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Chromium VI

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I. Purpose.

The purpose of this directive is to provide guidelines and establish uniform inspection and compliance procedures for Chapter 296-62 WAC, Part I-2, the occupational exposure rule for hexavalent chromium, also known as chromium (VI).

II. Scope.

This directive applies to all DOSH staff and operations statewide.

III. References.

- Chapter 296-62 WAC, Part I-2, General Occupational Health Standards, Hexavalent Chromium.
- Chapter 296-841 WAC, Airborne Contaminants,
- WAC 296-841-20025, Permissible Exposure Limits (PELs)
- Chapter 296-304 WAC, Shipbuilding, Ship Repairing, and Shipbreaking
- WAC 296-304-040, Welding, Cutting and Heating

IV. Background.

OSHA issued three new Chromium (VI) standards, 29 CFR 1910.1026, 29 CFR 1926.1126, and 29 CFR 1915.1026, that lowered the permissible exposure limit (PEL) by a factor of 10 to 5 micrograms of Cr(VI) per cubic meter of air (5 $\mu\text{g}/\text{m}^3$) as an 8-hour time-weighted average (TWA). In addition, the standards established an action level for airborne concentrations of hexavalent chromium at 2.5 $\mu\text{g}/\text{m}^3$.

Prior to the issuance of the three substance-specific standards, enforcement of occupational exposures to hexavalent chromium was based on three general Air Contaminants standards, 29 CFR 1910.1000 Air Contaminants, 29 CFR 1915.1000 Air Contaminants, and 29 CFR 1926.55 Gases, Vapors, Fumes, Dusts, and Mists. The three Air Contaminants standards formerly listed the PEL for airborne chromic acid and chromates, as 100 $\mu\text{g}/\text{m}^3$ of CrO_3 , which is chemically equivalent to 52 $\mu\text{g}/\text{m}^3$ of hexavalent chromium.

The PEL for chromic acid and chromates in the general industry standard was a ceiling limit, while the PEL in the construction and shipyard standards was an 8-hour TWA. These three Air Contaminants standards also formerly listed a ceiling PEL for airborne tert-Butyl chromate, an organic Cr(VI) compound, as 100 $\mu\text{g}/\text{m}^3$ of CrO_3 . All these Cr(VI) entries in the Air Contaminants standards have now been changed (by the Final Rule for Hexavalent Chromium) to reference the new applicable Cr(VI) standards.

States were required to adopt standards at least as effective as OSHA's new Cr(VI) standards, and DOSH filed an expedited rule package in December 2006 for this purpose. The state of Washington adopted Chapter 296-62 WAC, Part I-2, *Hexavalent Chromium*.

V. Inspection and Enforcement Procedures.

A. Scope.

1. Exposure to hexavalent chromium is covered by Chapter 296-62 WAC, Part I-2 in the General Occupational Health Standards. The standard applies to occupational exposures to Cr(VI), that is, any chromium species with a valence of positive six, regardless of its form or compound. DOSH considers all Cr(VI) compounds to be carcinogenic. The primary intent of the DOSH standard is to protect employees from lung cancer resulting from inhalation of Cr(VI).

In addition to lung cancer, Cr(VI) is also capable of causing airway sensitization or asthma, nasal ulcerations and septum perforations, skin sensitization or allergic contact dermatitis, irritant contact dermatitis and skin ulcerations, and eye irritation.

For more information on Cr(VI) health effects, see Chapter 296-62, Part I-2, plus the DOSH website's A-Z Safety and Health Topics Page on Hexavalent Chromium, and OSHA's, Small Entity Compliance Guide for the Hexavalent Chromium Standards, OSHA Publication 3320-10N, 2006. See also, the NIOSH website's page on Hexavalent Chromium.

Typical industries/operations with potential Cr(VI) exposures include:

- Electroplating
- Manufacturing of pigments and dyes
- Welding
- Foundry operations
- Spray painting
- Paint removal (abrasive blasting, grinding, needle gun, etc.)

See Appendix A for specific examples of Cr(VI) compounds and typical industries/operations with Cr(VI) exposures. As chromium compounds were used in dyes and paints and in the tanning of leather (although hexavalent chromium is no longer typically used in the leather tanning industry), these compounds are often found in soil and groundwater at former or abandoned industrial sites, and may be targeted contaminants for environmental remediation at Brownfields and Superfund sites. Primer paint containing hexavalent chromium is still widely used for aerospace and automobile refinishing applications.

Welders represent nearly half of the employees covered by these standards. A welder's exposure to hexavalent chromium may occur from inhalation of fumes when performing "hot work" such as welding, brazing, or torch-cutting stainless steel or other chromium-containing metals. In these situations the chromium is not originally hexavalent, but the high temperatures involved in the process result in oxidation that converts the

chromium to a hexavalent state in the fume. Stainless steels, in general, have 12-30% chromium content.

2. Table 1 shows **exclusions** from the standard.

Table 1 Exclusions in the Chromium (VI) Rules WAC 296-62-08003	
Specific Exclusion	Work Operations
Exposures in work applying pesticides containing Cr(VI).	Manufacture of pressure-treated wood with chromated copper arsenate (CCA) and acid copper chromate (ACC).
Exposures in work with portland cement.	Manufacture of portland cement; mixing cement; working wet concrete, mortar, grout, bricklaying; cutting and hammering concrete; cement plant; cinder block manufacturing.
Where an employer has objective data showing a work operation cannot release dusts, fumes, or mists of Cr(VI) in concentrations at or above 0.5 µg/m ³ as an 8-hour TWA under any expected conditions of use.	See examples in corresponding section of text, below.

a. **Inspection Procedures for Operations with Cr(VI) Pesticides**

The standard does **not** apply to exposures to Cr(VI) in the **application** of pesticides for wood treatment, such as chromated copper arsenate (CCA) and acid copper chromate (ACC). Application of pesticides is instead regulated by the Environmental Protection Agency.

The standard applies where Cr(VI) exposures occur either in the manufacture of Cr(VI) pesticides **or** while using or otherwise handling wood products treated with Cr(VI) pesticides. The standard would also apply to employees working adjacent to or inside work areas where Cr(VI) pesticides are being or have recently been applied.

OSHA’s exposure profile for woodworking indicated that construction work using wood treated with pesticides containing Cr(VI) involved Cr(VI) exposures above the new PEL (up to 30 percent exceeded the PEL). The compliance officer should also remember that CCA is a common wood preservative chemical, which contains both Cr(VI) and inorganic arsenic, each regulated by a substance-specific standard.

Where a compliance officer encounters operations involving applications of Cr(VI) pesticides to wood products, and there are concerns about compliance with environmental regulations, a referral to the Washington State Department of Ecology may be made.

b. Inspection Procedures for Operations with Portland Cement

DOSH's Cr(VI) standard does **not** apply to operations with portland cement because compliance with pre-existing DOSH general standards provides adequate protection for employees exposed to the trace amounts of Cr(VI) found in portland cement. The applicable DOSH standards are those for air contaminants, personal protective equipment, sanitation, and hazard communication. Chapter 296-841 WAC, *Air Contaminants*, already lists a PEL for portland cement that effectively limits Cr(VI) exposures from Cr(VI)-contaminated cement to levels below the new Cr(VI) PEL.

Portland cement is one of the most widely-used formulations of cement in construction and the occupational health hazards are generally well known. These include inhalation, dermal, and eye hazards, some of which result from trace constituents generally found in portland cement, including hexavalent chromium (Cr(VI)). Cr(VI) is a trace constituent of portland cement not because it is an added ingredient but because it is a contaminant that enters the mixture during its manufacture. Generally there is less than 20 µg Cr(VI) per gram of cement, or 20 parts per million (ppm).

Whenever performing an inspection where there **are** exposures to portland cement, such as a construction site, a cement plant, or cinder block manufacturing facility, the compliance officer shall determine the employer's compliance with the applicable existing standards for air contaminants, personal protective equipment, general hygiene, and training. This explains how these standards, and DOSH's recordkeeping regulations, are enforced at workplaces, primarily construction workplaces, where employees are exposed to portland cement.

A one-page checklist is included in Appendix B to assist compliance officers in these inspections.

c. Inspection Procedures for Operations with Objective Data

This standard does **not** apply where the employer has objective data demonstrating that a material containing chromium or a specific process, operation, or activity involving chromium cannot release dusts, fumes, or mists of Cr(VI) in 8-hour TWA concentrations at or above 0.5 µg/m³ under any expected conditions of use. When this

provision applies, the material, process, operation, or activity shown not to result in Cr(VI) exposures above the 0.5 µg/m³ threshold falls outside the scope of the Chromium (VI) standards. This exemption from the scope of the standard is based on **total** Cr(VI) exposures from all sources, and must take into account all conditions that may add or contribute to the employees' overall exposure levels.

Compliance officers presented with an employer claiming exclusion from the standard on the basis of objective data shall determine sufficiency by evaluating whether the data meet the standard's three key requirements as follows:

- (1) The data must demonstrate that a material containing chromium or a specific process, operation, or activity involving chromium cannot release dusts, fumes, or mists of Cr(VI) in 8-hour TWA concentrations at or above 0.5 µg/m³ under any expected conditions of use.

“Any expected conditions of use” refers to situations that can reasonably be foreseen. For instance, variation in exposures even in well controlled workplaces requires that typical exposures be below 0.25 µg/m³ in order for an employer to be reasonably sure that exposures will consistently be below 0.5 µg/m³. An industry survey showing typical exposures below 0.25 µg/m³ might be used to show that exposures for a given operation would be below 0.5 µg/m³ under any expected conditions of use.

- (2) 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.

For example, if an employer's objective data indicate that a Cr(VI) welding process that uses argon as an inert shielding gas does not release Cr(VI) in concentrations exceeding 0.5 µg/m³, but the compliance officer finds that the employer's current welding process uses carbon dioxide as the shielding gas (which is known to produce far higher amounts of welding fume), then this requirement is not met.

