

SOP-207 (Ver. 3)

Hexavalent Chromium

Standard Operating Procedure (SOP)

Effective: 1/25/2022 Supersedes: 11/02/2020

Approved By: James D. Herberg General Manager

# I. Purpose

The purpose of this program is to protect the Orange County Sanitation District (OC San) staff and contractors from overexposure to hexavalent chromium [(Cr (VI)]. The goal is to help ensure that worker exposure levels to hexavalent chromium are accurately assessed and that workers are not exposed to hexavalent chromium at levels that are above occupational exposure limits. Measured concentrations of hexavalent chromium (below, at or above the exposure limit) will dictate compliance procedures to be implemented.

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This written compliance program is implemented to reduce exposures at or below the occupational exposure limit, solely through means of engineering and work practice controls. This written program contains a description of each operation in which hexavalent chromium is emitted by District staff and the specific means that will be employed to achieve compliance, including engineering plans and studies used to determine methods selected for controlling exposure to hexavalent chromium.

## II. Background

Hexavalent chromium is a form of the metallic element chromium. Properties of chromium include corrosion resistance, durability, and hardness. Hexavalent chromium enters the body via inhalation, ingestion, and skin absorption. If not protected, exposure may cause lung cancer, irritation or damage to the nose, throat and lung, or irritation and damage to the eyes and skin.

District staff and contractors can be exposed to hexavalent chromium when welding, grinding, or cutting on stainless steel, galvanized steel, or chrome-coated metals. Hexavalent chromium occurs through the oxidation of chromium compounds with lower valence states. Chromium metal [Cr (0)] is present in electrodes, welding wires, stainless steel, and many low-alloy metals. The high temperatures created by welding, grinding, or cutting oxidize the chromium to the hexavalent state.

## III. Definitions

**Action Level** – The action level for implementation of this program is the concentration of airborne hexavalent chromium of 2.5 micrograms per cubic meter of air (2.5  $\mu$ g/m<sup>3</sup>), calculated as an 8-hour time-weighted average (TWA).

Administrative Controls – Work procedures such as written safety policies, rules, supervision, schedules, and training with the goal of reducing the duration, frequency, and severity of exposure to hazardous situations.

**Air Changes Per Hour** – An amount of air equal to the gross volume of air passing through a confined space in an hour.

Air Moving Devices – Term that includes exhaust, fan, or blower systems.

**Chromium (VI)** – Hexavalent chromium or Cr (VI) has a valence of positive six, in any form and in any compound. It is usually produced by an industrial process and is known to cause cancer. Chromium targets the respiratory systems, kidneys, liver, skin, and eyes. A major source of exposure is welding on stainless steel and other alloy steels containing chromium metal.

**Emergency Release** – Any activity that results or is likely to result in an uncontrolled release of hexavalent chromium. If an incidental release of hexavalent chromium (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.

**Employee Exposure** – The exposure to airborne chromium (VI) that would occur if the employee were not using a respirator.

**Engineering Controls** – Employ mechanical means or process redesign to eliminate, contain, divert, dilute, or collect hexavalent chromium emissions at the source. Examples of this type of control include process isolation or enclosure, employee isolation (excluding respirators) or enclosure, closed material handling systems, product substitution or process redesign to eliminate the contaminant, and local exhaust ventilation.

**High-Efficiency Particulate (HEPA) Filter** – A filter that is at least 99.97 percent (%) efficient in removing mono-dispersed particles of 0.3 micrometers (µm) in diameter or larger.

**Historical Monitoring Data** – Hexavalent chromium exposure assessment monitoring data obtained prior to September 19, 2006 (effective date of the hexavalent chromium standard). For the employer to rely on historical data, the data must have been 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.

**Job Safety Analysis (JSA)** – A safety procedure which helps integrate accepted safety and health principles and practices into a task or job operation. In a JSA, each basis step of the job is to identify potential hazards and to recommend the safest way to do the job. A JSA should be completed for critical jobs, tasks, or activities.

**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 employee exposure to chromium (VI) associated with a product or material or a specific process, operation, or activity. The data must reflect workplace conditions closely resembling the process, types of material, control methods, work practices, and environmental conditions in the employer's current operations.

