm^2, laboratory analysis must be performed to confirm lead content.

5.1.3.5 **Note**: While an initial assessment is preferred, an acceptable alternative is to assume the coating contains a high lead content, establish appropriate engineering and Personal Protective Equipment (PPE) controls, and conduct IH monitoring during the work. The results of the IH monitoring can then be used as baseline data for similar work in the future.

5.2 Exposure Assessments

5.2.1 The Safety Department conducts periodic area and personal monitoring when tasks indicate the disturbance or creation of toxic metal particles or fumes covered by this program. Where exposure control measures are not utilized or historical monitoring data does not exist, the employee will wear the maximum PPE required.

5.2.2 Air monitoring

5.2.2.1 Determine representative employee exposure from breathing zone air samples during operations such as those mentioned in this program.

5.2.2.2 Include collateral operations when monitoring, such as representative monitoring of downwind areas and personnel samples (e.g., abrasive blasting helpers).

5.2.2.3 If monitoring reveals exposures at or above the action level, periodic monitoring must be conducted every six months, as operations permit.

5.2.2.4 If monitoring reveals exposures at or above the PEL, periodic monitoring must be conducted every three months, as operations permit.

5.2.2.5 The employer may discontinue monitoring for respective tasks/operations when monitoring results are below the action level for two consecutive monitoring events taken at least seven days apart.

5.2.2.6 Monitoring must be conducted when there has been any change in process, raw materials, equipment, personnel, work practices, or control methods that may result in new or additional exposures.

5.2.2.7 Send samples to an MPC approved laboratory for analysis by ICP in accordance with NIOSH Sampling and Analytical Method 7300.

5.3 Regulated Areas

5.3.1 Work Area Warning Signs

5.3.1.1 Operating personnel will ensure that proper signs/labeling and barricades, as necessary, are placed at all entrance ways of regulated areas, including temporary regulated areas.

NOTE: This requirement does not apply to Manganese.

5.3.1.2 Signs must state the contaminant, the hazard, that entrance is for authorized personnel only, and the PPE requirements. (Refer to OSHA Standards for specific sign labeling verbiage)

a. Where lead-containing materials are being disturbed, install barricade tape and post warning signs at perimeters of each work area Signs should be worded exactly as follows:

DANGER
LEAD
MAY DAMAGE FERTILITY OR THE UNBORN CHILD
CAUSES DAMAGE TO THE CENTRAL NERVOUS SYSTEM
DO NOT EAT, DRINK, OR SMOKE IN THIS AREA

b. Where a hexavalent chromium regulated area is required by Attachment A, install barricade tape and post warning signs at perimeters of each work area Signs should be worded exactly as follows:

DANGER
HEXAVALENT CHROMIUM
CANCER HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATOR REQUIRED

5.3.1.3 All products, including waste containers, containing hazardous levels of toxic metals must be labeled.

5.3.1.4 Temporary regulated areas will be dismantled, and signs removed at the completion of the work operation.

5.3.1.5 Contaminated PPE must not be worn outside the regulated area.

5.4 Exposure Controls

5.4.1 All MRD Minimum Controls are summarized in RSW-SAF-052-FORM24-DT MRD Specific Minimum Control Measure Requirements for General and Specialty Maintenance.

5.4.2 Less toxic materials should be investigated to substitute for toxic metals, but without compromising the quality or integrity of operations.

5.4.2.1 The use of alternatives to hexavalent chromium-containing materials will be investigated in order to minimize the potential for employee exposure to chromium (VI), without compromising quality or integrity of operations. Alternative welding processes will be used in place of stick welding where practical, such as substituting TIG welding.

5.4.3 In work areas where toxic metals are present, engineering controls and work practices should be used to reduce and maintain employee exposure at or below MPC OELs, except where these controls are not feasible. Even where engineering controls are not adequate to reduce exposures to less than the PEL, they will still be used to reduce exposures to the lowest feasible level.

5.4.3.1 Planning and execution of work with the potential for employee exposure to hexavalent chromium will follow the protocol in Attachment A.

5.4.4 In the interim, when engineering controls are being installed or are not feasible, appropriate personal protective equipment must be used, as described in the personal protective equipment section below.

5.4.5 Dilution ventilation will be used when hot work is taking place inside of confined spaces. See Attachment B for generalized diagrams of how to install ventilation for confined spaces.

5.4.6 If airborne levels of toxic metals exceed MPC OELs, local exhaust ventilation must be used, when feasible, to prevent the accumulation of toxic metal fumes and particulates in the employee's breathing zone.

5.4.6.1 Ventilation will be the primary method used to reduce employee exposure to hexavalent chromium. Local exhaust ventilation is preferred over general ventilation.