As another example, if an employer's objective data indicate that a process that burns fuel, such as coal, with some specified trace amount of Cr(VI), does not release Cr(VI) in concentrations exceeding 0.5 µg/m³, but the data only considered fuel supplied from a specific vendor or from a limited locale, and the compliance officer learns that the employer is currently using fuel obtained from a different vendor or locale, and there is knowledge or reason

to suspect the amount of Cr(VI) contamination in this fuel is significantly greater, then this requirement is not met. (See also the definitions in section B.3.c., for additional clarification of the phrase “closely resembling.”)

- (3) The data must be sufficient to accurately characterize employee exposures to Cr(VI), that is, the data must provide the same degree of assurance that employee exposures have been correctly characterized as air monitoring would.

When a compliance officer determines that an employer’s objective data meet the above requirements and appear sufficient to support its determination that the facility and/or construction operation is exempt from the Cr(VI) standard, the compliance officer is not required to collect any air samples to confirm the objective data.

If the compliance officer determines that the employer’s objective data fail to meet any of the above requirements, then air sampling shall be performed to evaluate Cr(VI) exposures. If air sample results identify Cr(VI) exposures, then the compliance officer shall cite, at a minimum, a violation of (d)(3) because the employer’s objective data were not “sufficient to accurately characterize employee exposure to Cr(VI).” Additional violations may be citable, depending on what level of Cr(VI) exposure is found. See Sections C and D, below, for further inspection and citation guidelines for air sampling and exposure determinations.

Operations Excluded with Objective Data

The Cr(VI) standards do not apply where the employer has objective data demonstrating that a material containing chromium or a specific process, operation, or activity involving chromium cannot release dusts, fumes, or mists of Cr(VI), under any expected conditions of use, in concentrations at or above 0.5 $\mu\text{g}/\text{m}^3$.

As an example, the employer may have objective data in the form of documentation from an industry group or trade association showing that the Cr(VI) fraction of workplace dusts would be such that compliance with the PEL for nuisance particulates of 10 mg/m^3 yields an airborne exposure to Cr(VI) below the exclusion criterion of 0.5 $\mu\text{g}/\text{m}^3$.

A similar example could involve an employer performing remediation of Cr(VI)-contaminated soil, like Model Toxics Control Act, Brownfield, or Superfund cleanup. If the employer

has soil sampling data that reasonably characterize the Cr(VI) concentrations within the soil as less than 30 parts per million, and the employer has previously monitored the employees' airborne dust exposures at this worksite under all expected conditions of soil remediation work and determined with 95% confidence and +/- 25% accuracy that employee exposures to total dust do not exceed the PEL of 10 mg/m³ (reference WAC 296-841-20025, Table 3, particulates not otherwise regulated, total dust), then the employer may perform an exposure determination for airborne Cr(VI) by multiplying the soil Cr(VI) concentration by the maximum total airborne dust exposures, yielding maximum Cr(VI) exposures that do not exceed 0.3 µg/m³.

See subsections D.2, and M.4-5, in this section for specific enforcement procedures if the employer's objective data are absent or inadequate.

B. Definitions.

1. Chromium (VI) [hexavalent chromium or Cr(VI)] means chromium with a valence of positive six, in any form or chemical compound in which it occurs. This term includes Cr(VI) in all states of matter, in any solution or other mixture, even if encapsulated by other substances. The term also includes Cr(VI) created by an industrial process, such as when welding of stainless steel generates Cr(VI) fume. See Appendix A for examples of Cr(VI) compounds and typical industries/operations with Cr(VI) exposures.
2. All other definitions in the standard are for terms previously used by DOSH in other health standards, and the terms are similarly defined and used. These terms include "action level," "emergency," "high-efficiency particulate air (HEPA) filter," "historical monitoring data," "objective data," and "regulated area."
3. For two of the terms listed above, "historical monitoring data" and "objective data," while their definitions are technically the same as in other DOSH standards, they have broader application in the Cr(VI) standard.
 - a. Historical monitoring data means data from chromium (VI) monitoring conducted prior to July 31, 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.
 - b. Objective data means 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 employee exposure to Cr(VI) associated with a particular product or material or a

specific process, operation, or activity. As with historical monitoring data, the objective 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. Objective data demonstrate the Cr(VI) exposures associated with a work operation or product under the range of expected conditions of use. For example, data collected by a trade association from its members may be used to determine exposures to Cr(VI) provided the data meet the definition of objective data in the standard.

Chapter 296-62 WAC, Part I-2, allows employers to use objective data for two purposes:

- (1) In WAC 296-62-08003, *Scope*, to be exempt from all provisions of the Cr(VI) standard if the employer's objective data show that employee exposures are below $0.5 \mu\text{g}/\text{m}^3$ as an 8-hour time-weighted average (TWA) under any expected conditions of use (note, this is similar to the exemption in the 1,3 Butadiene standard, WAC 296-62-07460); or,
 - (2) In WAC 296-62-08009(3), *Exposure Determination*, to determine employee 8-hour TWA exposures under the *performance-oriented option*, using objective data, historical monitoring data, employee air monitoring data, or any combination thereof. The burden is on the employer to show that the data comply with the requirements.
- c. Closely resembling means circumstances where the major workplace conditions which have contributed to the levels of historic exposure are no more protective than in the current workplace. Similarly, in the Cr(VI) standard, DOSH's intent is to allow data reflecting past exposures to be used to predict current exposures only when the conditions of the earlier job were not more protective, i.e., employees were not better trained, work practices and engineering controls were not used or applied more consistently, and no more supervision was present.

C. Permissible Exposure Limit (PEL).

1. Per WAC 296-62-08007, Chrome VI has an 8-hour TWA permissible exposure limit of $5 \mu\text{g}/\text{m}^3$.
2. Inspection Guidelines. The DOSH compliance officer shall review the employer's air monitoring records, or other data used by the employer to characterize exposures, to determine what levels might be expected before entering the work area. If review of the employer's air monitoring records shows that overexposures have occurred, then the compliance officer shall document these overexposures by obtaining copies of the employer's

exposure data, plus any related attachments or separate documents, such as laboratory analytical results or chain of custody sample forms, and placing them into the case file.

- a. If the compliance officer believes that the employer's exposure data may not be representative (i.e., new or different operations are occurring in the workplace that do not closely resemble the operations represented by the employer's exposure data), or if there are no exposure data, and operations may be likely to exceed the PEL, the compliance officer shall collect personal samples to measure the 8-hour TWA for one or more of the Cr(VI) operations likely to exceed the PEL. A violation is established if the measured exposure exceeds the PEL after applying corrections for possible sampling and analytical error (SAE) and applying a 95 percent confidence limit. The compliance officer shall document Cr(VI) exposures by ensuring that all available exposure data – whether provided by the employer or obtained during the inspection – are copied to the case file.

Cr(VI) air sampling procedures may be found through the web page of the DOSH Lab. If air samples are not properly handled in accordance with Lab instructions, then errors may occur due to interferences and/or the high reduction potential of Cr(VI). Unfortunately, there are no colorimetric detector tubes or any other simple devices to quickly and inexpensively screen for airborne Cr(VI). For conventional air sampling and laboratory analysis, DOSH Analytical Method L&I 0005 is specifically designed for hexavalent chromium. This method samples air through a PVC membrane Filter (0.8 or 5 μ m) Media #27 or #37 or 41 (37 mm) or #21 or #39 or 43 (25mm) contained in a polystyrene cassette.

Air samples from chromium electroplating operations should be collected using PVC filters with cellulose back-up pads in polystyrene cassettes. All air samples are to be collected closed face, then capped, sealed with a DOSH sample label, and shipped overnight to the analytical laboratory within 24 hours of sampling. At least one blank sample shall be submitted with each set of samples, making sure that it is from the same lot as the filters used for sampling. The blank cassette shall be handled in the same manner as the sample cassettes except no air should be drawn through it. Sample volume (in liters of air) shall be recorded for each sample and the type of operation sampled shall be identified. It is important to identify the operation because it affects the sample preparation procedure used at the laboratory.

For any air sampling performed by compliance officers, if they must enter a regulated area or other areas where anticipated exposures are above the PEL or expect to have contact with Cr(VI), they shall wear the personal protective equipment and clothing required by the employer or as appropriate for the officer's inspection or sampling activity. Since

compliance officers have no instrumental method for screening airborne concentrations of Cr(VI), they should be conservative about time spent in areas where high concentrations exist or are suspected. Still, when compliance officers are sampling employee exposures, they should frequent the work areas often enough to keep the sampling under surveillance. Also, see Section VI in this directive, for specific policies and precautions to minimize exposures of DOSH personnel.

- b. Since welders represent nearly half of the employees covered by the new Cr(VI) standards, the compliance officer may often have to develop an air sampling strategy for welding operations where Cr(VI) exposures are expected. The compliance officer shall assess the expected contaminants from the operation to be sampled and consider discussing sampling options with the DOSH IH Lab Division. Cr(VI) can be specifically air sampled and analyzed using method L&I 0005, which will contain all sampling information needed.

Welding fumes can be air sampled and analyzed using L&I 0009, however, this method does not distinguish the different valence forms of chromium, such as Cr(VI), in the sampled fume; all forms will simply be identified as chromium metal so the results cannot be used to cite for overexposure to Cr(VI). This method is useful in that with one sample it can distinguish multiple metal elements in the fume, such as iron, lead, and aluminum.

For some workplace exposures involving welding, the DOSH Lab may advise the compliance officer to collect two samples side-by-side, one for Cr(VI) and one for welding fume. When collecting an air sample on a welder wearing a protective helmet, the sampling cassette shall be positioned inside the helmet. If the free space inside the hood precludes the use of a 37-mm diameter cassette and filter, 25-mm diameter sampling filters and cassettes can be used instead. In some cases, a welder's helmet may be integrated into a respirator, such as a hooded, powered air purifying respirator (PAPR). If this is the case, the sampling cassette shall be positioned outside the helmet and respirator assembly.