**Physician or Other Licensed Health Care Professional (PLHCP)** – is an individual whose legally permitted scope of practice allows them to independently provide or be delegated the responsibility to provide some or all the health care services required by CALOSHA safety orders.

**Permissible Exposure Limit (PEL)** – No employee shall be exposed to airborne concentration of chromium (VI) more than 5 micrograms per cubic meter of air ( $\mu$ g/m<sup>3</sup>), calculated as an 8-hour time-weighted average (TWA).

**Personal Protective Equipment** – All clothing and other devices worn by a worker to protect against workplace hazards.

**Qualified Person** – A person who, by possession of a recognized degree, certificate, professional standing, or skill, and who, by knowledge, training, and experience, has demonstrated the ability to deal with problems relating to a subject matter, the work, or the project.

**Regulated Area** – An area, demarcated by the employer, where an employee's exposure to airborne concentrations of hexavalent chromium exceeds, or can reasonably be expected to exceed, the PEL.

**Time Weighted Average (TWA)** – an employee's average airborne exposure in any 8-hour work shift of a 40-hour work week which shall not be exceeded.

**Ventilation** – The changing of air within a compartment by natural or powered means.

#### IV. Responsibilities

#### A. Risk Management

Risk Management is responsible for administration of this program, including but not limited to:

- Monitoring overall effectiveness of the program.
- Providing training to affected District staff.
- Providing technical assistance to District staff and contractors.
- Providing industrial hygiene evaluations for District activities with the potential for hexavalent chromium exposure.
- Verifying required inspections, tests and recordkeeping functions have been performed.
- Reviewing and updating the program at least annually, or as needed.

#### B. Supervisors

Supervisors or designees are responsible for implementation of this program, including but not limited to:

- Ensure that each employee exposed to hexavalent chromium has appropriate general awareness training.
- Ensure that employees conduct work in compliance with this procedure.
- Evaluate work locations periodically for changes in hazards that may require modification to this procedure.
- Ensure that all equipment and PPE required by this procedure is available to employees always.

#### C. Employees

Employees, including contractor personnel, are responsible for the following:

• Shall complete hexavalent chromium awareness training as required by this program.

- Shall follow all safety rules, policies, procedures, and specific requirements regarding exposure to hexavalent chromium.
- Shall inspect protective equipment before use to ensure the equipment will provide the proper protection.
- Shall utilize protective equipment, include local exhaust ventilation systems where required by this program.
- Shall inform supervision of tasks that cannot be performed safely.
- Shall request additional safety equipment and/or other equipment from supervision as needed to ensure ongoing compliance with this procedure.
- Shall wear required PPE in accordance with the PPE hazard assessment and/or JSA.
- Maintain, inspect, and store equipment and PPE as specified by the manufacturer.
- Shall immediately report incidents, near misses, or hazards that may result in exposure to hexavalent chromium.

## V. Exposure Determination

No employee shall be exposed to an airborne concentration of hexavalent chromium more than the permissible exposure limit (PEL), which is 5 micrograms per cubic meter of air  $(5 \ \mu g/m^3)$  calculated as an 8-hour time-weighted average (TWA). As such, requirements of this program will be implemented when an action level of 2.5 micrograms per cubic meter of air (2.5  $\mu g/m^3$ ), calculated as an 8-hour time-weighted average (TWA), is exceeded.

OC San will conduct exposure assessments for District staff with possible exposure to hexavalent chromium. The assessments will be performed to identify and prevent overexposures, collect exposure data for selection of control methods, and evaluation for the overall effectiveness of those methods. Contractors are responsible for the assessment of their employees.

The exposure determinations can be completed either through scheduled monitoring or performance-oriented monitoring, which are described below.

#### A. Scheduled Monitoring

Scheduled monitoring is performed by collecting personal breathing zone air samples from a representative number of personnel in each job classification of each work area where exposure to hexavalent chromium may exist. The sampling shall be representative of a full shift to determine the 8-hour time-weighted average (TWA). Results of initial monitoring will determine frequency of periodic monitoring.

