



SECTION 35

HEXAVALENT CHROMIUM – CHROMIUM VI PROGRAM



1. **REGULATORY STANDARD:** OSHA - 29 CFR 1910.1026 & 1926.1126

Purpose: The purpose of this program outlines the requirements that Maul Electric, Inc employees and subcontractors must comply with when implementing a program to evaluate and control worker exposure to hexavalent chromium (Cr VI).

The program provides information and the process to follow to recognize, evaluate, and control employee exposure to Cr VI at Maul Electric, Inc., project locations.

References:

- Occupational Exposure to Hexavalent Chromium – Federal Register Number 71:10099-10385, U.S. Department of Labor, Final Rule, 29 CFR 1910.1026 and 29 CFR 1926.1126, Chromium VI
- U.S. Department of Labor, Occupational Safety and Health Administration (OSHA), Final Rule, 29 CFR 1910.1026, and 29 CFR 1926.1126, Chromium VI

2. **SCOPE AND APPLICATION**

This program applies enterprise-wide to call Maul Electric, Inc, legal entities their employees, subcontractors, and lower-tier subcontractors that operate in the United States.

Where states OSHA agencies may have more stringent requirements, contact the appropriate Health and Safety Lead to address these specific requirements.

This program applies when employees may be exposed to Cr VI due to the following activities:

- Maul Electric, Inc employees who may be exposed to Cr VI when performing hot work such as welding on stainless steel or Cr VI painted surfaces, traffic painting or paint removal containing Cr VI, refractory brick restoration, or soil disturbance activities such as drilling or from heavy equipment moving on soils containing Cr VI soils.
- Maul Electric, Inc workers who may be exposed to Cr VI when working at project sites or in proximity to Cr VI related operations such as electroplating, painting (aerospace and autobody repair), chromate pigment and chemical production, chromium dye and catalyst production, glass manufacturing, or plastic colorant production. (Maul Electric, Inc., subcontractor, or third-party contractor employees)
- Maul Electric, Inc provides oversight of subcontractor's activities where worker exposure to Cr VI can occur.



2.1 Applicable Enterprise Programs

Other programs that may be applicable to worker exposure to Cr VI include the following:

- Abrasive blasting on surfaces containing Chromium VI creating airborne dispersion of Chromium VI compounds and resulting in worker exposure
- Contracts, subcontracts, and HSE management practices for subcontractor workers who perform tasks that could result in exposure to Cr VI
- Operations or tasks involving exposure to Cr VI in confined spaces
- Worker decontamination when Cr VI materials may adhere to workers' skin or clothing or to personal protective equipment worn by them
- Disposal of personal protective equipment (PPE) or other debris contaminated by chromium compounds
- Demolition where materials containing Cr VI could become airborne and present a potential worker exposure
- Exposure assessment for employee exposure to Cr VI
- Medical monitoring and access to records for employees exposed to Cr VI
- Wearing respiratory protection as a control measure to minimize employee exposure to Cr VI acceptable concentrations
- Employee training on the hazards and exposure prevention measures to Cr VI

3. DEFINITIONS

3.1 Action Level (AL)

The action level for implementation of this program is a concentration of airborne Cr VI of 2.5 micrograms per cubic meter ($2.5\mu\text{g}/\text{m}^3$) of air calculated as an 8-hour time-weighted average (TWA).

3.2 Chromium VI or Hexavalent Chrome

Chromium with a valence of positive six, in any form and in any compound.



3.3 Emergency Release

Any activity that results or is likely to result in an uncontrolled release of Cr VI. If an incidental release of Cr VI (measured at or below the Permissible Exposure Limit) can be controlled at the time of release by workers in the immediate release area, it is not an emergency.

3.4 Worker Exposure

The exposure to airborne Cr VI that would occur if the worker was not using respiratory protection.

3.5 High-Efficiency Particulate (HEPA) Filter

Filter that is at least 99.97 percent (%) efficient in removing mono-dispersed particles of 0.3 micrometers (μg) in diameter or larger.

3.6 Historical Monitoring Data

Hexavalent chromium exposure assessment monitoring conducted prior to May 30, 2006, obtained during work operations conducted under workplace conditions closely resembling the processes, types of material, control methods, work practices, and environmental conditions in the employer's current operations.