5.4.7 Job rotation is prohibited to obtain compliance with respective MPC OELs.

5.4.8 Containment Systems

5.4.8.1 Containment systems are used usually to reduce environmental contamination of lead containing materials by capturing paint particles and used blasting materials. Containment system materials and designs should vary according to conditions at the worksite. Considerations for specifying and selecting containment systems should include the following:

a. Load bearing capacity and integrity of the containment system and of the scaffolding structure.
b. Size and elevation of the structure being abated.
c. Location of the structure.
d. Proximity to other buildings, structures or equipment.
e. Local climate and conditions (e.g., heavy winds, rain, etc.).

5.4.8.2 Refer to Attachment C for additional guidance on which lead paint removal methods may require containment systems.

5.4.8.3 Containment systems tend to increase airborne lead concentrations to workers inside the containment. They should be designed to optimize the flow of ventilation air past the worker, and the worker should remain upstream of the blasting operation if possible.

5.4.8.4 Periodically check mechanical ventilation used to control lead-containing materials for effectiveness.

5.5 Housekeeping

5.5.1 All surfaces must be maintained as free as practical of accumulations of toxic metals. This may include cleaning of dust and debris frequently throughout a project, but at a minimum, it must be conducted daily or at the end of the work shift in which particulates were generated.

5.5.2 Compressed air must NOT be used to cleanup floors and other surfaces where metal particulates accumulate.

5.5.3 Dry shoveling or dry sweeping and brushing can be used only where vacuuming and other equally effective methods have been tried and found to be ineffective.

5.5.4 Vacuums must be equipped with high-efficiency particulate air (HEPA) filters and used and emptied in a manner that minimizes the re-entry of particulates into the atmosphere.

5.6 Personal Protective Equipment

5.6.1 Personal Protective Equipment (PPE) is the least preferred means of controlling exposures but is typically necessary in addition to engineering controls.

5.6.2 Whenever the level of exposure is unknown or the employees will be exposed at or above the PEL, full body disposable coveralls (taped at wrists and ankles), gloves, hood, shoes (or covers), and face/eye protection shall be worn.

5.6.3 Treat used disposable clothing as contaminated waste, keeping contaminated work clothes separate from street clothes.

5.6.4 Safety glasses must be worn at a minimum, unless a full-face respirator provides appropriate eye protection.

5.6.5 When there is a risk of flying debris and particulates, a face shield and safety glasses must be worn.

5.6.6 Goggles or a face shield with safety glasses must be worn when around pressurized water use.

5.6.7 Appropriate welding helmets with tinted lenses must be worn for the respective welding operation.

5.6.8 Contractors supply the same level of protective clothing for their employees.

5.6.9 For further details, refer to RSW-SAF-052-DT Personal Protective Equipment

5.6.10 Respiratory Protection

5.6.10.1 Respiratory protection will be required in accordance with MRD's RSW-SAF-070-DT Respiratory Protection Plan as well as in RSW-SAF-052-FORM24-DT

5.6.10.2 Determine the need for respiratory protection by performing the marathon IH exposure assessment methodology (EXAM) process or similar exposure assessment process on job assignments, routine tasks, or emergency response activities to determine where there is reasonably foreseeable employee exposure to airborne contaminants above the applicable occupational exposure limits (OELs) or potentially immediately dangerous to life or health (IDLH) atmospheres.

5.6.10.3 Use respirators when air monitoring results for lead are above 50 micrograms per cubic meter of air or when the concentration of lead is unknown.

5.6.10.4 For non-routine or new processes/tasks and emergency situations, a minimum of a full-face air purifying respirator with a p100 (HEPA) filter must be used.

5.6.10.5 Higher protection factor respirators may be necessary under some circumstances.

5.6.10.6 Supplied air respiratory protection is required when performing hot work on chromium alloys inside confined spaces.

5.7 Hygiene and Decontamination

5.7.1 Hygiene facilities must be provided and used when exposure exceeds the PEL or MPC adopted limits. Placement of personal decontamination facilities shall be approved by Safety, Operations and Maintenance Departments. These include the use of disposable FR coveralls when exposures exceed the PEL, hand washing facilities, decontamination facilities, and segregated storage of re-useable coveralls with appropriate warning labels.

5.7.2 Personal hygiene practices are an important control measure for protecting workers from exposure to toxic metals. Eating, drinking, chewing gum, the use of tobacco products, and applying cosmetics are not permitted in the regulated area. Employees must wash hands, forearms, and face after completion of job task and prior to eating, drinking, smoking, chewing tobacco or gum, applying cosmetics and using the restroom. Adequate washing facilities should be furnished at the worksite.

