Hexavalent chromium

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Table of contents

Introduction **4**
Workplace assessment **4**
Step-by-step approach **4**
General information and sources of exposure **5**
Health hazards **6**
Routes of exposure **6**
Factors affecting risk **7**
Prevention and control of Cr(VI) exposure **8**
Overview of the hexavalent chromium standard **9**
Initial exposure determination **9**
Periodic exposure monitoring **10**
Permissible Exposure Limit (PEL) **10**
Action level (AL) 10
Exposure monitoring 11
Methods of compliance (when exposure exceeds the PEL) 11
Mechanical (local exhaust) ventilation 12
Respiratory protection 12
Protective work clothing and equipment 12
Removal and storage of contaminated PPE 13
Cleaning and replacement of protective clothing 13
Housekeeping 14
Disposal of Cr(VI)-contaminated waste 14
Hygiene facilities and work practices 15
Regulated areas 15
Medical surveillance 16
Frequency of medical examinations 17
Information provided to and from the PLHCP 17
Employee information and training 18
Recordkeeping 18
Historical monitoring and objective data 19
Resources **19**
Appendix A: Flowchart guide to Cr(VI) requirements **20**
Appendix A1: Program requirements when air monitoring results are less than the action level of 2.5 µg/m³ **21**

Appendix A2: Program requirements when air monitoring results are ≥2.5 and <5.0 µg/m³ (at or above the action level and below the PEL) 21

Appendix A3: Program requirements when air monitoring results are ≥5.0 µg/m³ (at or above the PEL) for less than 30 days per year 22

Appendix A4: Program requirements when air monitoring results are ≥5.0 µg/m³ (at or above the PEL) for more than 30 days per year 23

Appendix B: Cr(VI) compounds and typical industries/ operations with exposures 24

Introduction

Hexavalent chromium (Cr(VI)) is widely used in industrial applications and can also be generated during metalworking activities. Workers may be exposed to Cr(VI) when handling chromium-containing materials or when high heat or chemical reactions convert chromium into its more toxic hexavalent form. Common workplace sources include:

- Chromate pigments in dyes, paints, inks, and plastics
- Anti-corrosive chromate coatings and primers (aerospace, structural steel)
- Chromium electroplating and stripping using chromic acid solutions
- Thermal processing such as smelting, welding, cutting, or grinding of stainless steel and chromium alloys
- Impurities in Portland cement, which can cause skin sensitization

SAIF developed this guide to help employers recognize where Cr(VI) exposure can occur, understand its health hazards, and implement effective controls to protect workers and comply with Oregon OSHA requirements.

Workplace assessment

Before applying the guidance in this document, employers must determine whether Cr(VI) is present or could be generated during work activities. Start by evaluating:

- Safety data sheets (SDSs) and your hazard communication program for chromium-containing materials
- Work processes that generate fume, dust, or spray from stainless steel or chromium alloys (e.g., welding, thermal cutting, grinding)
- Surface coatings, primers, and paints that contain chromates
- Chemical use such as chromic acid electroplating or stripping

If Cr(VI) is present, determine whether the process or material can be eliminated or substituted with a less hazardous alternative. Removing Cr(VI) at the source is the most effective way to protect workers and greatly reduces regulatory requirements.

If elimination is not feasible, this guide will help you implement controls to protect employees and comply with Oregon OSHA's Cr(VI) standard.

Step-by-step approach

1) **Determine which regulatory standard applies to your work**

   Hexavalent chromium exposure is regulated under three OSHA standards:

   - General Industry – 29 CFR 1910.1026
   - Construction – 29 CFR 1926.1126
   - Shipyards – 29 CFR 1915.1026 *(also applies to marine terminals and longshoring)*

   Oregon OSHA adopts and enforces equivalent standards. Use the Resources section to access current rule language.

2) **Confirm whether Cr(VI) is present or could be generated**

   Review SDSs and evaluate processes for potential Cr(VI) exposures (e.g., welding stainless steel, chromate primers, electroplating). If none exist, document the assessment and no further action under the Cr(VI) standard is required unless conditions change.

3) **Assign responsibility and assess employee exposure**

   Designate a competent person to manage the Cr(VI) program. If Cr(VI) is present, determine whether employees could be exposed in the air:

   - Conduct initial personal monitoring.
   - Compare results to the PEL and action level
   - Repeat monitoring as required if exposures are ≥AL or PEL

4) **Implement controls based on monitoring results**

   Use the hexavalent chromium compliance flowchart (Appendix A) to determine:

   - Engineering and work practice controls
   - Respiratory protection and PPE needs
   - Medical surveillance triggers
   - Hygiene and housekeeping requirements
   - Additional administrative obligations (training, regulated areas, recordkeeping)

General information and sources of exposure

Chromium is a metal that can exist in several valence states, including trivalent chromium [Cr(III)] and hexavalent chromium [Cr(VI)]. This guide focuses exclusively on Cr(VI) because it presents the greatest risk to worker health.

Cr(VI) compounds are found in many workplace materials and can also be generated when chromium-containing metals are heated, such as during welding or thermal cutting of stainless steel.

Table 1 provides examples of where Cr(VI) is found and the specific compounds commonly associated with those uses. For additional detail on Cr(VI) compounds and related industries, see Appendix B, adapted from OSHA Directive CPL 02-02-074 with updates reflecting Oregon OSHA enforcement.