3.7 Objective Data

Information such as air monitoring data from industry-wide surveys or calculations based on the composition or chemical and physical properties of a substance demonstrating the worker exposure to Cr VI associated with a particular product or material or a specific process, operation, or activity. The data must reflect workplace conditions closely resembling the processes, types of material, control methods, work practices, and environmental conditions in the employer's current operations.

3.8 Permissible Exposure Limit (PEL)

The level of worker exposure to an airborne concentration of Cr VI, without regard to the use of respirators, at 5 micrograms per cubic meter of air ($5 \mu\text{g}/\text{m}^3$) calculated as an 8-hour time-weighted average (TWA) that cannot be exceeded.

4. ROLES AND RESPONSIBILITIES

The following sections outline the roles and responsibilities for individuals when applying this program.

4.1 Health & Safety Leads

Health and Safety (H&S) Leads are responsible for assisting Project Managers in implementing this program for all projects where there is a potential for worker exposure to Cr VI. The H&S Lead has the authority to approve deviations from this standard to accommodate additional domestic and international requirements.



4.2 Project Manager

The Maul Electric, Inc project manager (PM) is responsible for implementing this procedure and providing adequate resources (budget and staff) for project-specific implementation of the H&S management process on projects where there is a potential for worker exposure to Cr VI. The PM has overall H&S management responsibility, but may delegate specific tasks to other project staff. The PM retains ultimate H&S responsibility for the project.

4.3 Site Manager

The Maul Electric, Inc on-site manager is responsible for all field operations onsite and is typically the Construction Manager (CM), Site Superintendent, Site Supervisor, or Field Team Leader. The Site Manager is directly responsible for implementing all aspects of the project H&S plan and applicable requirements of this program.

4.4 Health & Safety Manager (HSM)

The Responsible Health & Safety Manager is the HSM is to provide health and safety technical guidance and support to the project. The HSM prepares and /or approves the Maul Electric, Inc., project H&S plan, develops the Cr VI sampling plan, conducts the personal protective equipment (PPE) evaluation for skin, eye, and respiratory hazards to Cr VI, reviews subcontractor H&S plans and submittals, conducts project H&S audits, and provides H&S support and guidance to the project.

4.5 Site Safety Coordinator (SSC)

The Site Safety Coordinator is either the Site Manager or is someone designated by the Site Manager to implement the project H&S plan. The Site Safety Coordinator ensures that the appropriate elements of this program are implemented.

5. REQUIREMENTS

The following requirements outline the mandatory criteria that each Maul Electric, Inc., employee must comply with when implementing this program using their policies, procedures, processes, training, and contracting documents.

5.1 Subcontractor Management

Subcontractor H&S responsibilities are expressly defined through the subcontract terms and conditions. Subcontractors must determine how to conduct their operations, in compliance with applicable H&S regulations and industry standards, and how to correct deficiencies. Maul Electric, Inc., employees shall not direct the means and methods of subcontractor operations.

Subcontractors are responsible and accountable for implementing these requirements and any additional requirements established in their own health and safety procedures as described in Maul Electric, Inc Health & Safety Program, Contracts, Subcontracts, and HSE&Q Practices. Subcontractors retain control over their practices, and Maul Electric, Inc oversight does not relieve them of their own responsibility for effective implementation and enforcement of H&S requirements.



The “Subcontractor Health and Safety Procedure Criteria – Cr VI” provides the minimum criteria for these safety procedures. These criteria may be used by the H&S staff to review submitted subcontractor safety procedures when Maul Electric, Inc., is performing oversight of subcontractor’s operations.

5.2 Exposure Determination

- Initial exposure monitoring must be conducted to document worker breathing-zone exposures over the course of a full shift. A representative 8-hour TWA sample shall be collected to determine employee exposure for each job classification in each work area.
- Air monitoring will be performed at the beginning of each job task.
- Exposure determinations must follow the current, accepted sampling and analytical method equivalent to that used by OSHA.
- Sample media used for Cr VI monitoring will be analyzed using an industrial hygiene laboratory accredited by the American Industrial Hygiene Association (AIHA). An equivalent laboratory accreditation can be substituted in countries that do not have an AIHA-accredited industrial hygiene laboratory.
- Periodic monitoring of workers is required at least every 6 months when the initial monitoring indicates TWA results are equal to or greater than the Action Level (AL) but below the Permissible Exposure Limit (PEL).
- When initial monitoring results are greater than the PEL, additional periodic monitoring, at least quarterly, for each worker involved is required.
- Periodic monitoring every 6 months or quarterly may be halted when two consecutive samples taken at least 7 days apart are equal to or below the AL.
- When monitoring results fall below the AL, monitoring may be suspended.
- Additional monitoring is required when there has been a change in production process, control equipment, personnel, or work practices that may result in new or additional exposures.
- A performance-oriented option may be used to determine the initial 8-hour TWA exposure for each worker on the basis of any combination of air monitoring data, historical monitoring data, or objective data sufficient to accurately characterize exposure to Cr VI.
- Workers shall be informed in writing of exposure monitoring results within 5 working days after receipt of the results.