5.7.3 Contaminated protective clothing which is to be cleaned, laundered, or disposed of, must be placed in a closed, labeled container to prevent dispersion of lead outside the container.

5.7.4 Employees working in regulated areas or subject to the possibility of skin or eye irritation from toxic metals must shower at the end of the work shift.

5.7.5 Shower facilities must be provided in accordance with OSHA Standard 1910.141(d)(3)

5.7.6 See Attachment C: Hygiene Facilities and Decontamination Procedures

5.8 Waste and Disposal

5.8.1 Toxic metals must be disposed in a manner that minimizes their release and that complies with appropriate regulatory requirements.

5.8.2 Lab results will determine whether a spent material is hazardous or non-hazardous.

5.8.3 Consult with the Environmental Department for appropriate sampling methods and disposal requirements.

5.9 Medical Surveillance

5.9.1 Medical monitoring will be performed on MPC employees in the event of exposure concentrations that are equivalent to or greater than the Action Levels of any toxic metal for more than 30 days per year. This will be done in accordance with HLT-2025 Employee Health Monitoring Standards.

NOTE: This requirement does not apply to Manganese.

5.9.2 Additional monitoring and emergency medical treatment must be conducted for employees that develop signs or symptoms of adverse health effects associated with exposure to any toxic metals.

6.0 TRAINING

6.1 MPC and Contractor employees with the potential for exposure to hazardous levels of any toxic metal compounds must be provided awareness training on hazards associated with toxic metals and the measures established to control exposure.

6.2 Training on toxic metals will consist of, but is not limited to, the following:

6.2.1 The content of the OSHA Lead Standards 29 CFR 1926.62 and 1910.1025.

6.2.2 The content of the OSHA Chromium (VI) Standards, 29 CFR 1910.1026 and 1926.1126.

6.2.3 The content of the OSHA Inorganic Arsenic Standards, 29 CFR 1910.1018 and 1926.1118.

6.2.4 The content of the OSHA Beryllium Standards, 29 CFR 1910.1024

6.2.5 The content of the OSHA Cadmium Standards, 29 CFR 1910.1027

6.2.6 Hazard Communications 29 CFR 1910.1200

6.2.7 Specific nature of operations that could result in exposure to toxic metals above the OSHA Action Level.

6.2.8 Respiratory Protection requirements.

6.2.9 Engineering controls and good work practices associated with the job assignment.

6.2.10 The right to access records under 29 CFR 1910.1020, Access to Employee Exposure and Medical Records.

6.2.11 All materials relating to the training programs and a copy of the standard will be made readily available to all employees.

7.0 RECORDKEEPING

7.1 Recordkeeping

7.1.1 The Safety Department will establish and maintain an accurate record of all monitoring and other data used to conduct employee exposure assessments as required by and OSHA 29 CFR 1910.1020 Access to Employee Exposure and Medical Records standard.

7.1.2 Contractors are also required to maintain records of all employee monitoring and other data used for the exposure assessment.

8.0 REFERENCES

8.1 OSHA 29 CFR 1910.1026, Chromium (VI) General Industry

8.2 29 CFR 1926.1126, Chromium (VI) Construction

8.3 OSHA 29 CFR 1910.1018 and 29 CFR 1926.1118, Inorganic Arsenic

8.4 OSHA 29 CFR 1910.1025, Lead General Industry

8.5 29 CFR 1926.62, Lead Construction

8.6 OSHA 29 CFR 1910.1024, Beryllium

8.7 OSHA 29 CFR 1910.1027, Cadmium

8.8 OSHA 29 CFR 1910.1020, Access to Employee Exposure and Medical Records

8.9 OSHA 29 CFR 1910.1200, Hazard Communication

8.10 MRD Hazardous Communication Program

8.11 MRD Respiratory Protection Plan

8.12 MRD Industrial Hygiene Program

8.13 HLT-2017 Toxic Metals Exposure Control Program

9.0 REVISION HISTORY

Revision #	Description of change	Written by	Checked by	Effective date
0	Complete re-write to combine RSW-SAF-014-DT (Lead Abatement) and RSW-SAF-036-DT (Hexavalent Chromium Standard) and to include other toxic metals such as Beryllium, Cadmium, Arsenic, and Manganese.	A. Styes	A. Morales	09/01/2021