Table 1: Types of hexavalent chromium and where it is found and used

Where found/used	Types
Pigments for paints, inks, and plastics	Lead chromate (chrome yellow, molybdate orange), zinc chromate, barium chromate, calcium chromate, potassium dichromate, sodium chromate
Anti-corrosion coatings (including chrome plating, spray coatings)	Chromic trioxide (chromic acid), zinc chromate, barium, chromate, calcium chromate, sodium chromate, strontium chromate

Stainless steel	Cr(VI) can be generated when stainless steel is welded, thermally cut, ground, or cast
Textile dyes	Ammonium dichromate, potassium chromate, sodium chromate
Wood preservation	Chromated Copper Arsenate (CCA), Acid Copper Chromate (ACC), chromium trioxide
Leather tanning	Ammonium dichromate

Health hazards

Cr(VI) is a known human carcinogen. Workplace exposure can lead to both short-term irritation and long-term respiratory and skin disease.

Cancer
Inhalation of Cr(VI) increases the risk of lung cancer. Elevated cancer rates have been consistently observed among workers in chromate production, electroplating, pigment manufacturing, and stainless steel welding. Cr(VI) is also a strong respiratory irritant.

Eyes
Direct contact with chromic acid or chromate-containing dusts can cause severe irritation and may result in permanent eye damage if not promptly treated.

Respiratory tract
Cr(VI) can irritate the nose, throat, and lungs. Repeated or high exposures can damage the nasal mucosa and lead to ulceration. In serious cases, damage may progress to perforation of the nasal septum. Cr(VI) can also contribute to occupational asthma and decreased lung function.

Skin
Prolonged or repeated contact may cause irritant dermatitis, chemical burns, or small ulcers known as "chrome holes." Some individuals may become sensitized, resulting in allergic contact dermatitis with even minor subsequent exposures.

**Note: The Cr(VI) standard does not apply to airborne exposure from Portland cement, as typical air concentrations are below the Action Level. However, cement can cause chromate-induced skin sensitization, and related requirements for PPE, washing facilities, and hazard communication still apply.*

Routes of exposure

Workers can be exposed to Cr(VI) through:

Inhalation

The primary route of exposure. Cr(VI) can be inhaled as airborne dust, fume, or mist, especially during welding, cutting, grinding, or spraying activities.

Ingestion
Hand-to-mouth exposure can occur when food, beverages, cosmetics, tobacco, or smoking materials become contaminated in work areas. Poor personal hygiene practices can increase risk.

Skin contact
Cr(VI) compounds can be absorbed through intact skin, leading to irritation or allergic sensitization. Once absorbed, Cr(VI) is converted to Cr(III) in the skin, where it may bind to proteins and trigger eczema-like dermatitis in sensitized individuals.

Contaminated clothing, tools, or personal items can transfer Cr(VI) outside the workplace, potentially exposing family members and others.

Factors affecting risk

The magnitude of risk from Cr(VI) exposure depends on several workplace conditions:

Process factors
Risk increases when:

- Work involves high temperatures (e.g., welding, thermal cutting, foundry processes)
- Fume, dust, or mist is generated and not effectively captured
- Chromate-containing coatings or residues are heated or disturbed
- Work occurs in confined or poorly ventilated areas
- Older, poorly maintained equipment is used

More intense processing typically results in higher exposure potential.

Engineering controls
The effectiveness of ventilation directly impacts exposure control:

- Local exhaust ventilation (LEV) is the preferred engineering control for Cr(VI). LEV captures and removes emissions at the source before they enter the breathing zone.
- LEV must be properly positioned and maintained, and must not interfere with welding shielding gas.
- General (dilution) ventilation alone is not adequate for Cr(VI), because low concentrations can still exceed regulatory limits.

Work practices and hygiene
Preventing the spread of Cr(VI) contamination requires:

- Prohibiting use of compressed air to clean clothing or surfaces
- Regular housekeeping with HEPA-filtered vacuuming or wet cleaning
- Proper use and removal of PPE
- Ensuring workers wash exposed skin before eating, drinking, or leaving the area

Good hygiene and housekeeping can significantly reduce exposures from surface contamination and unintentional ingestion.

Prevention and control of Cr(VI) exposure

The most effective way to control Cr(VI) exposure is to remove or reduce the hazard at the source. Employers should apply the hierarchy of controls, prioritizing substitution and engineering controls before relying on PPE.

Substitution
When possible, replace Cr(VI)-containing materials or processes with less hazardous alternatives. Before substitution, evaluate:

- Technical feasibility and product performance
- Worker safety and exposure potential
- Regulatory and customer requirements

Some substitutes may have limited toxicity information, so evaluate alternatives carefully before implementation.

Engineering controls
Local exhaust ventilation (LEV) is the most effective method for controlling airborne Cr(VI). LEV removes fume and dust at the point of generation before it enters the breathing zone. To remain effective:

- Prevent interference with airflow (e.g., cooling fans, open bay doors)
- Position capture hoods as close as practicable to the source
- Maintain and clean systems regularly
- Manage exhaust according to environmental regulations.

**Special note – welding: LEV must be arranged so it does not disrupt shielding gas. Capture hoods should generally be within 1-1.5 duct diameters of the arc to ensure effective fume capture.*

Housekeeping and hygiene
Good housekeeping reduces contamination that can lead to skin contact and ingestion. Required practices:

- Use HEPA-filtered vacuuming or wet cleaning
- Do not use compressed air to clean surfaces or clothing
- Manage dust carefully during vacuum maintenance or waste removal

Workers must not eat, drink, smoke, or apply cosmetics in Cr(VI) use areas.

Provide appropriate hygiene facilities for exposed employees, which may include:

- Change rooms
- Showers
- Lunchrooms isolated from contaminated areas

Contaminated clothing must be properly contained and labeled to prevent secondary exposure to workers or laundry personnel.