Note: When placing a sampling cassette for monitoring *abrasive blasting* exposures where an employee is wearing an abrasive blast respirator with hood/helmet, the cassette shall be placed outside of the helmet/hood, i.e., outside the abrasive blasting shroud, but as near as practicable to the employee's breathing zone.

If welding exposures are due to multiple maintenance and repair jobs throughout a worksite, and the employee during a typical work shift performs several welding tasks at different locations on different materials under different conditions, then a representative exposure determination is

more complex. The employer or compliance officer may choose to perform monitoring by collecting a short-term (grab) sample for each welding task performed throughout the day, and then adding these measurements to determine the 8-hour TWA exposure (NIOSH *Occupational Exposure Sampling Strategy Manual*, 1977).

- c. At times, air sampling for Cr(VI) exposures may involve two or more chemicals with potential health effects to similar target organs, e.g., welding stainless steel, cutting structures coated with lead chromate paint, or cutting pressure-treated wood. If two or more chemical exposures are present potentially causing similar effects to the same target organ(s), samples for both chemicals should be collected.

Thus, if an exposure to a chemical mixture is found that includes Cr(VI) and another toxic chemical, and the substances have known additive effects to one or more target organs, the compliance officer shall apply the mixture formula in WAC 296-841-20005.

- d. If the employer has air monitoring data showing either a Cr(VI) or chromate exposure exceeding the PEL, and the employer was not adequately protecting the employees with all feasible engineering and work practice controls and appropriate use of respiratory protection, but it is not practical for the compliance officer to collect air sample(s) to confirm the overexposure (such as upon arrival on site after Cr(VI) exposures occurred during prior construction operations or non-routine tasks), the employer's data may be used to support a violation of the PEL. That violation shall be grouped with any violations of applicable exposure control provisions.

3. Citation Guidelines. Citations for violations of the PEL shall be issued as follows:

When employees are overexposed to both Cr(VI) and any other air contaminant(s), cite each PEL violation, and propose separate penalties. Additionally, where the mixture formula is used and the calculation exceeds unity (i.e., 1.0) but exposures to the individual components do not exceed their PELs, cite only for a violation of WAC 296-841-20005. Employers shall control such mixed exposures using feasible administrative or engineering controls, or protective equipment, as per WAC 296-841-20005(5).

Where the mixture formula exceeds unity, and one or more components of the mixture also exceed their PELs, cite for violations of the mixture provision and the PEL(s), and assess separate penalties for each violation, unless the contribution from the smaller component is less than ten percent of that component's PEL.

D. Exposure Determination.

1. WAC 296-62-08009 requires employers to assess their employees' exposures to Cr(VI). The purposes of requiring an assessment of employee exposures to Cr(VI) include: determination of the extent and degree of exposure at the worksite; identification and prevention of employee overexposure; identification of the sources of exposure to Cr(VI); collection of exposure data so that the employer can select the proper control methods to be used; and evaluation of the effectiveness of those selected methods.
2. WAC 296-62-08009(2) and (3) provide two options for employers to follow in determining employee exposures to Cr(VI). The first option, WAC 296-62-08009(2), the "scheduled monitoring option," requires initial monitoring and periodic monitoring at specific intervals based on monitoring results. This approach is similar to exposure assessment requirements in previous OSHA substance-specific standards. The second option, WAC 296-62-08009(3), the "performance-oriented option," allows employers to use any combination of air monitoring data, historical monitoring data, or objective data to determine employee exposures to Cr(VI).
 - a. If there are any changes in the production process, raw materials, equipment, personnel, work practices, or control methods that may be reasonably expected to result in new or additional Cr(VI) exposures, or when the employer has any reason to believe that new or additional exposures have occurred, then the employer shall perform additional exposure monitoring. These additional determinations are necessary to ensure that results accurately represent existing exposure conditions. This information will enable the employer to take appropriate action to protect exposed employees, such as instituting additional engineering controls or providing appropriate respiratory protection.
 - b. The performance-oriented option allows the employer to determine the 8-hour TWA exposure for each employee on the basis of any combination of air monitoring data, historical monitoring data, or objective data sufficient to accurately characterize Cr(VI) exposures. The employer's exposure determination must provide the same degree of assurance that employee exposures have been correctly characterized as air monitoring would. This option may be useful in certain workplaces, e.g., for Cr(VI) operations that are intermittent, variable, and of short duration, or even for Cr(VI) operations where conditions do not normally change and periodic monitoring would provide little information and no added protection for employees.

Where the employer elects to follow this option, the exposure determination must be performed prior to the time the work operation commences so that the appropriate controls and protective measures can

be implemented to ensure employees will not be overexposed. The employer is also expected to reevaluate employee exposures when there is any change in the production process, raw materials, equipment, personnel, work practices, or control methods that may reasonably be expected to result in new or additional exposures to Cr(VI). However, the employer using this option does not have to follow any particular fixed schedule for performing reevaluations.

Unlike other DOSH substance-specific health standards, the Cr(VI) standards do not limit the use of objective data to show that exposures would be below the action level (e.g., WAC 296-62-07427(2), for cadmium; nor to historical monitoring data obtained only within the previous 12 months (e.g., WAC 296-62-07470(4)(b)(i) for methylene chloride). However, the burden is on the employer to show that the data comply with the requirements of the standard.

- c. Inspection Guidelines. If there is any uncertainty regarding employee exposures during a DOSH compliance inspection, the compliance officer shall conduct personal sampling. Refer to the previous guidance on air sampling under Section A, *Scope*, and Section C, *Permissible Exposure Limits*.

The compliance officer shall review the employer's monitoring data or other data used by the employer to characterize Cr(VI) exposures. The compliance officer must determine whether employers have accurately characterized the exposure of each employee to Cr(VI). In cases where the employer uses air monitoring for exposure determinations, this may entail monitoring of all exposed employees. However, representative exposure sampling is permitted when a number of employees perform essentially the same job under the same conditions. Representative personal sampling for employees engaged in similar work with Cr(VI) exposure of similar duration and magnitude is achieved by monitoring the employee(s) reasonably expected to have the highest Cr(VI) exposures. For example, this may involve monitoring the Cr(VI) exposure of the employee closest to an exposure source. This exposure result may then be attributed to the remaining employees in the group. These samples must include at least one sample characteristic of the entire shift or consecutive representative samples taken over the length of the shift. Where employees are not performing the same job under the same conditions, representative sampling will not adequately characterize actual exposures, and individual monitoring is necessary.

Employers that perform air monitoring must ensure that samples are collected in the employee's breathing zone, i.e., the sampling device is attached to or near the collar or lapel near the employee's face (unless sampling inside a welder's helmet where attachment is made to the

helmet). The compliance officer shall review the time periods for the samples collected, and interview employees to determine whether the sample times were representative of the work hours and whether samples were collected in the employee's breathing zone.

The 8-hour TWA exposure is generally best measured by collecting at least one 8-hour air sample from the representative employee, or by collecting two consecutive 4-hour samples. However, there are some situations, e.g., where multiple and different Cr(VI) exposure tasks are performed throughout the work shift, in which it is more effective to collect a short-term (grab) sample during each task (e.g., see the example for maintenance welding in Section C.2.b, above, and for general guidelines see the NIOSH *Occupational Exposure Sampling Strategy Manual*, 1977).

Although it is preferable to sample between 7 and 8 hours of exposure, if an employee's Cr(VI) exposure is known to be limited to a small portion of the 8-hour work shift, the employer may determine exposure by sampling only during the exposure period and documenting that there was no additional Cr(VI) exposure during the remainder of the employee's work shift.

Alternatively, for any unsampled exposure time (for example, if 7 hours were sampled and 1 hour was unsampled), the employer may assume the same exposure measured by the sampled period also occurred during the unsampled period.

If the compliance officer determines that the employer's assessment of an employee's full shift exposure is inadequate because of insufficient sampling time and/or insufficient documentation, then a violation of the exposure determination provision shall be cited.

If an air sampling filter becomes overloaded with dusts or other air contaminants while sampling, the result will not be valid. To avoid this situation where high loading of the filter is likely (such as when sampling abrasive blasting or paint grinding operations), the employer should conduct the exposure monitoring using consecutive air samples over shorter sampling periods.

Whether an employer used the scheduled monitoring option or the performance-oriented option, the compliance officer shall verify that the employer has performed a new exposure assessment required by WAC 296-62-08009(2)(f) "when there has been any change in production process, raw materials, ... or control methods that may result in new or additional exposures." This provision also requires the employer to make a new exposure assessment when an employee performs a different

operation and/or moves to a different work location unless the original determination considered these changes. The original determination can specify production variables over ranges of anticipated operation for which the determination is valid (NIOSH *Occupational Exposure Sampling Strategy Manual*, 1977). One common example of this is an employer's sampling strategy to use an employee whose exposure is "worst case" or "maximum risk," i.e., an employee expected to have the highest Cr(VI) exposures of all employees represented. If the range of changes of differing operations or work locations is not reasonably anticipated to create exposures higher than the worst-case exposure already determined, then no additional monitoring or exposure determination is required.

- d. Citation Guidelines. If no initial or historic monitoring records exist and the employer does not have objective data (as described in Section B, *Definitions*, above), and employees are exposed to Cr(VI), cite WAC 296-62-08009(1), as applicable.

If the employer is using the scheduled monitoring option, but all samples are area (environmental) samples and not personal samples, or if the employer's personal air samples do not cover the entire Cr(VI)-exposure period or all tasks (without documentation that this is the employee's only exposure to hexavalent chromium), or if the employer's samples are not representative of employees in each work area, WAC 296-62-08009(2)(a) shall be cited.

If the employer states that it is using the scheduled monitoring option, but there is no periodic monitoring being performed, WAC 296-62-08009(2)(c) shall be cited, as applicable.

If there has been a change in the workplace that could result in new or additional Cr(VI) exposures, and the employer has not performed additional exposure determinations, WAC 296-62-08009(2)(f) shall be cited for employers using the scheduled monitoring option, or WAC 296-62-08009(3) shall be cited for employers using the performance-oriented option.