1. Initial Determination

Workplaces or work operations with the potential for exposure to hexavalent chromium will be monitored to determine if exposure to hexavalent chromium is at or above the action level. This determination will be made as by a qualified industrial hygienist as part of the respiratory hazard assessment. If initial monitoring results are below the action level, no further monitoring is required unless changes in workplace result in new or additional exposures. Engineering controls and work practices resulting in results below the action level shall continue. If initial monitoring results are at or above the action level, periodic monitoring shall be performed, including but not limited to, a review of engineering controls and work practices.

2. Periodic Monitoring

Periodic monitoring will be performed at the following frequencies if initial results are at or above the action level:

- If initial monitoring results are above or at action level, monitoring shall be performed every 6 months thereafter.
- If monitoring results are above the PEL, monitoring shall be performed every 3 months.
- If the periodic monitoring reveals that employee exposures have been reduced below the action level because of applied engineering controls or work practices, and confirmed by monitoring conducted at least 1 week apart, monitoring may be discontinued.

Additional sampling shall be performed when workplace changes, which can include alteration in process, raw materials, equipment, personnel, work practices, control methods used, or when the employer has any reason to believe that new or additional exposures have occurred.

All exposure monitoring results collected for District staff will be retained by Risk Management.

B. Performance Oriented Monitoring

Performance oriented monitoring utilizes a combination of air monitoring data (i.e., data obtained from initial and periodic monitoring, historical monitoring data, or object data sufficient to accurately characterize employee exposure to hexavalent chromium) to determine employee exposures.

When using this method, the exposure determination must be performed prior to the start of the work operation. Employers are required to reevaluate employee exposures when there is a change in the process, materials, equipment, personnel, work practices or control methods. The determination for performance-oriented monitoring must be documented in writing.

C. Accuracy of Measurement

Sampling methods employed for scheduled and performance-oriented monitoring shall measure hexavalent chromium with an accuracy of plus or minus 25 percent and produce accurate measurements within a statistical confidence level of 95 percent for air concentrations at or above the action level. The sampling methods must also be approved by the Occupational Safety and Health Administration (OSHA), OSHA ID-215 and the National Institute for Occupational Safety and Health (NIOSH), NIOSH 7600.

Affected employees or designated representatives reserve the right to observe any monitoring performed. Work area shall be delineated and use of personal protective equipment will be required when entering work area.

# D. Extended Work Shifts

Adjustment of the PEL for extended work shifts may be required. To minimize errors and assumptions associated with fluctuations in exposure, representative full-shift sampling shall be performed. Monitoring results for employees working more than 8 hours in each workday will be time-weighted accordingly. The 8-hour time-weighted average (TWA) will be calculated using the following formula:

8-hour TWA = 
$$[(C_1) (T_1) + (C_2) (T_2) + ... + (C_n)(T_n)] / 8$$

where T is the duration in hours of the exposure at concentration C; 8 is used as the denominator regardless of total hours worked.

## VI. Employee Notification

Employees shall be notified within 5 working days after the receipt of monitoring results. The notification shall be made in writing by posting results in a location accessible to all affected employees or notified individually.

Whenever the results indicate that the representative employee exposure, without regard to respirators, is at or above the PEL, the written notification shall include a description of the corrective action taken being taken to reduce employee exposure to or below the PEL.

#### VII. Methods of Compliance

#### A. Engineering Controls and Work Practice Controls

Engineering and work practice controls shall be used to reduce and maintain employee exposure to hexavalent chromium below the PEL, except where it can be demonstrated that such controls are not feasible. When feasible engineering controls are not sufficient to reduce employee exposure to or below the PEL, respiratory protection shall supplement the engineering controls used. Job rotation is not permitted to maintain compliance with the PEL. Engineering controls may include:

- 1. Substitution Using a less toxic material or substituting a process that results in lower exposures for another type of process that results in higher exposures.
- 2. Isolation Enclosing the source of exposure or placing a barrier between employees and the source of exposure.
- 3. Ventilation Local exhaust systems that capture airborne hexavalent chromium near its source and removing it from the workplace, or general ventilation that dilutes hexavalent chromium concentrations by circulating large quantities of air. The exhaust system shall be designed and operated to prevent harmful exposure by maintaining a volume and velocity of exhaust air sufficient to gather dusts, fumes, mists, vapors, or gases. The local exhaust ventilation shall provide a minimum air velocity of 100 lineal feet per minute in the welding zone. Ventilation systems shall be frequently inspected and maintained per manufacturer recommendations. Flow rate will be verified on an annual basis completed by compliance group.