Personal protective equipment (PPE)
Use PPE when:

- Engineering controls cannot fully maintain exposures below the PEL

- Controls are in development or temporarily unavailable
- Needed to supplement other protective measures

PPE may include:

- Respiratory protection as required by a written program
- Protective clothing resistant to Cr(VI) solutions
- Eye and face protection to prevent splashes and dust contact

Overview of the hexavalent chromium standard

Oregon OSHA enforces the Hexavalent Chromium standard under:

- OAR 437-002-0385 (General Industry)
- OAR 437-003-1005 (Construction)
- OAR 437-005-0840 (Maritime)

These rules adopt and enforce requirements equivalent to the federal OSHA standards:

- 29 CFR 1910.1026 – General Industry
- 29 CFR 1926.1126 – Construction
- 29 CFR 1915.1026 – Shipyards

The Oregon standards apply to all occupational exposures to Cr(VI) unless the employer can demonstrate exposures are consistently below 0.5 µg/m^3 under any foreseeable conditions.

**Note: Unlike Federal OSHA, the Oregon OSHA Cr(VI) standard does not exempt exposures related to pesticides or Portland cement. Employers must evaluate these activities and apply applicable workplace protections.*

Initial exposure determination

Employers must determine whether employees are exposed to Cr(VI) at or above 0.5µg/m^3 (8-hour TWA) under any expected conditions of use.

An exposure determination is not required only if the employer can demonstrate through objective data that:

Materials, processes, or activities involving chromium cannot release Cr(VI) dust, fume, or mist at or above 0.5µg/m^3 as an 8-hour TWA.

If such data is unavailable, or if Cr(VI) may be present, employers must perform personal air monitoring:

- Collect enough full-shift breathing-zone samples to accurately characterize exposure
- Evaluate each shift, job classification, and work area with potential exposure
- When using representative sampling, monitor the employee(s) most likely to have the highest exposure

The purpose of the initial assessment is to determine whether any employee exposures are at or above the Action Level (AL) of 2.5 µg/m^3 (8-hour TWA).

If initial monitoring shows all employee exposure are below the AL:

- The employer may discontinue exposure monitoring for those represented employees
- Monitoring must restart if process, production, equipment, controls, or work practices change in a way that may increase exposure

Periodic exposure monitoring

If initial monitoring shows that any employee is exposed to Cr(VI) at or above the Action Level (AL) of 2.5µg/m^3 (8-hour TWA), the employer must begin periodic personal exposure monitoring.

Monitoring frequency is based on exposure level:

Exposure level	Monitoring frequency
≥ Action Level but < PEL	At least **every 6 months**
≥ PEL (5 µg/m^3 8-hr TWA)	At least **every 3 months**

Periodic monitoring may be discontinued when:

- Two consecutive personal air samples
- Collected at least 7 days apart
- Are below the Action Level

Monitoring must resume is changes occur in production, process, controls, personnel, or equipment that may increase exposures.

Permissible Exposure Limit (PEL)

The Permissible Exposure Limit (PEL) for Cr(VI) is:

5µg/m^3 as an 8-hour time-weighted average (TWA)

Employers must use feasible engineering and work practice controls to reduce exposures to or below the PEL. Respiratory protection may only be used when:

- Engineering/work practice controls are not feasible, or
- They cannot fully reduce exposures to or below the PEL

Action level (AL)

The Action Level (AL) for Cr(VI) is:

2.5µg/m^3 as an 8-hour TWA

Employee exposures at or above the AL trigger ongoing exposure monitoring and medical surveillance requirements.

Exposure monitoring

Employers must evaluate workplace exposures to determine is employees are exposed to Cr(VI) at or above the Action Level. Exposure determination requirements apply regardless of whether respiratory protection is worn.

Within 15 working days of receiving monitoring results, the employer must:

- Notify each affected employee in writing, or
- Post results in a location accessible to affected employees

If employee exposures exceed the PEL, the notification must include:

- A description of the corrective actions being taken to reduce exposures to or below the PEL

Monitoring must be repeated as required if changes in processes, equipment, ventilation, production, or controls may increase Cr(VI) exposure.

Methods of compliance (when exposure exceeds the PEL)

Engineering and work practice controls
If an employee is exposed to Cr(VI) above the PEL for 30 or more days per year, the employer must implement feasible engineering and work practice controls to reduce exposures to or below the PEL.

If these controls cannot reduce exposures below the PEL, the employer must:

- Continue to use engineering and work practice controls to the extent feasible, and
- Provide respiratory protection to achieve compliance

If a process or task does not result in exposures above the PEL for 30 or more days per year, mandatory implementation of engineering and work practice controls does not apply to that process or task. (Respiratory protection must still be used as needed to maintain exposures below the PEL).

Aerospace industry exception
For painting aircraft or large aircraft parts in the aerospace industry:

- Employers must use engineering and work practice controls to reduce exposures to 25 $\mu g/m^3$ or below
- Respiratory protection must be used in combination with those controls to achieve the 5 $\mu g/m^3$ PEL

This applies unless the employer can demonstrate that such controls are not feasible.

**Note: This requirement reflects the unique difficulty in controlling atomized Cr(VI) during large-scale painting operations.*

Prohibition on employee rotation
Employers may not rely on job rotation for the purpose of achieving compliance with the PEL.

**Note: Employee rotation for other operational reasons, such as skill development or ergonomic support, is still allowed.*

Mechanical (local exhaust) ventilation

When mechanical ventilation is used to control Cr(VI) exposure, the employer must ensure that the system is functioning effectively. Employers must:

- Assess system performance at least every 3 months. Acceptable parameters include capture velocity, duct velocity, or static pressure
- Reevaluate ventilation effectiveness whenever production, equipment, or process changes may increase Cr(VI) emissions

If ventilation systems recirculate air back into the workplace:

- Exhaust air must pass through high-efficiency filtration, with a reliable fail-safe that prevents recirculation if filter or system performance degrades
- Exhaust stacks must be located to prevent re-entrainment of Cr(VI) into building air intakes or occupied areas.