If the employer is using the performance-oriented option and the compliance officer determines that significant differences exist between the historic or objective data and current conditions which could cause the employee(s) exposure(s) to be underestimated (e.g., the data do not meet the criteria in Section B.3.c, above), a violation of WAC 296-62-08009(3) shall be cited.

Also, see Section M, Recordkeeping, below, for inspection and citation guidelines concerning the employer's documentation of its exposure determinations.

3. Paragraph WAC 296-62-08009(4)(a) of the standards requires employers to notify each affected employee of the exposure determination results regardless of the exposure level. Note that employees have access to *all* exposure records under Chapter 296-802 WAC, Employee Medical and Exposure Methods.

Employers shall provide notification of the exposure determination results within 5 working days. Where the employer follows the scheduled monitoring option, the 5 working day period begins when monitoring results are received. For employers following the performance-oriented option, the 5 working day period begins when the determination is made (i.e., prior to the time the work operation begins or when exposures are reevaluated).

Employers shall perform this notification either by providing a personal written communication to each affected employee, or by posting the written exposure determination results in an accessible area. Affected employees who are not scheduled to work at or be near the posting location must be individually notified in writing of their exposure results.

When using the term "affected employees" in this context, DOSH is referring to all employees whose exposure is considered to be represented by the exposure determination. This would include employees who were not actually subject to personal monitoring, but who are represented by an employee who was sampled. Affected employees also include employees whose exposures have been determined on the basis of historical or objective data.

When employee exposure exceeds the PEL, WAC 296-62-08009(4)(c) also requires employers to describe in the written notification the corrective action being taken to reduce employee exposure to or below the PEL.

- a. Inspection Guidelines. The compliance officer shall ask employees whether and when they were given copies of the results of their exposure determination, or when and where the results were posted.
- b. Citation Guidelines. If employees have not seen their exposure determination results within 5 working days, and the employer does not have a dated copy of the letter or posting of the results, WAC 296-62-08009(4)(a) shall be cited. If the employer's written notification did not explain corrective action being taken when the exposure

determination results indicated that employee exposure exceeded the PEL, WAC 296-62-08009(4)(b) shall be cited.

4. WAC 296-62-08009(5) requires employers to use an accurate sampling and analytical method that has the ability to measure Cr(VI) at the action level with at least the required degree of accuracy (+/- 25%). Rather than specifying a particular method that must be used, DOSH allows any method to be used, as long as the chosen method meets the accuracy specifications. One example of an acceptable method of monitoring and analysis is DOSH Method L&I 0005.

NIOSH has developed similar methods, including NIOSH 7600, 7604, 7605, and 7703. These NIOSH methods may meet the accuracy requirements of WAC 296-62-08009(5) when adequate sample volumes are collected and the effects of interferences from other metals are controlled. The International Organization for Standardization (ISO) has also developed a method, ISO 16740:2005, for the measurement of airborne hexavalent chromium.

- a. Inspection Guidelines. The compliance officer shall ask the employer for the analytical report(s) of Cr(VI) air monitoring samples. If a method other than a DOSH method has been used, the compliance officer may consult the DOSH Lab regarding the accuracy of the other method.
 - b. Citation Guidelines. If the laboratory reports indicate that the analytical method does not meet an accuracy of +/- 25% at a confidence level of 95%, then WAC 296-62-08009(5) shall be cited.
5. WAC 296-62-08009(6) provides for observation of monitoring and protection of the observers. This provision is consistent with DOSH's other substance specific health standards. Note that while this provision requires the employer to provide affected employees or their designated representatives with the right to observe monitoring, the observation should not seriously disrupt production or the sampling itself.
 - a. Inspection Guidelines. The compliance officer shall ask affected employees or their designated representative if they were given the opportunity to observe any monitoring of employee exposure.
 - b. Citation Guidelines. If an employee or the employees' designated representative were not given the opportunity to observe monitoring for personal samples, WAC 296-62-08009(6) shall be cited.

E. Regulated Areas (not applicable to construction and shipyard standards).

1. WAC 296-62-08011(1) requires employers to establish regulated areas wherever an employee's exposure to airborne concentrations of Cr(VI) is, or can reasonably be expected to be, in excess of the PEL.

Inspection and Citation Guidelines. Determine whether the general industry employer is complying with the requirement to conduct all Cr(VI) work within regulated areas wherever an employee's exposure to airborne concentrations of Cr(VI) is, or can reasonably be expected to be, in excess of the PEL. If the employer is not complying and cannot demonstrate infeasibility, WAC 296-62-08011(1) shall be cited.

2. The employer may use any method to demarcate the regulated area as long as it effectively warns employees that they are not to enter unless authorized. The employer may use ropes, markings (such as lines, textured flooring, or warning signs), temporary barricades, gates, or more permanent enclosures to demarcate and limit access to these areas.
 - a. Inspection Guidelines. If a general industry employer has established a regulated area, observe the demarcation and persons entering and exiting the area. Determine whether the employer has adequately demarcated a regulated area and whether the demarcation effectively warns employees not to enter unless they are authorized.
 - b. Citation Guidelines. If the employer is not complying with the above requirement to demarcate the regulated area, WAC 296-62-08011(2) shall be cited.
3. Access to the regulated area shall be limited to persons authorized by the employer and required by work duties to be present in the regulated area. This may include maintenance and repair personnel, management, quality control engineers, or other personnel if job duties require their presence in the regulated area. In addition, persons exercising the right to observe monitoring procedures are allowed to enter regulated areas when exposure monitoring is being conducted. Persons authorized under the WISHA Act, such as DOSH compliance officers, are also allowed access.
 - a. Inspection Guidelines. Interview available employees entering and exiting the regulated area to determine if their access is authorized.
 - b. Citation Guidelines. If the employer is not complying with the requirement to limit access to authorized persons, WAC 296-62-08011(3) shall be cited.

F. Methods of Compliance.

1. WAC 296-62-08013(1) establishes the methods which shall be used by employers to comply with the PEL.
 - a. WAC 296-62-08013(1)(a) requires that employers institute effective engineering and work practice controls as the primary means to reduce and maintain employee exposures to Cr(VI) to levels that are at or below the PEL unless the employer can demonstrate that such controls are not feasible. Such controls may not be feasible during some maintenance and repair operations or during emergency operations. Where the employer demonstrates that such controls are not feasible, the standard requires the employer to institute engineering and work practice controls to reduce exposures to the lowest feasible level. The employer is then required to supplement these controls with respiratory protection to achieve the PEL.

Engineering controls include process or contaminant substitution, isolation, and ventilation. Work practice controls involve adjustments in the way a Cr(VI) task is performed, such as periodic inspection and maintenance of process and control equipment. If a particular engineering or work practice control not already implemented is feasible, the control shall be identified as an appropriate abatement method.

- b. WAC 296-62-08013(1)(b) provides a unique exception for the painting of aircraft or large aircraft parts. For these operations, employee exposures shall be reduced to 25 $\mu\text{g}/\text{m}^3$ or less using engineering and work practice controls. Respiratory protection shall then be used to achieve the PEL. The term “aircraft or large aircraft parts” refers to the interior or exterior of assembled aircraft, and to wings, tail sections, control surfaces (e.g., rudders, elevators, and ailerons), or comparably sized aircraft parts.
- c. Inspection Guidelines. The compliance officer shall observe employees using (or ask the employer to describe and/or demonstrate) the engineering controls and/or work practice controls to ensure that the controls are present and appropriate. If exposures are still over the PEL (or 25 $\mu\text{g}/\text{m}^3$ for aircraft painting), and the employer claims additional engineering or work practice controls are infeasible, the burden is on the employer to support a claim of infeasibility. The employer should provide information specific to the particular operation that is relevant to its claim of infeasibility.
- d. Citation Guidelines. If the employer’s engineering and work practice controls are not reducing employee exposures to or below the PEL (or 25 $\mu\text{g}/\text{m}^3$ for aircraft painting), and additional engineering and work practice controls are feasible, then WAC 296-62-08013(1)(a) shall be cited and grouped with the PEL violation, WAC 296-62-08007.

- e. WAC 296-62-08013(1)(c) provides an exception to the general requirement for primary reliance on engineering and work practice controls for processes or tasks that do not result in employee exposures above the PEL for 30 or more days per year (during 12 consecutive months). Thus, if a process or task causes employee exposures to Cr(VI) that exceed the PEL on 29 or fewer days during any 12 consecutive months, the employer is allowed to use any combination of controls, including respirators alone, to achieve the PEL.

This provision is to be narrowly construed to be consistent with DOSH's longstanding preference for engineering controls over respiratory protection. Respirators are less reliable than engineering and work practice controls and create their own safety and health hazards. This provision is intended to cover situations in which Cr(VI) exposures are infrequent and is not meant to permit the use of respirators in lieu of inexpensive, mobile engineering controls.

f. Identifying Processes and Tasks.

- Welding, Electroplating, and Painting: DOSH considers welding, electroplating, and painting to each constitute a single process or task, i.e., for purposes of determining the applicability of the 30-day exception, the days of exposure above the PEL from all types of welding, or all types of electroplating, or all types of painting, must be considered.
- For job functions other than welding, electroplating, and painting, each other numbered application group identified during OSHA's rulemaking (see, e.g., 71 FR 10265) will typically constitute one process or task. Within each application group, the processes used, exposures generated, and controls needed to achieve compliance will usually be the same. In unusual circumstances, however, an employer may be able to show that a numbered application group actually includes multiple, distinct processes or tasks. These claims must be considered on a case-by-case basis.

- g. Inspection Guidelines. The burden is on the employer to show that exposures from a process or task do not exceed the PEL on 30 or more days per year.