10.0 ATTACHEMENTS

10.1 Attachment A: Hexavalent Chromium Exposure Determination

10.2 Attachment B: Vessel Ventilation Using General Ventilation

10.3 Attachment C: Hygiene Facilities and Decontamination Procedures

10.4 Attachment D – Lead Paint Removal Methods

10.5 Attachment E: API Welding Metals Characterization Form

10.6 Attachment F: Planning Work That May Contain Toxic Metals

Attachment A: Hexavalent Chromium Exposure Determination

Hexavalent Chromium Exposure Determination

Site	Date	Area	Description
Unit #		**Equipment #**	
			Toxic
Fire Work Method: Select only ONE below			
	Score	**Fume Level**	**Fire Work Process**
☐	9	High Fume Producing	Stick Welding, Arc Gouging, Torch Cutting
☐	3	Medium Fume Producing	MIG Welding, Plasma Cutting, Grinding
☐	1	Low Fume Producing	TIG Welding
Chrome Content (refer to attached Cr content table): Select only ONE below			
	Score	**Chrome Content**	**Percentage of Chrome in Base Metal or Filler rod/wire**
☐	9	High Chrome Content	17%
☐	3	Medium Chrome Content	9% - 17%
☐	1	Low Chrome Content	0.5% - 9%
☐	-5	Very Low Chrome Content	Less than 0.5% Chrome (Carbon Steel, Galvanized, Ductile Iron)
Work Area: Select only ONE below			
	Score	**Type of Space**	**Description**
☐	9	Confined Space	Includes all small confined spaces. For large confined spaces consult the IH for determination
☐	3	Semi- Enclosed	Includes Weld Bays, Spark Enclosures and Indoor Shops without local exhaust ventilation
☐	1	Open Air Location	Includes only open air welding without any barriers (i.e. no fire blanket or other such materials that may block air flow.)
Duration Per Shift (Time spent actually performing fire work, not to be used as a job rotation schedule)			
	Score	**Type of Shift**	**Description**
☐	4	Long (Full Shift)	More than 6 hours of actual time creating emission (striking a weld, etc.)
☐	2	Moderate (Half Shift)	Between 4 and 6 hours of actual fire work
☐	1	Short	Between 2 and 4 hours of actual fire work
☐	-1	Very Short	Less than 2 hours of actual fire work
Ventilation (Subtract from total score)			
	Score	**Type of Ventilation**	**Description**
☐	-8	Local Exhaust Ventilation	Local Ventilation that captures the point source of the emission
☐	-4	Dilution Ventilation	General dilution ventilation (i.e. Copus Blower, Air Horn)
☐	0	N/A	No other ventilation used
Total Score		**See Description of compliance method based on score.**	
		The use of monitoring data may override this determination as it may provide additional data.	

Chrome Content Table

High Chrome Content > 17%			
Material Type	**Chrome Contents (%)**	**Material Type**	**Chrome Contents (%)**
304/304L (ss)	18.0 - 20.0	Alloy 20	19.0 - 21.0
308 (ss)	19.0 - 21.0	AL-6X (ss)	20.0 - 22.0
309 (ss)	22.0 - 24.0	Nitronic 50	20.5 – 23.5
310 (ss)	24.0 - 26.0	Nitronic 60	
316/316L (ss)	16.0 - 18.0	Diplex 2205 (ss)	
317/317L (ss)	18.0 - 20.0	Alloy 800/800H	19.0 – 23.0
321 (ss)	17.0 - 19.0	Inconel 625	20.0 – 23.0
347 (ss)	17.0 - 19.0	Alloy 825	19.5 - 23.0
904L (ss)	19.0 - 23.0		

Medium Chrome Content: > 9 - 17%	
Material Type	**Chrome Contents (%)**
9 Cr	8.0 - 10.0
405 Stainless (ss)	11.5 - 14.5
410/410S (ss)	11.5 - 13.0
17-4 PH (ss)	15.5 - 17.5
Alloy 600	14.0 - 17.0
Alloy C-276	14.5 - 16.5

Low Chrome Content: 0.5 - 9%	
Material Type	**Chrome Contents (%)**
1 Cr	0.8 - 1.25
1 1/4 Cr	1.0 - 1.5
2 1/4 Cr	1.9 - 2.6

Welding Filler Material Not Included Already	
Material Type	**Chrome Contents (%)**
Inconel 117 Electrode	21.0 - 26.0
Inconel 617	20.0 - 24.0
Inconel 82	20.0 Average
Inconel 182	14.0 Average
Inconel A	15.0 Average
Inconel 112	21.5 Average

*Welding operations chrome content is determined from consumable electrode.

*Cutting operations chrome content is determined from base metal.