Proper placement, use, and maintenance of ventilation is critical to maintaining exposures below the PEL.

Respiratory protection

Respiratory protection must be used when:

- Feasible engineering and work practice controls are not yet implemented or cannot fully reduce exposures to or below the PEL
- Performing maintenance, repair, or infrequent tasks where engineering controls are not feasible
- Employees are exposed above the PEL for fewer than 30 days per year and the employer elects not to implement engineering controls for that task
- There is uncontrolled release or unexpected significant exposure

Respirators:

- Must be NIOSH-approved
- Require medical evaluation prior to fit testing or use
- Must be fit-tested initially and at least annually
- Must be selected and used in accordance with a written Respiratory Protection Program that complies with OAR 437-002-1041 (29 CFR 1910.134 adopted by reference)

**Note: Respirators can increase breathing effort and heat stress and may reduce communication and job efficiency. Whenever feasible, employers should prioritize engineering controls to minimize reliance on respirators.*

Protective work clothing and equipment

Where there is a hazard of skin or eye contact with Cr(VI), employers must provide appropriate personal protective clothing and equipment (PPE) at no cost to employees, and must ensure it is properly used.

Depending on the task and potential for contact with Cr(VI), required PPE may include:

- Full-body protective clothing (e.g., coveralls, chemical-resistant suits)

- Gloves, head coverings, and protective footwear or disposable boot covers
- Eye and face protection, such as face shields or chemical splash goggles

PPE must be selected based on a written workplace hazard assessment as required by:

- 29 CFR 1910.132(d) – General PPE requirements
- 29 CFR 1910.133 – Eye and face protection

Employers must ensure PPE provides effective protection against Cr(VI) in both solid and solution forms.

Removal and storage of contaminated PPE

Employers must ensure that:

- Employees remove Cr(VI)-contaminated protective clothing and equipment at the end of the work shift or immediately after completing Cr(VI)-exposing tasks
- Contaminated PPE is not removed from the workplace, except by personnel whose job duties include laundering, cleaning, maintenance, or disposal.

Contaminated protective clothing and equipment must be:

- Stored and transported in sealed, impermeable bags or containers
- Clearly labeled according to the Hazard Communication Standard (29 CFR 1910.1200 / OAR 437-002-1910.1200)

Labels must warn that the contents contain hexavalent chromium and may post cancer, skin, and respiratory hazards.

Proper handling and segregation of contaminated PPE helps prevent the spread of Cr(VI) to clean areas and reduces the risk of dermatitis and secondary exposure.

Cleaning and replacement of protective clothing

Protective clothing and equipment must be maintained in a clean and serviceable condition to ensure continued protection against Cr(VI) exposure.

Employers must:

- Clean, launder, repair, and replace protective clothing and equipment as needed to maintain its effectiveness
- Prohibit dry cleaning methods such as shaking, brushing, or using compressed air that may disperse Cr(VI) into the air or onto workers
- Ensure that contaminated PPE is handled in a way that minimizes skin and eye contact and prevents airborne release of Cr(VI)

Any personnel or service (including outside laundry facilities) responsible for cleaning or maintaining contaminated PPE must be informed by the employer:

- That the clothing or equipment is contaminated with Cr(VI)
- Of the health hazards associated with Cr(VI)
- That it must be cleaned or laundered in a way that prevents secondary exposure and airborne releases above the PEL

Bags or containers used to store or transport contaminated PPE must be impermeable and labeled in accordance with the Hazard Communication Standard. Required label wondering:

DANGER

CONTAINS HEXAVALENT CHROMIUM

CAN CAUSE CANCER

CAN DAMAGE SKIN AND RESPIRATORY SYSTEM

Employers should maintain documentation of PPE cleaning schedules as part of their Cr(VI) compliance program.

Housekeeping

Employers must keep work areas as free as practicable of Cr(VI) contamination. This includes:

- Cleaning work surfaces regularly and promptly after spills or visible accumulation
- Using approved cleaning methods such as HEPA-filtered vacuuming, wet wiping, or wet mopping
- Employing proper vacuum maintenance and waste handling practices to prevent re-aerosolization of Cr(VI)

Compressed air must not be used to remove Cr(VI) dust from surfaces or clothing unless:

- "Air is used in conjunction with a HEPA-filtered ventilation system that captures the dust, and"
- "Such use is explicitly demonstrated to be safe and compliant"

**Note: In most workplaces, compressed-air cleaning is strictly prohibited.*

Dry sweeping, brushing, or shoveling should be avoided unless no other effective cleaning method is feasible.

Effective housekeeping helps minimize exposures from surface contamination, skin contact, and unintentional ingestion.

Disposal of Cr(VI)-contaminated waste

Waste materials, scrap, and debris contaminated with Cr(VI) must be:

- Collected and stored in sealed, impermeable bags or closed containers
- Labeled according to the Hazard Communication Standard (29 CFR 1910.1200 / OAR 437 adoption)

Labels must clearly identify hexavalent chromium hazards to prevent accidental exposure during transport, laundering, or disposal.

Employers should consult with applicable environmental and hazardous waste regulations to ensure proper Cr(VI) waste handling and disposal.

Hygiene facilities and work practices

When protective clothing and equipment are required to prevent contact with Cr(VI), the employer must provide hygiene facilities and work practices that prevent contamination from spreading beyond the work area.