- The 30-day exception is based on the number of days a process or task results in employee exposures to Cr(VI) that exceed the PEL.
- The exposures of all employees performing the process or task must be accounted for in determining whether the exception applies. For example, if an employer has a Cr(VI) process that involves exposures above the PEL on 40 days per year, and one employee is exposed for 20 of these days, and a second employee is exposed for the other 20

days, the employer may not claim the 30-day exception based solely on the days either employee is exposed over the PEL. The employer would be required to use feasible engineering and work practice controls for that Cr(VI) process to achieve the PEL since total employee exposures exceed the PEL for 30 or more days per year.

- When an employer has two or more Cr(VI) processes or tasks within its facility, then exposure days for each process or task are to be considered separately for the purpose of the 30-day exception. However, employers may not divide or classify a single Cr(VI) process or task into two or more separate processes or tasks in order to claim the 30-day exception.

Days exceeding the PEL may not be counted as if they result from separate processes or tasks simply because some aspect of the process is changed, such as using a different stock of material. For example, if shop employees are exposed to Cr(VI) in excess of the PEL for 20 days in a 12-month period while electroplating *automotive parts*, and are then exposed to Cr(VI) in excess of the PEL for an additional 20 days while electroplating *plumbing fixtures*, the employer may not designate these two electroplating operations as different processes or tasks for the purpose of the 30-day exception.

In addition, for a *mobile* process or task, such as may be the case with welding or painting, days exceeding the PEL may not be counted as if they result from separate processes or tasks simply because they occur in different locations. For example, if welders at a construction site are exposed to Cr(VI) in excess of the PEL for 20 days, and then relocate to a different work site at a later date where their welding exposures exceed the PEL for an additional 20 days, the employer may not designate these welding activities as different processes or tasks for the purpose of the 30-day exception.

If an employer operates multiple fixed facilities or establishments, and engineering controls for Cr(VI) exposures would need to be permanently fixed in those locations, the days of PEL-exceeding Cr(VI) exposures do not need to be added across facilities. For example, if an employer operates two facilities or establishments – one where a process or task results in exposures over the PEL on 20 days per year, and another one where the same process or task also results in exposures over the PEL on 20 days per year – the employer does not need to install permanent, fixed engineering controls in either location.

- Historical monitoring data and objective data or air monitoring data may be used to demonstrate that a process or task will not result in employee exposures above the PEL for 30 or more days per year. Other information, such as production orders showing that processes

involving Cr(VI) exposures are conducted on fewer than 30 days per year, may also be used to demonstrate that employees performing a process or task will not be exposed above the PEL for 30 or more days per year.

If an employer performs exposure determinations to show that whenever a process or task is performed under certain defined conditions the PEL is not exceeded, then any days on which that process or task is performed under those conditions need not be counted for purposes of the 30-day exception. For example, if welders' exposures are determined to be at or below the PEL whenever they use specified low-chromium content materials, then days on which employees are welding only on those low-chromium content materials do not need to be counted as days above the PEL for purposes of the 30-day exception.

- h. Citation Guidelines. If a process or task results in Cr(VI) exposures above the PEL and engineering and work practice controls are feasible, but respiratory protection is the only control being used, WAC 296-62-08013(1)(a) shall be cited unless the employer demonstrates that employees in that process or task are exposed above the PEL for 29 or fewer days per year.
2. WAC 296-62-08013(2) prohibits the rotation of employees to different jobs as a means of achieving the PEL.
- a. DOSH recognizes that employers rotate employees for a variety of reasons (e.g., an employer may rotate employees in order to provide cross-training on different tasks, or to allow employees to alternate physically demanding tasks with less strenuous activities), and DOSH does not intend for this provision to be interpreted as a general prohibition on employee rotation where there is exposure to Cr(VI).

As an example, an employer is not allowed to use one employee to operate a needle gun for removing Cr(VI) paint from a metal structure for four hours of a work shift, and then rotate the task to a second employee for the last four hours of the work shift just to ensure that each employee's 8-hour TWA exposure does not exceed the Cr(VI) PEL. Yet, if the physical labor for operating a needle gun is so demanding that an employee cannot effectively or safely operate the gun for any more than four hours a day, then employee rotation may be considered a reasonable work practice in this situation.

- b. Inspection Guidelines. The compliance officer shall interview employees and managers working in and supervising processes or tasks where exposures exceed or are likely to exceed the PEL to determine if employees are rotated to achieve compliance with the PEL.

- c. Citation Guidelines. If the employer cannot demonstrate that an employee's job rotation is conducted for reasons other than compliance with the PEL, WAC 296-62-08013(2) shall be cited.

G. Respiratory Protection.

WAC 296-62-08015 establishes requirements for respiratory protection.

1. WAC 296-62-08015(1) requires employers to provide employees with appropriate respiratory protection when engineering controls and work practices are not implemented or are not sufficient to reduce employee exposures to or below the Cr(VI) PEL.
 - a. Inspection Guidelines. Specifically, WAC 296-62-08015(1)(a) and WAC 296-62-08015(1)(e) require employers to provide respirators when:
 - Engineering and work practice controls are being installed (as demonstrated, for example, by an employer's purchase order), as provided by WAC 296-62-08015(1)(a); **or**
 - Engineering and work practice controls are not feasible, such as during maintenance and repair activities, as provided by WAC 296-62-08015(1)(b); **or**
 - Engineering and work practice controls are not sufficient to reduce exposure to or below the PEL, as provided by WAC 296-62-08015(1)(c); **or**
 - Engineering and work practice controls are not being used because the Cr(VI) process or task is exposing employees for fewer than 30 days per year above the PEL, as demonstrated, for example, by an employer's production order, as provided by WAC 296-62-08015(1)(d); **or**
 - An emergency exposes employees to an uncontrolled Cr(VI) exposure, as provided by WAC 296-62-08015(1)(e).
 - b. Citation Guidelines. If the employer does not provide appropriate respiratory protection for employees in the above situations, WAC 296-62-08013 shall be cited and grouped with the PEL violation, WAC 296-62-08007.
2. Where respirator use is required, WAC 296-62-08015(2) requires the employer to institute a respiratory protection program in accordance with Chapter 296-842 WAC, *Respirators*.
 - a. Inspection Guidelines. The compliance officer shall verify that the

employer has established and implemented an appropriate respiratory protection program that contains all of the required elements. Compliance with the program shall be verified through a review of the written program, visual observation during a walkaround, and employee interviews.

- b. Citation Guidelines. If employees are required to wear respirators, then the employer shall have a respiratory protection program. If the employer has not implemented the program or elements of it are deficient or missing, WAC 296-62-08015(2) shall be cited. Additionally, if elements are deficient or missing, the compliance officer shall group where appropriate and cite the applicable WACs under chapter 296-842 WAC, *Respirators*.

For example, when the employer has provided a respirator with an assigned protection factor (APF) that does not maintain an employee's exposure to Cr(VI) at or below the maximum use concentration, WAC 296-62-08015(2) shall be cited and grouped with a violation of WAC 296-842-13005.

If there is a discrepancy between the written program and implemented work practices at the worksite, WAC 296-62-08015(2) shall be cited and grouped with a violation of chapter 296-842 WAC that requires the work practice.

3. Although the Cr(VI) standards do not address the voluntary use of respirators, where the compliance officer finds employees voluntarily using respirators to protect themselves from Cr(VI) exposures, use the applicable provisions of Chapter 296-842 WAC, *Respirators*. If violations are found, the applicable voluntary use provisions of chapter 296-842 WAC shall be cited.

H. Protective Work Clothing and Equipment.

WAC 296-62-08017 sets forth requirements for the provision of protective clothing and equipment. The standards require the employer to provide appropriate protective clothing and equipment at no cost to employees where a hazard is present or is likely to be present from skin or eye contact with Cr(VI). Ordinary street clothing and work uniforms or other accessories that do not protect employees from Cr(VI) hazards are not considered protective clothing or equipment under these standards. Employers are also required to ensure employee use of any clothing and equipment provided.

These requirements are intended to prevent the adverse health effects associated with dermal exposure to Cr(VI) and the potential for inhalation of Cr(VI) that would otherwise be deposited on employees' street clothing. The requirements further serve to minimize exposures to Cr(VI) that may occur as a result of improper handling of contaminated protective clothing or equipment.

1. WAC 296-62-08017(1) requires the employer to provide appropriate protective clothing and equipment where a hazard is present or is likely to be present from skin or eye contact with Cr(VI). To determine whether protective clothing or equipment is necessary, the employer must evaluate the workplace. This performance-oriented requirement is consistent with WAC 296-800-160, *Personal Protective Equipment (PPE)*.

To determine whether there is a potential hazard from skin or eye contact with Cr(VI) in a workplace, the employer should designate a safety officer or some other qualified person with expertise to assess work activity hazards and select appropriate PPE. The recommended approach involves a walk-through survey to identify sources of Cr(VI) hazards to employees. Also recommended are reviews of occupational illness records to determine if skin exposures were reported which may have been linked to Cr(VI) exposures, as well as a review of any exposure determination(s) for operations involving Cr(VI). OSHA is aware of instances where exposure to Cr(VI) in welding fumes has been associated with development of dermatitis. However, these situations appear to be infrequent, and additional protective clothing and equipment may not generally be required to protect employees from skin contact with Cr(VI) during typical stainless steel welding operations.

Exposures to Cr(VI) in every workplace operation must be evaluated on a case-by-case basis, taking into account the physical aspects of the process or operation and any control measures, the chemical and physical properties of the compound or mixture, and the magnitude and duration of exposure. The employer has flexibility to select the clothing and equipment most suitable for the workplace. Other factors such as size, dexterity, and cut and tear resistance should be considered in the selection process as well. The point of this performance-oriented requirement is to prevent or eliminate skin exposures to Cr(VI) where feasible, and to reduce the inhalation hazard from Cr(VI) that might otherwise be deposited on employees' street clothing if appropriate protective clothing and equipment were not used.