- When the PEL has been exceeded, notification to the affected worker shall include the control measures utilized to reduce the exposure to below the PEL.

5.3 Demarcation of Regulated Areas

Work areas where worker exposure to Cr VI is or can reasonably be expected to exceed the OSHA PEL must be demarcated and access limited to only workers authorized to enter.

5.4 Methods of Compliance

Engineering and work practice controls must be applied to reduce the Cr VI worker exposure level to below the OSHA PEL unless it can be demonstrated that such controls are not feasible. Rotating employees to different jobs shall not be used to achieve compliance with the PEL. Methods of compliance in the hierarchy of controls include the following:

- Substitution – gas tungsten arc welding (GTAW) instead of shielded metal arc welding (SMAW) or flux cored arc welding (FCAW)
- Engineering controls – mechanical ventilation to remove fumes from the breathing zone
- Administrative controls – safe work practices for the worker on proper positioning to minimize fume trail in their breathing zone, either through positioning upwind in an open area or in proper alignment with ventilation controls
- Personal protective equipment (PPE) – use of respiratory protection as the last resort in reducing exposure or as an interim measure until substitution can be applied or engineering controls installed.

5.5 Respiratory Protection

Respiratory protection will be provided by the employer and worn by the worker sufficient to reduce the exposure to below the Cr VI action level. Respiratory protection will be used only as a last resort to ensure that worker exposure to Cr VI is maintained below the action level, or as an interim measure while applying substitution of materials or processes, implementation of work practice controls, or installation of mechanical ventilation. When employee exposures are above the PEL for no more than 30 days per year (12 consecutive months) from a particular process or task, respiratory protection can be primarily relied upon to ensure employee exposure is maintained below the PEL.

The elements of the respiratory protection program must comply with the Maul Electric, Inc Respiratory Protection, and 29 CFR 1910.134, Respiratory Protection. Key elements for an appropriate respiratory protection program include the following:

- Exposure assessment to determine the appropriate respiratory protection to be selected with the required protection factor and fit factor
- Medical surveillance for workers to determine their ability to wear respiratory protection



- Fit testing of workers to identify which model and type of respiratory protection can be worn
- Training workers on the how to wear, use, clean and maintain their respiratory protection equipment
- Respirator cartridge change-out guidelines for workers
- Periodic evaluation of the respiratory protection program by the assigned H&S representation

5.6 Personal Protective Equipment (PPE) and Work Clothing

Personal protective equipment and work clothing shall be provided to workers where an eye or skin hazard may exist to Cr VI at no cost to them. The elements of the PPE and work clothing program must comply with the Maul Electric, Inc., Personal Protective Equipment, and 29 CFR 1910.132, General Requirements for Personal Protective Equipment, and 29 CFR 1910.133, Eye and Face Protection. Key elements for an appropriate protective work clothing program include the following:

- Evaluation by the HSM of work tasks to identify the appropriate type of PPE and work clothing
- Providing the appropriate PPE and work clothing in a variety of sizes and styles
- Training workers on wearing, using, cleaning, and maintaining PPE and work clothing
- Ensuring that workers do not remove contaminated PPE or work clothing from the worksite
- Providing a service to launder reusable work clothing
- Repair or replace as needed

5.7 Hygiene Areas and Practices

Where work clothing is required to be worn in place of street clothing to prevent skin exposure to Cr VI, change rooms and washing facilities must be provided. Change rooms must include separate storage facilities for work clothing and for street clothes. Washing facilities must be readily accessible to workers and must be used by them at the end of the work shift and prior to eating, drinking, smoking, chewing tobacco or gum, applying cosmetics, or using the toilet.