Change rooms and washing facilities
Employers must provide change rooms and washing facilities that comply with OSHA's sanitation standard (29 CFR 1910.141 / OAR 437-002-140):

- Change rooms must have separate storage for protective clothing and street clothes to prevent cross-contamination
- Washing facilities must be readily accessible and capable of effectively removing Cr(VI) from the skin
- Contaminated clothing or equipment must not be taken home by employees

Employees must be given time during the workday to:

- Change into protective clothing before exposure
- Wash or shower, as needed, and change back into street clothes after exposure

Time spent washing, showering, and changing is considered work time and must be paid.

Where required, showers must meet minimum OSHA ratios:

- At least one shower for every 10 employees of each sex on each shift
- Hot and cold water, body soap, and clean towels must be provided

**Note: Providing adequate wash and change time often requires adjusting shift schedules.*

Eating, drinking, and personal items
To prevent ingestion of Cr(VI):

- Eating or drinking areas and surfaces must be kept as free as practicable of contamination
- Employees must not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in regulated areas or where skin/eye contact with Cr(VI) may occur
- Food, beverages, cosmetics, and tobacco may not be carried or stored in contaminated areas

Employers should provide a lunchroom or break room with:

- Positive pressure filtered air supply
- Temperature control
- Readily accessible location

Employees may only enter eating areas after removing contamination from PPE or changing out of protective clothing.

Regulated areas

Employers must establish regulated areas wherever airborne concentrations of Cr(VI):

- Exceed, or
- Are reasonably expected to exceed

- The PEL of 5 µg/m^3 (8-hr TWA)

These areas must be:

- Clearly demarcated to identify boundaries and prevent inadvertent entry
- Equipped with warning signs or barriers that alert employees to the hazard
- Restricted to only:
  - Persons authorized by the employer, and
  - Those whose work duties require their presence in the area (including authorized representatives and necessary support personnel)

Controls and hygiene facilities must be located to minimize the spread of Cr(VI) contamination outside the regulated area.

WARNING

HEXAVALENT CHROMIUM WORK AREA NO SMOKING OR EATING
WEAR APPROPRIATE PROTECTIVE EQUIPMENT

(The employer should specify the type of equipment here.)

Medical surveillance

Employers must provide a medical surveillance program for employees who:

- Are exposed to Cr(VI) at or above the Action Level (2.5 µg/m^3) for 30 or more days per year, or
- Show signs or symptoms of adverse health effects associated with Cr(VI), or
- Experience emergency exposures

Medical surveillance must be provided:

- At no cost to the employee
- During working hours
- By a Physician or Licensed Health Care Professional (PLHCP)

Each exam must include:

- A medical and work history, focusing on:
  - Past, current, and anticipated Cr(VI) exposure
  - Respiratory conditions and symptoms
  - History of asthma, dermatitis, skin ulcers, or nasal septum damage
  - Smoking status and history
- A physical examination of the skin and respiratory system
- Any additional tests the PLHCP determines necessary based on the worker's condition or exposure

Frequency of medical examinations

Medical examinations must be provided:

- Within 30 days of initial job assignment where surveillance is required (unless a qualifying Cr(VI) medical exam has been completed within the past 12 months), and
- Annually thereafter, or more often if recommended by the PLHCP

Medical surveillance must also be provided:

- After emergency exposure, as soon as possible
- At termination of employment if the worker was required to participate in surveillance

Employees must receive a written medical opinion, and employers must follow all recommendations for work restrictions, PPE, and exposure controls.

Information provided to and from the PLHCP

To support proper medical evaluation, the employer must provide the Physician or Licensed Health Care Professional (PLHCP) with:

- A copy of the Hexavalent Chromium Standard (29 CFR 1910.1026 / Oregon adoption)
- A description of the employee's past, current, and anticipated duties involving Cr(VI) exposure
- Exposure information including:
  - Historical and expected air monitoring results
  - Duration and frequency of exposure
- A description of PPE used or expected to be used, including type and duration of use
- Relevant medical records previously maintained by the employer for that employee

The PLHCP must provide a written medical opinion to the employer within 30 days of the examination that includes:

- Whether the employee has any medical condition(s) that place them at increased risk from Cr(VI) exposure
- Recommended limitations on the employee's exposure or PPE use (including respirators)
- Confirmation that the PLHCP has:
  - Explained any medical conditions related to Cr(VI)
  - Provided guidance on any follow-up evaluation or treatment
  - Explained any required special provisions for PPE use

The written opinion must not include findings or diagnoses unrelated to Cr(VI) exposure.

The employer must provide the employee with a copy of the PLHCP's written medical opinion:

- Within 2 weeks of receiving it

The medical opinion must be maintained confidentially according to OSHA medical records requirements.

Employee information and training

In addition to the requirements of the Hazard Communication Standard (29 CFR 1910.122 / Oregon adoption), employers must provide employees with information and training on:

- The contents and requirements of the Hexavalent Chromium Standard (29 CFR 1910.1026 / 1926.1126 / 1915.1026)
- The purpose and description of the medical surveillance program
- The specific operations and work activities that may result in Cr(VI) exposure
- The selection, proper use, fit, and limitations of respirators and other PPE used for Cr(VI) protection
- The proper use of engineering controls, such as local exhaust ventilation, used to reduce Cr(VI) exposures

Training must be provided:

- Prior to assignment to Cr(VI) exposure work
- Whenever changes occur that could increase exposure
- In a manner the employee can understand (e.g., language and literacy appropriate)

Employers must maintain documentation of training.

Recordkeeping

Employers must maintain accurate records for:

Exposure monitoring records
Records must include:

- Date of measurement
- Work activity and location monitored
- Sampling and analytical methods used
- Number, duration, and results of samples
- PPE in use during sampling (e.g., respirators)
- Names, job classifications, and identification of monitored or represented employees

**Note: Oregon OSHA does not require Social Security numbers due to identity-theft risk.*

Records must be retained for at least 30 years.