Work practice controls involve adjustments in the way a task is performed. In most cases, work practice controls will compliment an engineering control. Work practice controls will include periodic inspections and maintenance, work scheduling and duration of tasks.

#### B. Respiratory Protection

Respiratory protection shall be used when engineering and work practice controls cannot reduce employee exposures to within the PEL. Respirators shall be tight-fitting, air-purifying type. Respirators are required during:

- Periods necessary to install or implement feasible engineering and work practice controls.
- Work operations, such as maintenance and repair activities for which engineering, and work practice controls are not feasible.

- Work operations for which an employer has implemented all feasible engineering and work practice controls and such controls are not sufficient to reduce exposures below the PEL.
- Work operations where employers are exposed above the PEL for less than 30 days per year and the employer has elected to not implement engineering or work practice controls to reduce exposures below the PEL.
- Emergencies (i.e., uncontrolled release) that result in significant and unexpected exposures.

Respiratory protection must be used in accordance with the OC San Respiratory Protection Standard (SOP-109). For additional information, please refer to SOP-109.

C. Protective Work Clothing and Equipment

Employees shall wear protective clothing and equipment to protect against skin and eye contact from hexavalent chromium. Protective clothing and equipment may include, but is not limited to, gloves, aprons, uniforms or coveralls, foot coverings and goggles.

Contaminated clothing shall be removed at the end of the work shift or completion of tasks involving hexavalent chromium exposure, whichever comes first. No employee shall remove contaminated clothing or equipment from the workplace, except for laundering, cleaning or disposal of such clothing and equipment.

Contaminated protective clothing, which is to be disposed of, will be placed in a labeled and closed container in the area immediately adjacent to the hexavalent chromium task area, which prevents dispersion of hexavalent chromium outside the container.

Removal of hexavalent chromium from protective clothing or equipment by blowing, shaking, or any other means, which disperses hexavalent chromium into the air is strictly prohibited.

D. Housekeeping

Surfaces within the regulated area shall be maintained as free as practicable of accumulations of hexavalent chromium. Surfaces shall be HEPA vacuumed and/or wet wiped on a periodic basis. Floors and other surfaces shall not be cleaned using compressed air.

Shoveling, dry or wet sweeping, and brushing may be used only where HEPA vacuuming or other equally effective methods have been tried and found not to be effective.

Where HEPA vacuuming methods are selected, the vacuums shall be used and emptied in a manner which minimizes the reentry of hexavalent chromium into the workplace.

E. Hygiene Areas and Practices

Changing areas, washing facilities and break areas shall be provided to personnel exposed to hexavalent chromium at or above the action level.

Change rooms shall be provided where employees must change out of their street clothes to use protective clothing and equipment required by this program. The change room shall be equipped with separate storage facilities (i.e., lockers) for protective clothing and equipment and for street clothes, and these facilities shall prevent cross-contamination. Change rooms not only provide privacy to employees while changing their clothes but also avoids potential

contamination of an employee's car or home. Change rooms are only required where removal of street clothes is necessary.

Readily accessible washing facilities capable of removing hexavalent chromium from the skin shall be provided where skin contact occurs. The washing facilities must conform to OSHA's sanitation regulations (Title 8 CCR 3364). Personnel shall wash their hands and face at the end of the work shift and prior to eating, drinking, smoking, chewing tobacco or gum, applying cosmetics, or using the toilet. Shower facilities are located at both Plant 1 and Plant 2 Maintenance Buildings.

Eating, drinking, and smoking is only permitted in designated and approved areas that are free as practical from hexavalent chromium. Employees shall not enter break areas with protective work clothing or equipment unless decontaminated using methods that do not disperse hexavalent chromium into the air.

#### F. Regulated Areas

Regulated areas shall be established wherever exposure to airborne concentrations of hexavalent chromium is or can reasonably be expected to exceed the PEL.