An area on the worksite must be designated to be free of Cr VI for workers to consume food or beverages.



5.8 General Work Practices and Housekeeping

Work areas or project sites where Cr VI can potentially expose workers must implement and follow work practices to maintain acceptable housekeeping conditions to minimize contact or exposure. General work practices and housekeeping must include the following:

- All surfaces must be maintained as clean as practicable to minimize accumulation of Cr VI containing substances, dust or particles
- All spills and releases of Cr VI containing material must be cleaned up promptly
- Surfaces contaminated with Cr VI must be cleaned with HEPA-filter vacuuming or equivalent methods or practices that minimize the potential for worker exposure
- Avoid using compressed-air, dry-shoveling, dry sweeping, or dry brushing, and use only when a HEPA-filter vacuum system or equivalent method has been tried and found to be not effective
- Collection of waste, scrap, debris, or other materials contaminated or containing Cr VI must be in impermeable containers or bags and labeled meeting hazard communication requirements described in Maul Electric, Inc., Hazard Communication, or 29 CFR 1910.1200, Hazard Communication.
- Waste containing significant amounts of chromium may be subject to hazardous waste regulations and the corresponding generation, treatment and disposal requirements.

5.9 Medical Surveillance

Workers who are or will be potentially exposed to airborne Cr VI above the action level for at least 30 days per year, without regard to respirator use, will participate in their employer's Cr VI medical surveillance program.

Further participation in periodic Cr VI medical surveillance will be based on exposure conditions (such as an emergency or when a worker shows signs or symptoms of exposure), annually, or within a specified frequency determined by the company consulting physician (or equivalent), and at termination of employment.

Subcontractors are responsible for their workers receiving medical surveillance for Cr VI as required by regulatory requirements, contract, or their own company's requirements.

5.10 Communication of Hazards

Information concerning Cr VI hazards will be communicated according to the requirements of the OSHA Hazard Communications Standard and the OSHA Cr VI Standard including, but not limited to, the requirements concerning warning signs and labels, material safety data sheets (MSDSs), and employee information and training.

The entrance to regulated areas must be posted with signs that read "CHROMIUM VI REGULATED AREA – AUTHORIZED PERSONNEL ONLY".



In addition to the posting requirements, owners, contractors, and other personnel working in the area must be notified.

All storage or shipping containers shall be labeled with the following “Danger – Contains Cr VI – Cancer Hazard – Harmful if Inhaled or Swallowed – Use Only with Adequate Ventilation or Respiratory Protection”.

A copy of this program and the OSHA Cr VI Standards (General Industry and Construction) will be made available to all affected project workers.

Additional communication requirements are described in Section 6.0 Training Requirements.

6. TRAINING REQUIREMENTS

Workers who may be exposed to airborne Cr VI above the action level or anticipate working on projects where they could be exposed to airborne Cr VI above the action level, or to soil that contains elevated levels of Cr VI, must complete initial Cr VI exposure training. This training covers the following information:

- Where Cr VI is typically encountered at Maul Electric, Inc projects
- The regulatory requirements, exposure limits, potential hazards including toxicity and physical characteristics, and medical monitoring requirements
- For site-specific Cr VI hazards, discussion on the location and tasks associated with potential exposure and associated control measures
- Information contained in the site-specific Health, Safety, and Environmental Protection Plan or Job Hazard Analysis created for the project
- Quantity, location, manner of use, storage, sources of exposure, and the specific nature of operations that could result in exposure to Cr VI, as well as any necessary protective steps
- Purpose, proper use, and limitation of respirators
- Purpose and a description of the medical surveillance program
- Engineering controls and work practices associated with the employee’s job assignment
- A review of this program

Each worker must be provided with a copy of the OSHA Chromium Standard (General Industry and/or Construction) and appendices if requested.



Subcontractors are responsible for complying with all applicable training requirements relating to Cr VI exposure and for providing the training necessary to complete their tasks safely.

Maul Electric, Inc will provide initial training prior to or at each initial assignment. Maul Electric, Inc will ensure the training is understandable and ensure each employee can demonstrate knowledge of the health hazards associated with Cr VI exposure, location, manner of use, and release of chromium in the workplace; engineering controls and work practice controls; purpose, proper selection, fitting, proper use and limitations of respirators and protective clothing; emergency procedures; measures employees can take to protect themselves from exposure; purpose and description of medical surveillance program; contents of the standard. Maul Electric, Inc will have readily available without cost to all affected employees.