Medical Surveillance Records
Medical records must include:

- Employee name and duties
- Written medical opinions from the PLHCP
- Exam dates and recommended work restrictions

Medical records must be retained for duration of employment + 30 years

Records must be made available to:

- The employee
- Anyone with written employee consent
- Oregon OSHA (upon request)

Access must be provided in a reasonable time, place, and manner consistent with 29 CFR 1910.1020.

Historical monitoring and objective data

Employers may rely on historical monitoring data or objective data to demonstrate that employee exposures to Cr(VI):

- Will not exceed the PEL (5 µg/m^3 8-hr TWA), and
- Will occur fewer than 30 days per year, under all expected conditions of use

When an employer uses historical or objective data, they must:

- Establish and maintain records of all data relied upon
- Ensure the data accurately reflects current workplace conditions (materials used, work practices, controls, equipment, and production levels)

Employers may also use:

- Production schedules or work history that show Cr(VI)-related tasks occur on fewer than 30 days per year, or
- Exposure monitoring results that demonstrate specific process conditions maintain exposures below the PEL

Example:

If air monitoring shows welders' exposures are below the PEL when welding only low-chromium content materials, then days spent welding only those materials do not count toward the 30-day engineering-control requirement.

These provisions apply to general industry, construction, and shipyard employers equally.

Proper documentation of historical or objective data is essential for employers to maintain eligibility for the 30-day engineering control exemption.

Resources

Oregon OSHA topic page: Hexavalent chromium
bit.ly/49RttXi

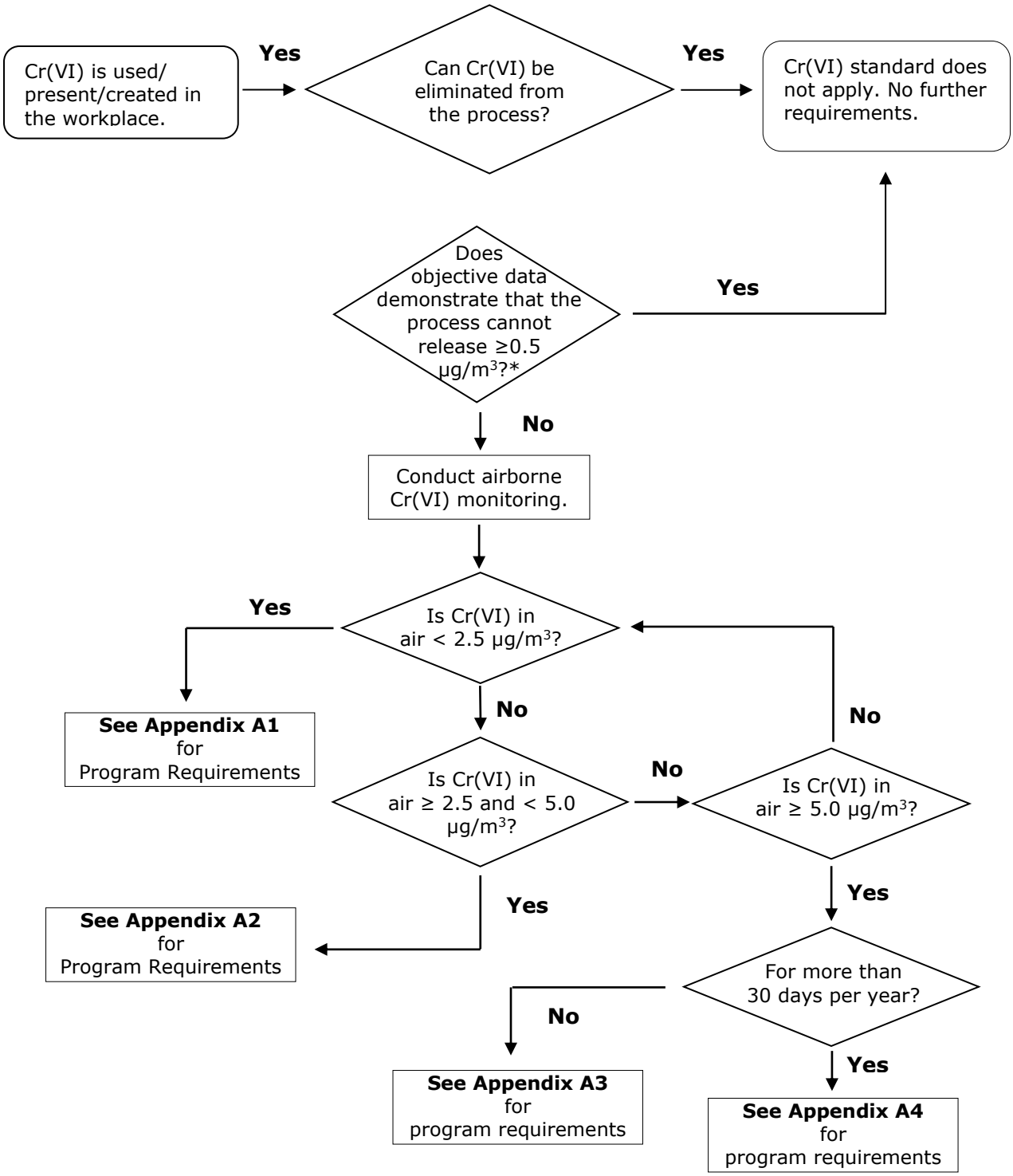
NIOSH - Occupational Exposure to Hexavalent Chromium: Criteria for a Recommended Standard
bit.ly/3NLeF3H

EPA - Chromium Compounds Toxicological Review & Chromium (VI) Fact Sheet
bit.ly/4q8AY0C