For example, a chrome plater may require an impervious apron, gloves, and goggles to protect against possible splashes of chromic acid that could result in both Cr(VI) exposure and chemical burns. A painter who works with chromate paints may need gloves, goggles, a respirator, and coveralls. When employees remove contaminated clothing and equipment, there is the potential for exposures to Cr(VI). The standards address this hazard by requiring employers to ensure affected employees use washing facilities (see Section I, *Hygiene Areas and Practices*, below), and that employees know about Cr(VI) hazards (see Section K, *Communication of Chromium (VI) Hazards to Employees*, below). Preventing inhalation of Cr(VI) contamination during removal of clothing and equipment is

accomplished by the use of, for example, HEPA vacuuming, cleaning and/or disposal of contaminated clothing and equipment, and personal hygiene.

- a. Inspection Guidelines. The compliance officer shall determine what work operations involve Cr(VI) exposures by examining the employer's exposure determination data, chemical inventories, MSDSs, job hazard analyses, injury/illness/accident data, written medical opinions of employees under medical surveillance, walkthrough observations, and conducting employer/employee interviews. Where suspected, a Cr(VI) hazard to the skin or eyes may be confirmed by collecting a wipe or bulk sample for Cr(VI) analysis (see Section I.4.a, below, for specific information on wipe and bulk sampling). A wipe sample, in this case, is collected to determine whether the contaminant (i.e., hexavalent chromium) is, in fact, present; not to measure against any quantitative threshold of dust loading.

The compliance officer shall assess whether appropriate protective clothing and equipment is being provided by the employer, and at no cost to employees. Although an employer may be providing work uniforms, these may not be "appropriate" protective clothing and equipment if they are not designed to protect the wearer from skin or eye contact with Cr(VI).

- b. Citation Guidelines. WAC 296-62-08017(1) shall be cited if the employer is not providing or ensuring the use of appropriate protective clothing and equipment where there is a hazard (or likely to be a hazard) from skin or eye contact with Cr(VI), or if the employer is requiring the employees to pay for the protective clothing and equipment. If the employer is requiring the employees to pay for their respirators, then WAC 296-842-13005 shall be cited.
2. WAC 296-62-08017(2) provides requirements for the removal and storage of protective work clothing and equipment.
 - a. WAC 296-62-18017(2)(a) requires the employer to ensure that employees remove all protective clothing and equipment contaminated with Cr(VI) at the completion of work shifts or tasks involving Cr(VI) exposure, whichever comes first.

For example, if employees perform tasks involving Cr(VI) exposures for the first two hours of a work shift, and then perform tasks that do not involve exposures, they must remove their protective clothing after the exposure period (in this case, the first two hours of the shift). If, however, employees are performing tasks involving Cr(VI) exposure intermittently throughout the day, or if employees are exposed to other contaminants

where protective clothing and equipment are needed, this provision does not prevent them from wearing the clothing and equipment until the completion of their shift.

If the employee leaves the contaminated work area for any reason, he or she must first either remove the contaminated clothing and equipment – inside a change room if changing back into street clothes – or remove the Cr(VI) contamination from protective clothing, such as by using a HEPA vacuum, before leaving the work area. This provision limits the duration of employees' exposure, and prevents contamination from Cr(VI) residues on protective clothing reaching other areas of the workplace.

- b. WAC 296-62-08017(2)(b) requires the employer to ensure that Cr(VI)-contaminated protective clothing and equipment is removed from the workplace only by those employees who launder, clean, maintain, or dispose of such clothing or equipment. This provision ensures that clothing contaminated with Cr(VI) is not carried by employees off the worksite, increasing the employees' exposure as well as exposing other individuals to Cr(VI) hazards.
- c. WAC 296-62-08017(2)(c) requires the employer to ensure that Cr(VI)-contaminated clothing and equipment that is to be laundered, cleaned, maintained, or disposed of be placed in closed, impermeable containers to minimize contamination of the workplace and ensure that employees who later handle these items are protected.
- d. WAC 296-62-08017(2)(d) requires the employer to ensure that warning labels are placed on containers of the Cr(VI)-contaminated clothing and equipment so that those subsequently cleaning these items will be informed of and protected from the potential hazards of exposure to Cr(VI), in accordance with the requirements of WAC 296-800-170, *Employer Chemical Hazard Communication*.

If Cr(VI)-contaminated clothing and equipment is sent to another business, the label information is to include the chemical identity, the appropriate hazard warnings, and the employer's name and address. See WAC 296-839-40005.

- e. Inspection Guidelines. Observe and interview employees involved in Cr(VI) operations to determine how, when, and by whom Cr(VI)-contaminated clothing and equipment is removed and cleaned or discarded. If clothing and equipment is disposable, inspect disposal containers for seals and labels. If Cr(VI)-contaminated clothing is laundered and reused and equipment is cleaned, ask the employer how the laundering/cleaning is performed and observe the clothing containers. Also, observe the laundry process, if conducted on-site. Interview employees to see if they have been informed about the requirements for

handling Cr(VI)-contaminated clothing and equipment. Also, see the note in Section H.3.d, below concerning employers who provide laundering/cleaning services.

- f. Citation Guidelines. If Cr(VI)-contaminated clothing and equipment are not being removed and disposed of or cleaned properly, the appropriate subsection of WAC 296-62-08017 shall be cited. If WAC 296-62-08017(2)(d) is cited, it shall be grouped with WAC 296-839-40005 when the clothing and/or equipment is sent to another business for handling.
3. WAC 296-62-08017(3) provides for the cleaning and replacement of the protective work clothing and equipment required by these standards.
 - a. WAC 296-62-08017(3)(a) requires the employer to clean, launder, repair and replace protective clothing as needed to ensure that the effectiveness of the clothing and equipment is maintained. This provision is necessary to ensure that clothing and equipment continue to serve their intended purpose of protecting employees. This also prevents unnecessary exposures outside the workplace.

In keeping with the performance-orientation of the standards, OSHA does not specify how often clothing and equipment must be cleaned, repaired or replaced, because appropriate time intervals may vary widely based on the types of clothing and equipment used, Cr(VI) exposures, and other circumstances in the workplace. The obligation of the employer, as always, is to keep the clothing and equipment in the condition necessary to perform its protective functions.
 - b. WAC 296-62-08017(3)(b) prohibits the employer from removing Cr(VI) from protective clothing and equipment by blowing, shaking, or any other means which disperses Cr(VI) into the air. Such actions would result in increased risk to employees from unnecessary exposure to airborne Cr(VI), as well as possible dermal contact.
 - c. WAC 296-62-08017(3)(c) requires the employer to inform any person who launders or cleans protective clothing or equipment contaminated with Cr(VI) of the potentially harmful effects of exposure to Cr(VI), and of the need to launder or clean contaminated clothing and equipment in a manner that effectively prevents skin or eye contact with Cr(VI) or the release of airborne Cr(VI) in excess of the PEL. As with the provision reminding employers of their obligation for labeling under the HCS, this requirement is intended to ensure that persons who clean or launder Cr(VI)-contaminated items are aware of the associated hazards so that they can take appropriate protective measures.

When laundry or cleaning services are performed by third parties, the information transmitted need not be extensive to accomplish this goal.

Appropriate hazard warnings, as required on labels by the HCS, will be sufficient to indicate the potentially harmful effects of exposure to Cr(VI). In addition, the language used in this provision, “the clothing and equipment should be laundered or cleaned in a manner that minimizes skin or eye contact with Cr(VI) and effectively prevents the release of airborne Cr(VI) in excess of the PEL,” could be put on a label. The employer is not expected to specify particular work practices that third parties must follow.

- d. Inspection Guidelines. Inspect protective clothing and equipment in Cr(VI) operations for signs of excessive wear or evidence of inadequate cleaning, laundering, and repair. Also inspect stored clothing and equipment for excessive Cr(VI) contamination. Interview the employer and employees to learn the frequency of and methods used for cleaning, laundering, repair, and replacement of protective clothing and equipment.

Note: Any employer providing such laundry services must determine Cr(VI) exposures for their laundry employees, in accordance with WAC 296-62-08009, and comply with any other applicable provisions, as well.

- e. Citation Guidelines. If contaminated clothing and equipment are not being adequately or properly cleaned, laundered, repaired, or replaced, or the persons who clean or launder contaminated items were not informed by the employer of the harmful effects of Cr(VI) or of the need to prevent skin or eye contact with Cr(VI) and the release of airborne Cr(VI) above the PEL, then the appropriate subsections of WAC 296-62-08017 shall be cited.

I. Hygiene Areas and Practices.

WAC 296-62-08019 requires employers to provide hygiene facilities and to assure employee compliance with basic hygiene practices that minimize exposure to Cr(VI). The standards include requirements for change rooms and washing facilities, ensuring that Cr(VI) exposure in eating and drinking areas is minimized, and prohibit certain practices that may contribute to Cr(VI) exposure.

1. WAC 296-62-08019(1)(a) restates compliance requirements for DOSH’s existing general sanitation provisions, which already addresses:
 - a. Change rooms and eating and drinking areas - Employers shall provide these in conformance with WAC 296-800-230 for general industry and shipyards, and WAC 296-155-17321 for construction.

- b. Washing facilities – Employers shall provide washing facilities in conformance with WAC 296-800-230 for general industry, WAC 296-304-06013 for shipyards, and WAC 296-155-140 for construction, and,
- c. Eating and drinking areas – Employers shall provide eating and drinking areas in conformance with WAC 296-800-230 for general industry, WAC 296-304-06013(7) for shipyards, and WAC 296-155-020 for construction.

The hygiene provisions of the Cr(VI) standards are intended to augment the requirements established under these other standards with additional provisions applicable specifically to Cr(VI) exposure.