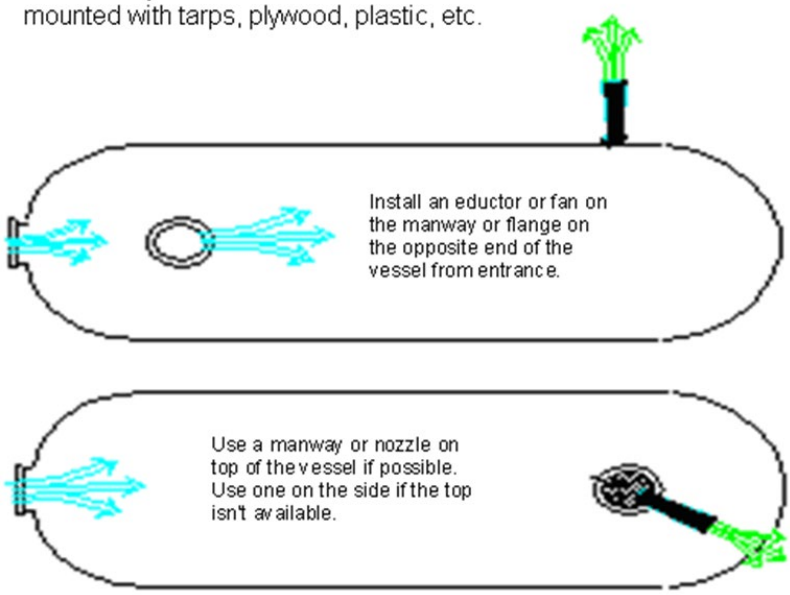
Controls Required

	Regulated Tasks or "Hot Zones"	**CrVI Controlled Tasks**	**Conditional Tasks**
Total Score	**≥ 19**	**10 - 18**	**4 - 9**
Respiratory Protection	**A minimum of a P100, or HEPA, ½ mask Air Purifying Respirator (APR).** Higher protection factor respirators may be needed in some other instances. **Persons performing alloy fire work inside a confined space shall wear supplied air respiratory protection.** Consideration for respiratory protection shall be given to individuals working in proximity of alloy fire work. Contact the IH for assistance.	A minimum of a P100, or HEPA, ½ mask Air Purifying Respirator (APR). Higher protection factor respirators may be needed in some other instances. Persons performing alloy fire work inside a confined space may need to wear supplied air respiratory protection. Hexavalent Chromium concentration alone is unlikely to require supplied air respirators under these circumstances, but other hazards as defined by the permit may warrant use of supplied air respiratory protection. Consideration for respiratory protection shall be given to individuals working in proximity of alloy fire work. Contact the IH for assistance	
Outer Clothing	Workers performing fire work must wear an outer layer of clothing, or other protective suit, that is properly decontaminated or discarded after each shift, before taking a break or at the end of the job; whichever comes sooner.		
Hygiene	Hand and face washing facilities are to be readily available. Workers shall not eat, drink, smoke or use smokeless tobacco until after decontaminating the outer layer of clothing and washing their hands and face.	Workers shall not eat, drink, smoke or use smokeless tobacco in area.	
Decontamination	All contaminated materials that are not cleaned shall be bagged and sealed, and labeled with a "Hexavalent Chromium" warning label either for waste or laundry service. All surfaces should be maintained as free as practical of Cr+6 accumulations. Wet or HEPA methods should be utilized for decon. Compressed air blowing shall not be used. Areas that do not need to be decontaminated include: confined spaces that will return to process service and open air locations such as pipe racks, gravel areas, etc.		
Employee Awareness	Training required for all personnel participating in all work		
Exposure Monitoring	Contact the Industrial Hygienist for sampling advice and scheduling.	Representative sampling should be performed on alloy work greater than 2 hours in length total fume producing time. For carbon steel, monitoring should be considered for further evaluation, contact site Industrial Hygienist for guidance.	

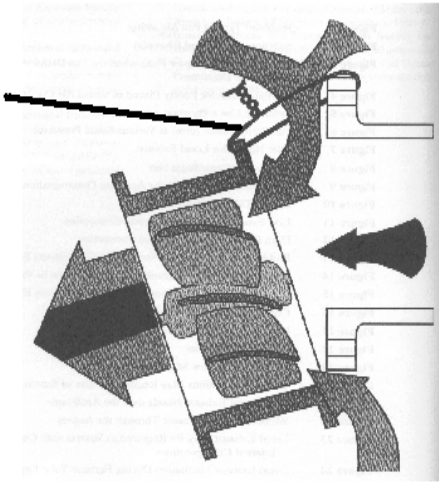
NOTE: For Total Scores ≤ 3 there are no additional control measures required beyond standard fire work protocols and prudent personal hygiene methods.