OSHA - Hexavalent Chromium Fact Sheet (OSHA 3373)
bit.ly/3McgSVq

OSHA – Controlling Hexavalent Chromium Exposures During Electroplating Fact Sheet
bit.ly/3MfBKer

Appendix A: Flowchart guide to Cr(VI) requirements



**Objective Data Exemption*

The Cr(VI) Standard does not apply if the employer has objective data demonstrating that a material, process, operation, or activity involving chromium cannot release Cr(VI) dust, fume, or mist at or above 0.5 µg/m³ (8-hour TWA) under any expected conditions of use. When this exemption applies, the Cr(VI) Standard does not cover that material, process, or activity. The demonstration must consider all contributing sources of Cr(VI) exposure in the workplace, reflect actual and foreseeable conditions (including worst-case scenarios), and be maintained as part of the employer's records. Objective data must be reliable, relevant, and scientifically supported (e.g., valid exposure monitoring data, published studies, or controlled testing).

Appendix A1: Program requirements when air monitoring results are less than the action level of 2.5 µg/m^3

1. Record employee exposure levels for all monitored employees.
2. Maintain complete air monitoring documentation, including:
    - Date of each measurement
    - The operation or task being monitored
    - Sampling and analytical methods used, including evidence of accuracy
    - Number, duration, and results of samples collected
    - Type of personal protective equipment used during sampling (e.g., respirators)
    - Names and job classifications of all monitored or represented employees

    **Note: Oregon OSHA does not require Social Security numbers in exposure records.*
3. Maintain all exposure monitoring records in accordance with 29 CFR 1910.1020 (Access to Employee Exposure and Medical Records)
4. Notify affected employees of monitoring results within 15 working days by:
    - Posting the results in a location accessible to affected employees, or
    - Providing each affected employee a written notification
5. Repeat exposure monitoring whenever:
    - Processes, materials, equipment, personnel, ventilation, or work practices change in a way that may increase exposure, or
    - The employer has reason to believe new or additional exposures have occurred
6. Provide employee training covering:
    - The contents and requirements of the Hexavalent Chromium Standard
    - The purpose and description of the medical surveillance program
    - Access to a copy of the standard, made available at no cost to employees

Appendix A2: Program requirements when air monitoring results are ≥2.5 and <5.0 µg/m^3 (at or above the action level and below the PEL)

1. Repeat exposure monitoring at least every 6 months for affected employees.
2. Notify affected employees of monitoring results within 15 working days by either:
    - Posting results in a location accessible to affected employees, or
    - Providing each affected employee individual written notification
3. Provide medical surveillance is employees are exposed to Cr(VI) at or above the Action Level (2.5 µg/m^3) for 30 or more days per year, in accordance with 1910.1026 Medical Surveillance Requirements.
4. Train employees so they can demonstrate knowledge of:
    - The contents and requirements of the Hexavalent Chromium Standard
    - The purpose and description of the medical surveillance program
    - A copy of the standard must be readily available at no cost to employees.

5. Continue periodic monitoring until two consecutive measurements, taken at least 7 days apart, show exposures below the Action Level. At that point, monitoring for those employees may be discontinued.
6. Repeat exposure monitoring whenever:
    - There is a change in production, process, equipment, controls, personnel, or work practices that may increase Cr(VI) exposure, or
    - The employer has reason to believe that new or additional exposures have occurred.

Appendix A3: Program requirements when air monitoring results are ≥5.0 µg/m^3 (at or above the PEL) for less than 30 days per year

1. Repeat exposure monitoring at least quarterly (every 3 months).
2. Notify affected employees of exposure monitoring results within 15 working days by:
    - Posting in a location accessible to affected employees, or
    - Providing written notification to each affected employee individually
3. Provide respiratory protection to reduce and maintain exposures to ≤5.0 µg/m^3 (PEL), in accordance with the Respiratory Protection Standard (1910.134).

    **Note: Respirators supplement controls until exposures are reduced below the PEL.*
4. Establish regulated areas wherever airborne Cr(VI) exposures exceed or may reasonably be expected to exceed the PEL. These areas must be:
    - Clearly demarcated to establish boundaries, and
    - Access restricted to authorized persons who must enter for work duties
5. Implement protective clothing and equipment procedures, including:
    - Provision and required use of appropriate PPE at no cost to employees
    - Removal of contaminated PPE only in designated change rooms
    - Proper storage and transport of contaminated items in closed, impermeable containers
    - Cleaning, laundering, repair, or replacement as needed to maintain effectiveness
    - Prohibition on shaking, blowing, or cleaning PPE in a manner that disperses Cr(VI)
    - Labeling containers per the Hazard Communication Standard (1910.1200)
    - Written notification to laundry or cleaning personnel of Cr(VI) hazards
6. Establish housekeeping procedures to keep surfaces as free as practicable of Cr(VI) accumulation. Cleaning must use:
    - HEPA vacuuming, wet methods, or other methods that prevent dust dispersal.

    **Note: Compressed air must not be used unless it is combined with point-of-capture ventilation.*
7. Provide hygiene facilities and practices per 1910.1026(i), including:
    - Separate change rooms for street clothes and work clothing
    - Washing facilities capable of removing Cr(VI)
    - Eating and drinking areas maintained as free as practicable from Cr(VI), with:
        - No eating, drinking, smoking, or cosmetics in regulated areas
        - Decontamination required before entering break areas
8. Train employees on:
    - Requirements of the Hexavalent Chromium Standard

- Purpose and description of the medical surveillance program.
- Employees must have free access to the standard.