Regulated areas shall be demarcated from the rest of the workplace in a manner that adequately establishes and alerts employees of the boundaries of the regulated area. Demarcation must include warning signs and barricades, caution tape, textured flooring, or any equally effective method. Warning signs shall include the following information:

#### DANGER HEXAVALENT CHROMIUM CARCINOGEN CAN CAUSER LUNG AND KIDNEY DISEASE AUTHORIZED PERSONNEL ONLY

Only authorized persons are permitted to be within the regulated area. Regulated areas must only be established for the duration of the task or activity in which exposure to hexavalent chromium exists.

Persons authorized to work within the regulated area shall be trained to administer engineering controls and wear required personal protective equipment. No employee is permitted to eat, drink, smoke, chew tobacco or gum, or apply cosmetics in a regulated area. Products that can be eaten, smoked etc. shall not be stored in the regulated area.

#### VIII. Medical Surveillance

Employees who are or may be occupationally exposed at or above the action level for 30 or more days per year, experience signs or symptoms of adverse health effects or exposed in an emergency to hexavalent chromium shall be included in a medical surveillance program. Medical surveillance shall be provided at no cost to the employee.

Medical examinations and procedures shall be performed by or under the supervision of a physician or other licensed health care professional (PLHCP). Medical evaluations shall be provided:

- Within 30 days after initial assignment unless chromium related medical examination has already been provided to the employee within the last 12 months.
- Annually.

- Whenever the employee shows signs or symptoms of the adverse health effects associated with hexavalent chromium exposure.
- At termination of employment unless the last examination was performed within 6 months prior to the date of termination.

Medical examinations shall include medical and work history, physical examination of skin and respiratory tract, and any additional tests deemed appropriate by the examining PLHCP.

The employer shall provide to the PLHCP a description of the affected employees former, current, and anticipated job duties and levels of exposure, personal protective equipment, and records of employee-related medical examinations as it relates to hexavalent chromium. The employer shall provide a copy of the written medical opinion to the examined employee within two weeks after receiving it.

# IX. Training

Employees engaged in welding activities or those that work in a regulated area where hexavalent chromium is generated, shall be appropriately trained. Training will be provided annually for employees exposed to hexavalent chromium. Training shall be documented and include the following at a minimum:

- The health hazards associated with hexavalent chromium exposure.
- The quantity, location, manner of use, release, and storage of hexavalent chromium in the workplace and the specific nature of operations that could result in the exposure of hexavalent chromium, especially exposure above the PEL.
- The engineering controls and work practices associated with the employee's job assignment.
- The measures employees can take to protect themselves from exposure to hexavalent chromium, including modification of such habits as smoking and personal hygiene, the specific procedures the employer has implemented to protect employees from exposure to hexavalent chromium such as appropriate work practices, emergency procedures, and the provision of person protective equipment.
- The purpose, proper selection, fitting, proper use and limitations of respirators and protective clothing.
- The purpose and a description of the medical surveillance program required by the standard.
- The employee's right of access to records.
- Access to information and training materials.

# X. Mandatory Requirements for District Staff

Risk Management has conducted various exposure assessments for hexavalent chromium over the last several years. The air monitoring results indicate, without regards to respiratory protection, results greater than the permissible exposure limit. Therefore, District staff engaged in welding, grinding, or cutting on stainless steel, galvanized steel or chrome plated materials must adhere to the following requirements:

- Employee shall receive training for exposure to hexavalent training.
- Employee shall receive medical clearance and be fit tested for the appropriate respirator used to protect against exposure to hexavalent chromium.
- Employee shall delineate work area at least 15 feet in all directions to keep other employees away.

- Employee shall wear PPE in accordance with the PPE hazard assessment and job safety analysis (JSA), which includes respiratory protection and OC San issued uniforms.
- Employee shall use local exhaust ventilations when working indoors, confined spaces or outdoor locations with poor natural ventilation. The ventilation units shall be maintained and operated per manufacturer instructions.
- Employee shall perform housekeeping in accordance with this program.