Attachment B: Vessel Ventilation Using General Ventilation

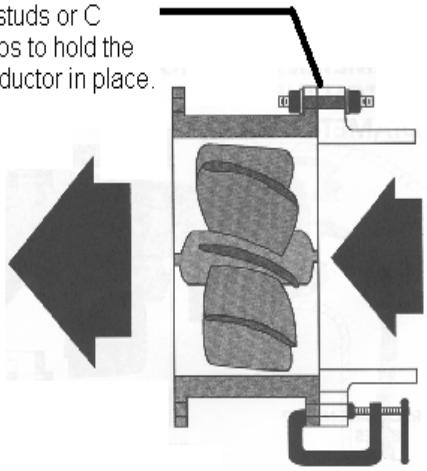
Install fans or eductors (air horns) to draw fresh air through the vessel. Seal extra openings at the manway/nozzle where the fan or eductor is mounted with tarps, plywood, plastic, etc.

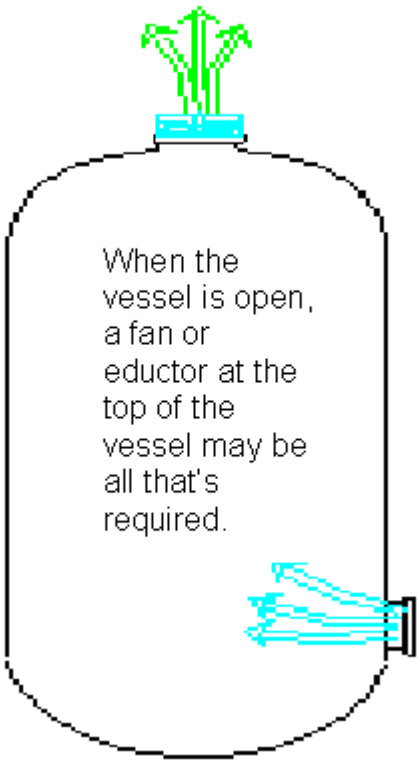


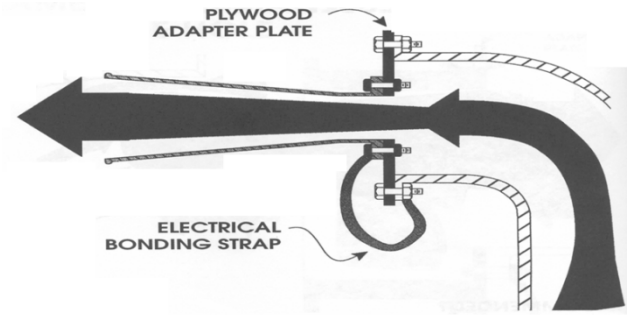
Do not allow any gaps between the fan/eductor and the nozzle/manway