Appendix A4: Program requirements when air monitoring results are ≥5.0 µg/m^3 (at or above the PEL) for more than 30 days per year

1. Repeat exposure monitoring at least quarterly (every 3 months).
2. Notify affected employees of monitoring results within 15 working days of receiving the results, by:
   - Posting in a location accessible to affected employees, or
   - Providing each affected employee individual written notification
3. Implement engineering and work practice controls to reduce exposures to ≤ 5.0 µg/m^3 (PEL), unless the employer can demonstrate that such controls are not feasible.
4. For aerospace painting operations (aircraft / large aircraft parts):
   - Engineering and work practice controls must reduce Cr(VI) exposure to ≤ 25 µg/m^3, unless not feasible.
   - Respirator use is required to achieve the PEL.
5. When engineering and work practice controls cannot reduce exposures below the PEL:
   - Use controls to achieve the lowest feasible exposure, and
   - Supplement with respiratory protection per 1910.134.
6. Prohibit employee rotation as a primary means of achieving compliance with the PEL.
7. Protective clothing and equipment procedures must include:
   - Provision and required use of appropriate PPE at no cost to employees
   - Removal only in designated change rooms
   - Closed, impermeable containers for storage, transport, and disposal
   - Cleaning, laundering, repair, and replacement to maintain protective function
   - Written notification to laundry/cleaning personnel regarding Cr(VI) hazards
   - Labeling containers per Hazard Communication Standard (1910.1200)
   - Prohibition on shaking, blowing, or methods that disperse Cr(VI) dust
8. Housekeeping must keep surfaces as free as practicable of Cr(VI) dust, using:
   - HEPA-filtered vacuuming, wet methods, or equivalent containment

   **Note: Compressed air may not be used unless combined with point-of-capture ventilation.*
9. Hygiene facilities and practices must be provided and maintained per 1910.1026(i), including:
   - Separate change rooms
   - Washing facilities
   - Eating and drinking areas with contamination prevention measures
10. Medical surveillance program required per 1910.1026(k) for all affected employees:
    - Initial exam within 30 days of assignment
    - Annual medical examination
    - Additional exams:
      - Within 30 days of a PLHCP recommendation

- When signs/symptoms of exposure appear
- Within 30 days following emergency exposure
- At termination of employment (unless a compliant exam occurred within the last 6 months)

- Medical records must:
  - Be retained for duration of employment + 30 years
  - Be accessible to the employee per 1910.1020

11. Employee training must ensure that employees can demonstrate knowledge of:
    - The Hexavalent Chromium Standard requirements
    - The purpose and description of the medical surveillance program.
    - Employees must have free access to a copy of the standard.

Appendix B: Cr(VI) compounds and typical industries/ operations with exposures

Table 2: Common Cr(VI) compounds

Compound name	Common chemical form	Primary uses/notes
Chromic acid / Chromium trioxide	CrO_3 (H_2CrO_4 in solution)	Electroplating, passivation, etching
Sodium chromate	Na2CrO4	Pigments, metal treatment, corrosion inhibitors
Sodium dichromate	$Na_2Cr_2O_7$*$2H_2O$	Electroplating, pigments, wood preservation, glass manufacture
Potassium chromate	K_2CrO_4	Laboratory reagents, corrosion inhibitors
Potassium dichromate	$K_2Cr_2O_7$	Glass cleaning compounds, oxidizing agents
Calcium chromate	$CaCrO_4$	Anti-corrosion pigment, conversion coatings
Strontium chromate	$SrCrO_4$	Aerospace primers, corrosion-resistant coatings
Zinc chromate	$ZnCrO_4$	Industrial primers, anti-corrosion coatings
Lead chromate	$PbCrO_4$	Pigments (chrome yellow, chrome green) – **high-toxicity**
Ammonium dichromate	$(NH_4)_2Cr_2O_7$	Laboratory oxidizer; discontinued in many uses
Chromated Copper Arsenate (CCA)	CrO_3 + As_2O_5 + CuO	Wood preservation (manufacturing only covered by Cr(VI) standard)
Acid Copper Chromate (AAC)	CrO_3 + CuO	Wood preservation (limited historic use)

**Note: All listed compounds contain Cr(VI) and may present inhalation, dermal, and ingestion hazards depending on the process.*

Table 3: Typical industries/operations with Cr(VI) exposures

Industry / Sector	Common Cr(VI) Exposure Source
Chromate chemical manufacturing	Production of dichromates and chromates
Iron and steel foundries / Forge shops	High-temperature processing releases Cr(VI) fumes
Welding[1] on stainless steel or chromium-containing alloys / coatings	Oxidation of chromium during welding, cutting, and gouging
Electroplating and chrome plating	Chromic acid mist
Aerospace and automotive coatings	Strontium chromate, zinc chromate primers; paint removal operations
Manufacturing of chromate pigments and dyes	Lead chromate, strontium chromate
Glass manufacturing	Sodium dichromate conversion
Fiberglass production	Furnace-generated Cr(VI) contaminants
Construction using pressure-treated wood	CCA / AAC in wood treatment only – use in construction exempt from Cr(VI) Standard but PPE/hygiene still required
Operations involving Portland cement	Cr(VI) impurity – governed under Air Contaminants PEL + PPE/hygiene requirements
Cleaning laboratory glassware	Use of chromic acid/dichromates as cleaners (phasing out)

Regulatory Footnote

[1] Cr(VI) welding hazard factors:

- *Chromium content of base metal and filler*
- *Presence of chromium surface coatings*
- *Confined or enclosed workspaces*
- *Effectiveness of local exhaust ventilation (LEV)*

Welding on stainless steel (typically 12 – 30% Cr) produces significantly higher Cr(VI) than welding on carbon steels (generally <3% Cr). Recommended technical resource: NIOSH Criteria for a Recommended Standard – Welding, Brazing, and Thermal Cutting (Chapter III).