Maul Electric, Inc will document all employee training.

7. RECORDKEEPING

An accurate record of all worker personal air sampling and other air monitoring related to determining Cr VI exposure for Maul Electric, Inc employees must be completed and maintained that includes the following:

- Industrial hygiene sampling surveys
- Specific information on the sample date, worker(s) sampled, job classification, process or task sampled, materials used, PPE worn, sample duration, air sampling, and analytical method

For historical monitoring data, an accurate record of the determination must include the following information:

- Confirmation that the data was collected using acceptable sampling and analytical methods
- Description of the process that matches the task, conditions, materials, equipment, and process for which the exposure is being determined

For objective data, an accurate record of information that is relied upon to determine worker exposure must include the following information:

- The type of chromium-containing material
- Description of the process, activity or operation
- Other relevant information used to support a comparable exposure assessment



Health & Safety Policy and Procedures Manual

Exposure assessment records related to Cr VI, including worker personal air sampling, historical monitoring data, and objective data must be maintained for a minimum of thirty (30) years. Copies of exposure assessment records for Maul Electric, Inc., employees are to be forwarded to the Maul Electric, Inc HR Manager.

Medical monitoring records related to Cr VI must be maintained for each employee for thirty (30) years beyond their duration of employment. Medical monitoring records will be retained in the employee's medical file and maintained by the Maul Electric, Inc., occupational health care provider.



Cr VI FACT SHEET

Uses and Occurrences

Chromium is a naturally occurring element in rocks, animals, plants, soil and volcanic gases. Chromium occurs in the environment predominantly in one of two valence states:

- Trivalent (Cr III), which occurs naturally and is an essential nutrient, and
- Hexavalent chromium (Cr VI), which, along with the less common metallic chromium (Cr 0), is most commonly produced in plating processes

The major industrial sources of Cr VI compounds are chromate pigments in dyes, paints, inks, and plastics; chromates added as anti-corrosive agents to paints, primer, and other surface coatings; chrome plating by depositing chromium metal onto an item's surface using a solution of chromic acid; particles released during smelting of ferro-chromium ore; fumes from welding stainless steel or nonferrous chromium alloys; and as an impurity in Portland cement.

Physical Characteristics

Appearance:	Dark red flakes or powder
Odor:	None
Flammable:	Non-combustible, solid, but will accelerate the burning of combustible materials
Flash Point:	None
Flammable Range:	None
Specific Gravity:	2.7 for Cr VI
Stability:	Stable
Incompatibilities:	Reducing and oxidizing agents, acetic acid
Melting point:	1907°C or 3465°F for Cr
Boiling point:	2671°C or 4840°F for Cr



Signs and Symptoms of Exposure

Short term (Acute): Coughing, sneezing, chest pain, breathing difficulty, itching and burning sensation to skin and lungs.

Long term (Chronic): Allergic (asthma like symptoms) respiratory reaction, skin and eye irritation, nosebleeds, contact dermatitis, allergic like skin reaction, ulceration and perforation of the nasal septum

Modes of Exposure

Inhalation: Dusts and fumes

Skin Absorption: Liquid

Ingestion: Dusts and liquids

Exposure Limits

Action level: 2.5 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$)

PEL: 5 $\mu\text{g}/\text{m}^3$

STEL: None

TLV: 5 $\mu\text{g}/\text{m}^3$

Exposure Level vs. Regulatory Requirements

EXPOSURE LEVEL (EL)	REGULATORY REQUIREMENTS
EL < AL	Maintain exposure as low as reasonably achievable
AL > EL, EL < PEL	Implement portions of the OSHA Cr VI standard and Training
EL > PEL	Implement all portions of the OSHA Cr VI Standard including training, medical surveillance, engineering controls, establishment of work areas, etc



PPE

Eye:	Safety glasses
Skin:	Chemical protective gloves and body protection
Respiratory:	Air-purifying respirators and supplied-air respirators, depending on the exposure, and a PAPR if requested by the worker

First Aid

Inhalation:	Move to fresh air; seek medical attention promptly
Skin:	Quick drenching with water; wash skin with soap and water; seek medical attention promptly
Eyes:	Flush with water for 15 minutes, lifting the lower and upper lids occasionally; seek medical attention promptly
Ingestion:	Seek medical attention promptly