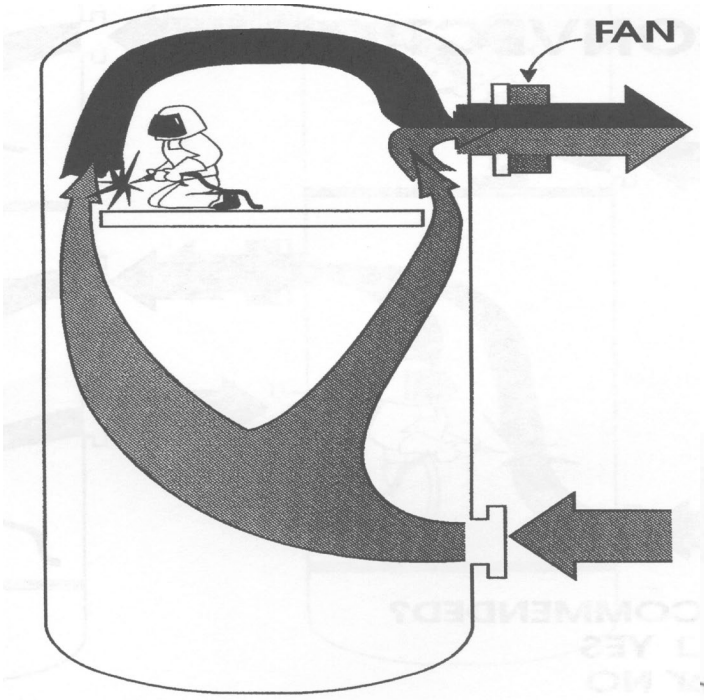


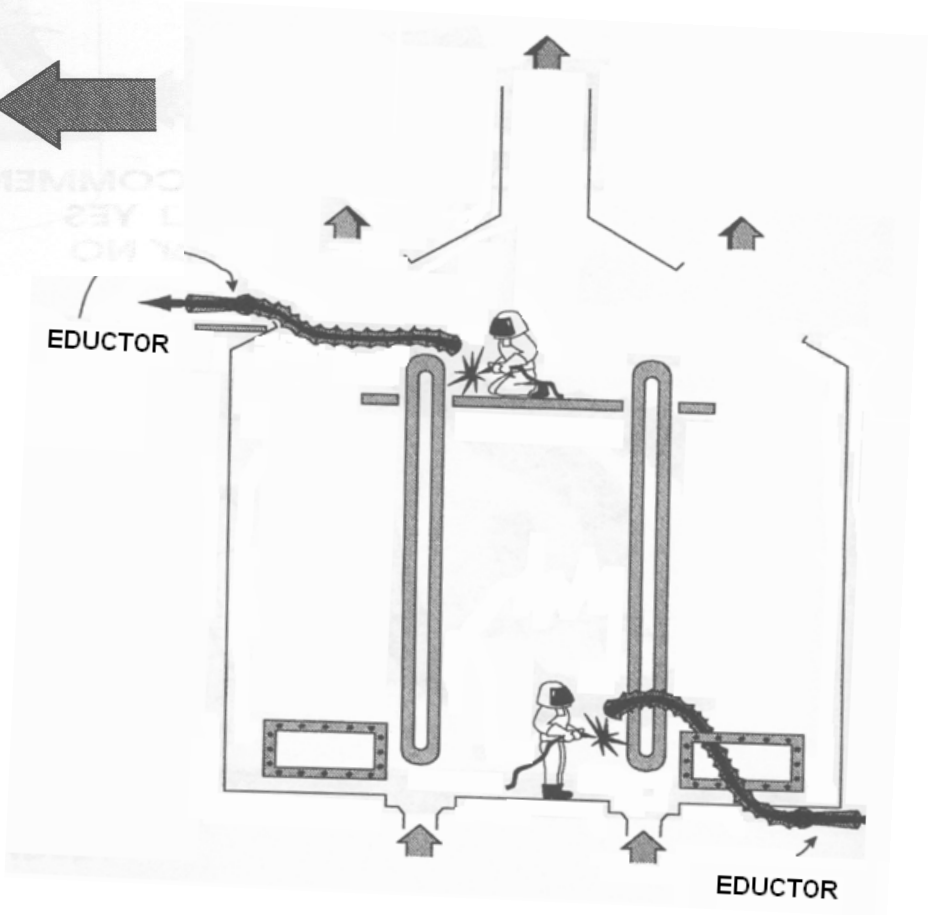
Use studs or C clamps to hold the fan/eductor in place.

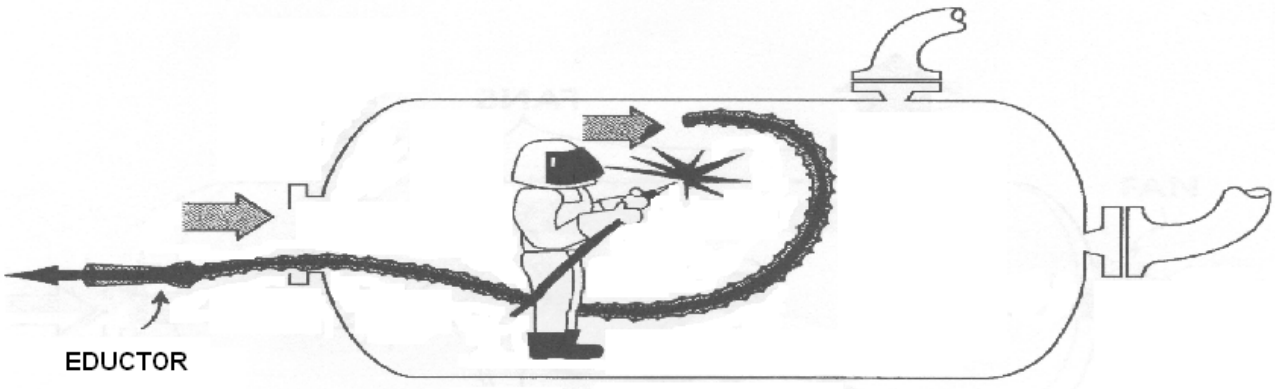












Attachment C: Hygiene Facilities and Decontamination Procedures

MPC and contractor employers will establish hygiene facilities and a decontamination plan for employees who work at regulated tasks using the following guideline or a similar method.

1. Employees who enter a regulated area will use disposable coverall on top of FR garments.

2. As employees leave the regulated area, they will immediately go to a decontamination (decon) area that will be placed nearby at a convenient location.

3. The decon area will include a wet or dry HEPA vacuum, waste disposal containers such as garbage bags or trash cans, and signs indicating it is a decon area. The waste disposal containers must bear labels. The area must be sized and equipped such that all persons who need to use the facility can do so without unreasonable delays. Employers will ensure the decon area is well maintained (timely trash disposal, adequate supplies, etc.).