- 2. WAC 296-62-08019(a) requires change rooms at all covered workplaces where employees must change their clothes (i.e., take off their street clothes) to use protective clothing and equipment. Where removal of street clothes is not necessary (e.g., in a workplace where only gloves are used as protective clothing), change rooms are not required.
 - a. Inspection Guidelines. Where employees are required to remove street clothing and don protective clothing prior to working with Cr(VI), the compliance officer shall inspect the change room to ensure that it meets the requirements of this paragraph, as well as the requirements in the applicable general Sanitation standards (WAC 296-800-23070). These general standards require change rooms to be equipped with separate storage facilities for street clothes and protective clothing.
 - b. Citation Guidelines. If a change room is required to control employee exposure to Cr(VI), and the employer has not provided one, or if the employer did not provide separate storage facilities for street clothes and protective clothing, WAC 296-62-08019(1)(a) and (b) shall be cited and grouped with a violation of WAC 296-800-23070.
- 3. WAC 296-62-08019(3) contains requirements for washing facilities. The employer shall provide readily accessible washing facilities capable of removing Cr(VI) from the skin and ensure that affected employees use these facilities when necessary. Also, the employer shall ensure that employees who have skin contact with Cr(VI) wash their hands and faces at the end of the work shift and prior to eating, drinking, smoking, chewing tobacco or gum, applying cosmetics, or using the toilet.

DOSH expects that hazardous skin and eye exposures will occur infrequently with the proper use of appropriate protective clothing and equipment. For the infrequent occasions when Cr(VI) penetrates protective clothing and equipment, washing facilities are necessary. While actual shower facilities are not required by the Cr(VI) standards, they may be an appropriate industrial hygiene control measure in some situations.

Employers covered by the Cr(VI) standards are already required to provide washing facilities that meet the applicable requirements of WAC 296-800-23025, WAC 296-304-06013, or WAC 296-155-140.

Where the Cr(VI) standards require employers to provide washing facilities “capable of removing Cr(VI) from the skin,” this means that employers must provide soap and potable water (OSHA examined scientific data related to whether moist towelettes or other waterless hand cleaners were sufficient for removing harmful contaminants and determined that these cleaners were not adequate substitutes for soap and water).

In addition, where employees are exposed to corrosives or otherwise acute-acting Cr(VI) contaminants (e.g., chromic acid), employers are required to provide facilities for quick drenching or flushing of the eyes and body in accordance with WAC 296-800-15035, or WAC 296-304-06013.

- a. Inspection Guidelines. The compliance officer shall interview and, if possible, observe employees who have skin contact with Cr(VI) to see if they wash their hands and faces at the end of the work shift and prior to eating, drinking, smoking, chewing tobacco or gum, applying cosmetics, or using the toilet. If the employer has not provided readily accessible washing facilities, a violation has occurred. If appropriate washing facilities are available but are not being used, then employee training should be evaluated (see WAC 296-62-08025).

Where exposures to chromic acid or other acute-acting Cr(VI) compounds are identified, the compliance officer shall inspect the work area to determine if facilities are provided for quick drenching or flushing of the eyes and body.

- b. Citation Guidelines. If an employer has not provided readily accessible washing facilities, WAC 296-62-08019(3) shall be cited and grouped with a violation of WAC 296-800-23025 for general industry, WAC 296-304-06013 for shipyards, or WAC 296-155-140 for construction.

If an employer is not ensuring that employees who have skin contact with Cr(VI) are washing their hands and faces at the end of the work shift and prior to eating, drinking, smoking, chewing tobacco or gum, applying cosmetics, or using the toilet, WAC 296-62-08019(3)(b) shall be cited.

If the employer has workplace exposures to chromic acid or other acute-acting Cr(VI) compounds but has not provided suitable facilities

for quick drenching of the eyes and body for employees, WAC 296-62-08019(3)(a) shall be cited and grouped with a violation of WAC 296-800-15030 for general industry, or WAC 296-304-06013 for marine terminals, or WAC 296-155-140 for construction.

4. The employer is not required to provide eating and drinking facilities to employees. However, if an employer allows employees to eat at the worksite, WAC 296-62-08019(4), requires the employer to ensure that eating and drinking areas and surfaces are maintained as free as practicable of Cr(VI). Employers also are required to ensure that employees do not enter eating or drinking areas wearing protective clothing, unless the protective clothing is properly cleaned beforehand. Employers may use any method for removing surface Cr(VI) from clothing and equipment that does not disperse the dust into the air or onto the employee's body. For example, if an employee is wearing coveralls for protection against Cr(VI), thorough HEPA vacuuming of the coveralls could be performed prior to entry into a lunchroom.
 - a. Inspection Guidelines. When employees eat and drink at the worksite, there are often cafeterias or break rooms. Employees may not eat or drink in Cr(VI)-contaminated work areas. Any area used by employees for eating or drinking shall be maintained as free as practicable from Cr(VI).

The compliance officer shall observe where employees consume food and beverages, and how employees handle their protective work clothing and equipment before entering eating and drinking areas.

When a determination has been made that an employer could reduce Cr(VI) contamination of surfaces within eating and drinking areas, or could make another area that is not contaminated available for employee consumption of food and drink, the compliance officer shall collect wipe or bulk samples to provide evidence that the surface contamination is Cr(VI). The standards do not define the term, "as free as practicable," however, if a wipe sample confirms Cr(VI) surface contamination in an area used for eating and drinking, and the compliance officer determines that the employer has not taken practicable measures to make a clean area available for eating and drinking, the employer is not in compliance with this provision.

For wipe samples, carefully wipe all removable dust from the surface being tested within an area of approximately 100 cm². Carefully fold the wipe sample with the exposed side in, and then place the folded wipe inside a 20-ml vial. Depending on the media selected, the sample vials may need to be pre-loaded by the laboratory with extraction reagent. If wipe samples are not pretreated or not immediately digested

with prescribed buffering solutions, then significant errors may occur due to interferences and the high reduction potential of Cr(VI). Complete wipe sampling procedures may be found through the DOSH Lab in Olympia.

A direct-read wipe for real-time detection or screening of surface chemicals can be useful in showing the areas and amounts of hexavalent chromium contamination. A few manufacturers have developed these wipes for on-the-spot detection of dozens of chemicals, including hexavalent chromium, beryllium, cadmium, lead, and mercury. The compliance officer should check with the DOSH Lab for available supplies, and contact the Lab to discuss the limitations (interferences, limits of detection, etc.) on using these wipes to screen for surface contamination.

Bulk samples may be collected for a variety of reasons, such as to determine the presence of Cr(VI) in paint removed by abrasive blasting, to determine the presence of Cr(VI) in waste or debris, or to confirm a suspicion that a product's material safety data sheet is not accurate concerning the presence of a Cr(VI)-containing ingredient. Bulk samples shall be shipped to the analytical laboratory separately from wipe or air samples. Cr(VI) bulk sampling procedures may be found within the original method L&I0005, which is posted on the DOSH Lab website.

Wipe and bulk samples collected for laboratory analysis are to be placed in 20-ml glass scintillation vials or other appropriate sized glass vial with polytetrafluoroethylene (PTFE) lined caps, one for each sample. Bulk solid samples should be approximately 20 grams in weight. Bulk liquid samples should be approximately 20 milliliters in volume. Note that quantities are approximate, so bulk or liquid samples placed in 20-ml glass vials do not need to be filled to the brim.

Whenever handling Cr(VI) materials, such as when collecting wipe or bulk samples, compliance officers shall wear protective gloves. For many Cr(VI) compounds, nitrile or polyvinyl chloride (PVC) gloves will provide sufficient protection, but it is suggested to first check the MSDS for the compound, if available, or check the glove manufacturer's performance specifications. Do not wear powdered gloves. Additionally, if 1% NaOH-coated, binderless quartz fiber filters are used for wipe sampling, gloves must provide sufficient protection from the caustic NaOH coatings on the filters.

- b. Citation Guidelines. If an area for employee consumption of food or beverages is not maintained as free as practicable of Cr(VI) contamination, WAC 296-62-08019(4)(a) shall be cited.

If employees are observed entering areas for eating and drinking without first removing their protective clothing and equipment, or at least removing Cr(VI) surface contamination from their protective clothing and equipment, or if they may potentially disperse Cr(VI) contamination into the air in a manner that exposes an employee's body to the Cr(VI) contamination, WAC 296-62-08019(4)(b).

- 5. WAC 296-62-08019(5) prohibits eating, drinking, smoking, chewing tobacco or gum, or applying cosmetics in regulated areas or in areas where skin or eye contact with Cr(VI) occurs. Products associated with these activities, such as food and beverages, cannot be carried or stored in these areas. Because the construction and shipyard standards do not include requirements for regulated areas, reference to regulated areas is omitted in the regulatory text for these standards.

- a. Inspection Guidelines. If the compliance officer observes or receives reports of any prohibited activities (eating, drinking, smoking, chewing tobacco or gum, applying cosmetics, or storing such products) in a work area where skin or eye contact with Cr(VI) occurs, or within a Cr(VI) regulated area, air, wipe, and/or bulk samples shall be collected to document exposures to Cr(VI).
- b. Citation Guidelines. If employees are permitted to conduct any of these prohibited activities (eating, drinking, smoking, chewing tobacco or gum, applying cosmetics, or carrying or storing related products) in regulated areas, or in areas where skin or eye contact with Cr(VI) occurs, as confirmed by the compliance officer's positive sample(s) for Cr(VI), WAC 296-62-08019(5) shall be cited.

J. Housekeeping (not applicable to construction and shipyard standards).

The general industry standard includes housekeeping provisions that require employers to maintain surfaces as free as practicable of Cr(VI), promptly clean Cr(VI) spills and leaks, use appropriate cleaning methods, and properly dispose of Cr(VI)-contaminated waste.

DOSH has determined that housekeeping requirements are highly impracticable for control of Cr(VI) exposures in construction and shipyard workplaces and, therefore, has not included housekeeping requirements for these industry sectors. Construction and shipyard employers still need to comply with the general housekeeping requirements found in WAC 296-155-020 (for construction), in

WAC 296-304-06001 (for shipyards), and in WAC 296-56-60007 (for longshoring and waterfront operations).