## XI. Recordkeeping

### A. Exposure Monitoring Data

Records of air monitoring data will be retained by the Risk Management Division. Results of the air monitoring will be incorporated into the Industrial Hygiene database. Air monitoring records will include the following information at a minimum:

- The date of measurement for each sample.
- The operation being monitored.
- Sampling and analytical methods used.
- Number, duration, and results of samples collected.
- Type of personal protective equipment, such as respirators worn.
- Name, employee number and job classification for employees monitored.

Employee exposure records shall be preserved and maintained for at least 30 years, except for background data, such as laboratory reports and worksheets, only need to be retained for 1 year if the sample results, sampling plan, description of analytical methods, and summary of the other background data relevant to interpretation of the results are retained for 30 years.

## B. Historical Monitoring Data

Employers relying on historical monitoring data to determine exposure to hexavalent chromium shall establish and maintained accurate records for data relied upon. The record shall include the following information:

- Data collecting using methods that meet accuracy requirements.
- Processes and work practices that were used when historical monitoring data was obtained.
- Characteristics of the material containing hexavalent chromium being handled when historical monitoring data was obtained, and verification the material is the same.
- Environmental conditions prevailing when the historical monitoring data was obtained and that the conditions are the same as those for which the exposure is being determined.
- Other relevant data to the operations, materials, processing, or employee exposures covered by the exception.

## C. Objective Monitoring Data

Employers relying on objective monitoring data shall maintain an accurate record of all objective data relied upon, including the following:

- Chromium containing material in question.
- Source of objective data.
- Testing protocol and results of testing, or analysis of material for release of hexavalent chromium.

- A description of the process, operation, or activity and how the data supports the determination.
- Other relevant data to the process, operation, activity, material, or employee exposures.

#### D. Medical Surveillance Program Removal

Risk Management will establish and maintain an accurate record for each employee removed from the medical surveillance program regarding exposure to hexavalent chromium. The record shall include:

- The name, employee number, social security number and job classification of the employee.
- The date on each occasion that the employee was removed from current exposure to hexavalent chromium, as well as the corresponding date on which the employee was returned to his or her former job status.
- A brief explanation of how the removal was or is being accomplished; and
- A statement indicating the reason for the removal.

Medical records shall be maintained for the duration of the employee's employment plus 30 years.

#### E. Availability

Environmental monitoring, medical removal, and medical records required by this paragraph shall be provided upon request to employees, designated representatives, and regulatory officials. Medical removal records shall be provided in the same manner as environmental monitoring records.

## XII. References

Injury and Illness Prevention Program

SOP-102, Personal Protective Equipment

SOP-109, Respiratory Protection Program

SOP-118, Hot Work Program

Title 8, California Code of Regulations, Article 4, Dusts, Fumes, Mists, Vapors, and Gases, Section 1532.2, Chromium (VI)

Title 8, California Code of Regulations, Article 107, Dusts, Fumes, Mists, Vapors and Gases, Section 5141, Control of Harmful Exposure to Employees

Title 8, California Code of Regulations, Article 107, Dusts, Fumes, Mists, Vapors and Gases, Section 5143, General Requirements for Mechanical Ventilation Systems

Title 8, California Code of Regulations, Article 107, Dusts, Fumes, Mists, Vapors and Gases, Section 5144, Respiratory Protective Equipment

Title 8, California Code of Regulations, Article 107, Dusts, Fumes, Mists, Vapors and Gases, Section 5150, Ventilation and Personal Protective Equipment Requirements for Welding, Brazing and Cutting

Title 8, California Code of Regulations, Article 107, Dusts, Fumes, Mists, Vapors and Gases, Section 5152, Ventilation and Personal Protective Equipment Requirements for Grinding, Polishing, and Buffing Operations

Title 8, California Code of Regulations, Article 107, Dusts, Fumes, Mists, Vapors and Gases, Section 5155, Airborne Contaminants

Title 8, California Code of Regulations, Article 110, Regulated Carcinogens, Section 5206, Chromium (VI)

Title 29, CFR, Subpart Z, Standard 1910.1026, Chromium (VI)

#### XIII. Revision History

Version	Date	Ву	Reason
1.0	07/08/2010	Huynh, Cindy	New
2.0	11/02/2020	Frattali, John	Periodic Update – Refer to Program Change Log
3.0	12/07/2021	Lam, Brian	Annual Program Update – Refer to Program Change Log