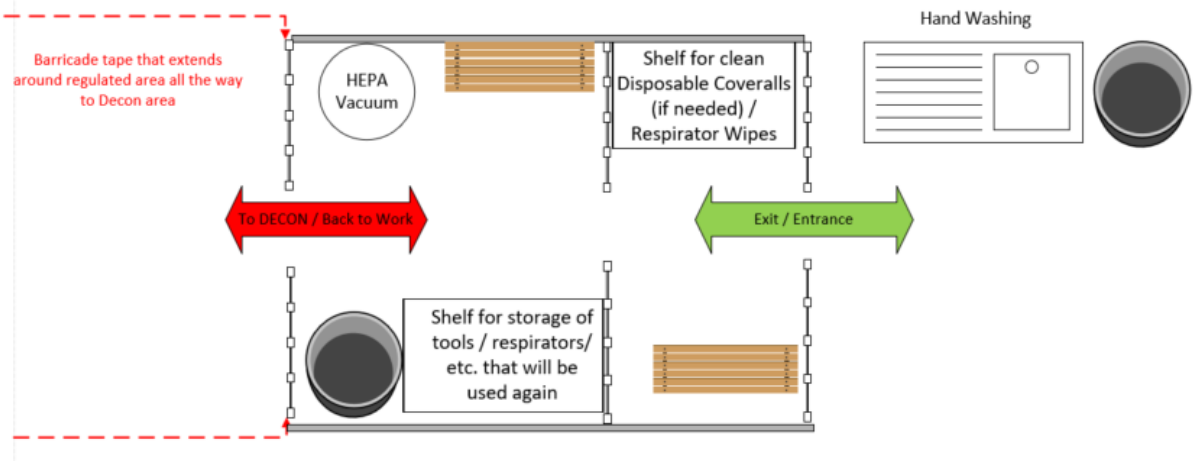
4. Employees will first vacuum their disposable coveralls and then remove them and place them in the waste disposal containers. They will then move to a nearby clean area and remove their respirator. Respirators should be stored in areas where they will not receive additional contamination and will not be damaged, such as by weather or other work activities.

5. Employees will immediately go to wash station and wash their faces and hands with soap and water. The suspected contaminated water from the wash area will be collected and treated or disposed of according to facility policy.

6. Upon exiting the wash station, the employee may resume normal duties such as eating lunch, taking a break or using the toilet.

7. Employees returning to work in regulated areas should don clean disposable coveralls and resuming using a respirator. If necessary, the inside of the respirator may be cleaned before the employee dons it again.

The ideal set up for a decon area is as follows:



If space doesn't allow for this type of set up, work with your safety representative to ensure all requirements are met.

Attachment D: Lead Paint Removal Methods

REMOVAL METHOD	QUALITY OF FINISH	DUST/WASTE GENERATION	ENGINEERING CONTROLS
Abrasive blasting with Expendable Abrasive	Excellent	Substantial dust High volume waste	A
Abrasive blasting with Recyclable Abrasive	Excellent	Moderate dust Low volume waste	B
Vacuum Abrasive Blasting	Excellent	Some dust Low volume waste	C
Wet Abrasive Blasting	Excellent	Low dust High volume waste	D
High Pressure Water Jetting	Poor	Low dust Moderate waste	D
High Pressure Water Jetting with Abrasive Injection	Good	Low dust Moderate waste	D
Hand Tool Cleaning	Poor	Low dust Low volume waste	E
Power Tool Cleaning	Fair	Moderate dust Low volume waste	E
Chemical Stripping	Fair	No dust Moderate waste	F

ENGINEERING CONTROLS

A Containments are constructed to contain the dust and paint debris. Containments typically have completely sealed seams and ground covers. Mechanical ventilation and dust collection equipment are required.

B Fully sealed containments are employed to contain dust and abrasive for re-use. The enclosure must be weather-tight to prevent the high steel content abrasive from rusting. Mechanical ventilation and dust collection equipment is required.

C Minimal containment required. Some dust may escape if nozzle assembly is not held tightly to the surface or if surface is irregular. An elaborate ventilation system is not necessary.

D Enclosure are constructed to contain the abrasive, paint debris, and water. Containment need not be air-tight because of minimal dust generation but must be equipped with a means for collecting and recycling the water.

E Minimal containment required. Screens or tarps are used to isolate the work area. Ground covers are used to collect paint debris.

F Containment usually not required for removal of the stripper, but a means for collecting water during flushing/scrubbing stages should be utilized.