The Agency recognizes that in some cases general industry work operations and work environments may be comparable to those found in construction and shipyards, i.e., are short in duration; performed outdoors, potentially under adverse environmental conditions (e.g., wind, rain); and are done at non-fixed workstations or worksites. As WAC 296-62-08021(1)(a) only requires surfaces to be maintained as free of the accumulation of Cr(VI) “as practicable,” it provides flexibility for any general industry situations where, as in construction and shipyards, it is not practicable to implement the housekeeping provisions.

1. WAC 296-62-08021(1)(a) requires the general industry employer to ensure that all surfaces are maintained as free as practicable of accumulations of Cr(VI), and that all spills and releases of Cr(VI)-containing material are cleaned up promptly.
 - a. Inspection Guidelines. The compliance officer shall observe where employees perform operations involving Cr(VI) exposures to make a visual assessment of housekeeping practices. Where suspected, poor housekeeping shall be further assessed by collecting a wipe or bulk sample for Cr(VI) analysis. Refer to the inspection guidelines for wipe and bulk sampling, above, in Section I.4.a. Employers and employees shall be interviewed and mishap reports, if available, shall be reviewed for incidents of spills and releases of Cr(VI) materials. Injury/illness records shall be checked for reports of skin exposures to Cr(VI) that could have been caused by poor housekeeping practices or improper spill response.

The standard does not provide a maximum allowable surface loading of Cr(VI) contamination in work areas as a criterion for “as free as practicable.” However, if a wipe sample does confirm Cr(VI) surface contamination in a work area, and the compliance officer determines that the employer has not taken practicable measures to reduce the Cr(VI) contamination, then the employer is not in compliance with this provision.

- b. Citation Guidelines. If general industry employers do not ensure that workplace surfaces are maintained as free as practicable of Cr(VI), WAC 296-62-08021(1)(a) shall be cited. Spills or releases of Cr(VI) that are not cleaned up promptly shall be cited under WAC 296-62-08021(1)(b).
2. WAC 296-62-08021(2) requires cleaning methods that best capture Cr(VI)-containing material, including HEPA-filtered vacuuming or other methods (such as wet methods) that minimize Cr(VI) exposure. If preferred cleaning

methods such as HEPA-filtered vacuuming or wet methods have been tried, but are not effective, then the employer may use dry shoveling, sweeping, or brushing, or compressed air in conjunction with a ventilation system designed to capture the dust cloud. Compressed air may be used without a ventilation system to capture dust only if no alternative method is feasible, such as cleaning out-of-reach crevices within furnaces, but these circumstances are expected to be extremely rare.

Caution should be exercised whenever compressed air is used as a cleaning method, since the air will spread the contamination further unless the dust is appropriately collected. Additionally, some airborne dusts may be explosive at high concentrations and may settle inside electric motors or other electric equipment and become an ignition source. Caution should also be exercised to avoid directing compressed air at employees; compressed air should not be used to clean protective clothing or equipment that employees are wearing. General industry employers shall ensure that all cleaning equipment is handled to minimize reentry of Cr(VI) into the workplace.

- a. Inspection Guidelines. The compliance officer shall interview and/or observe employees who are cleaning Cr(VI)-containing materials to inspect for approved methods. The compliance officer shall also observe the handling of cleaning equipment, such as HEPA-filtered vacuums. Maintenance operations to clean and/or replace vacuum filters also require effective housekeeping methods, such as using a second HEPA-filtered vacuum and a drop cloth to collect releases of Cr(VI)-contaminated dust.
 - b. Citation Guidelines. If general industry employers do not ensure that cleaning methods, such as HEPA-filtered vacuuming, are used to minimize the likelihood of exposure to Cr(VI), WAC 296-62-08021(2)(a) shall be cited. If an employer uses dry shoveling, sweeping, or brushing without demonstrating that HEPA-filtered vacuuming or similar cleaning methods that minimize Cr(VI) exposures were tried and found to be ineffective, WAC 296-62-08021(2)(b) shall be cited. If employers are allowing employees to use compressed air to remove Cr(VI) from surfaces without a ventilation system to capture the blown dust and without demonstrating that no alternative method is available, WAC 296-62-08021(2)(c) shall be cited. If employers are not ensuring that cleaning equipment is handled in a manner that minimizes the reentry of Cr(VI) into the workplace, WAC 296-62-08021(2)(d) shall be cited.
3. WAC 296-62-08021(3) requires that general industry employers use proper containers and labels to dispose of waste, scrap, debris, and other waste products contaminated with Cr(VI). The containers are to be sealed in impermeable bags or other impermeable containers. The label information is

to include the chemical identity, the appropriate hazard warnings, and the employer's name and address.

DOSH intends for the waste disposal provisions to be performance oriented. The standard permits the use of any container so long as it prevents release of or contact with Cr(VI). For example, sealed barrels could be used to serve this purpose. Palletizing items and wrapping the pallet in plastic to create an impermeable barrier between workers and the Cr(VI)-contaminated waste, scrap or debris would also be acceptable.

The labeling of Cr(VI) wastes is to be performed in accordance with WAC 296-839-40005.

In the event of an inquiry, the employer shall be informed that "hazardous waste" under the EPA's Resource Conservation and Recovery Act (RCRA) is specifically exempted by WAC 296-800-17055. DOSH recognizes that the RCRA's labeling requirements adequately convey hazard information to affected employees. RCRA is further described in Chapter IX, Section B.1.b .

- a. Inspection Guidelines. The compliance officer shall observe disposal practices to ensure that employers are using sealed, impermeable bags or other closed, impermeable containers labeled in accordance with the Hazard Communication standard WAC 296-800-17005.
- b. Citation Guidelines. If general industry employers do not ensure that Cr(VI) disposal containers are sealed and impermeable, WAC 296-62-08021(3)(a) shall be cited. If disposal containers are not properly labeled to warn employees of hazardous Cr(VI) material, WAC 296-62-08021(3)(b) shall be cited. If WAC 296-839-40005 is cited, it shall be grouped with WAC 296-62-08021(3)(b).

K. Medical Surveillance.

WAC 296-62-08023 sets forth requirements for the provision of medical surveillance.

1. WAC 296-62-08023(1) requires employers to make medical surveillance available at no cost, and at a reasonable time and place. If participation requires travel away from the worksite, the employer must bear the cost. Employees must be paid for time spent taking medical examinations, including travel time.

DOSH requires that medical surveillance be provided to employees who are experiencing signs or symptoms of the adverse health effects associated with Cr(VI) exposure, or who are exposed in an emergency. In addition, DOSH requires employers to provide medical surveillance for all

employees exposed to Cr(VI) at or above the action level for 30 or more days a year.

- a. DOSH intends that employees be trained about the signs and symptoms of Cr(VI)-related adverse health effects. This information, in conjunction with the training on Cr(VI) hazards required by the HCS, will help to assure that employees are able to adequately report signs and symptoms of Cr(VI)-related adverse health effects in order to receive medical attention from a licensed health care professional.
- b. Medical surveillance shall be made available to employees exposed in an emergency regardless of the airborne concentrations of Cr(VI) normally found in the workplace. While there are chronic effects associated with Cr(VI) exposure, there are also short-term effects such as skin ulcerations and dermatitis that might result from high exposures occurring during an emergency.
- c. The use of 30 days of exposure at or above the action level as a trigger for medical surveillance addresses potential Cr(VI) health effects associated with repeated exposures.

Even in situations where the employer elects the performance-oriented option for exposure determinations, OSHA requires that the employer sufficiently characterize all employee exposures to determine when to provide routine medical surveillance.

- d. Employers with temporary employees who are exposed to Cr(VI) during their employment, but who are employed for fewer than 30 days, must still provide medical surveillance if those employees experience signs or symptoms of the adverse health effects associated with Cr(VI) exposure or are exposed to Cr(VI) in an emergency.
 - e. Medical surveillance must be performed by or under the supervision of a physician or other licensed healthcare professional (PLHCP). Any health care professional can conduct medical examinations and procedures provided for under the standards if they are permitted by state law to do so. If an unlicensed person performs the medical examination under the supervision of a licensed physician or health care provider, he or she may write the medical opinion, but the licensed provider must review, concur with, and assume responsibility for the opinion. Any signature on the opinion must be the licensed provider's signature .
2. WAC 296-62-08023(2) requires employers to provide all covered employees with medical examinations whenever an employee shows signs or symptoms of Cr(VI) exposure, within 30 days after an emergency

resulting in an uncontrolled release of Cr(VI), and within 30 days after a PLHCP's written medical opinion recommends an additional examination. In addition, employers are required to provide covered employees with examinations within 30 days after initial assignment (unless the employee has received a medical examination in accordance with the standards within the past 12 months), annually, and at the termination of employment (unless an examination has been given less than six months prior to the date of termination).

Although the provision requiring medical examinations whenever an employee shows signs or symptoms of Cr(VI) exposure does not specify a specific number of days within which the employee must have the exam, employers must make examinations available for injured or ill employees as soon as possible so that prompt treatment is provided.

When an employer has previously determined that employees' exposures are at or above the action level for fewer than 30 days per year, but a change in process or task occurs that results in 30 or more days of exposure above the action level, then medical surveillance shall be made available to these employees. In such cases, the employer must make a reasonable attempt to provide a medical examination by the 30th day of exposure.

Note: For employees working in operations covered by Chapter 296-835 WAC, *Dipping and Coating Operations (Dip Tanks)*, 296-835-11050 requires the employer to provide periodic examinations of exposed body parts, especially nostrils, to employees exposed to chromic acid in electroplating, whether or not the employees are exposed above the Cr(VI) action level for 30 or more days a year. (See Section VI, *Interface with Other Standards*, subsection A.3. in this directive)

3. WAC 296-62-08023(3) specifies that the examination by the PLHCP shall consist of a medical and work history, a physical examination of the skin and respiratory tract, and any additional tests considered appropriate by the PLHCP. While additional tests, such as baseline and periodic spirometry and baseline chest x-rays, may be considered appropriate for certain affected employees, such determinations are left to the discretion of the PLHCP. Special emphasis is to be placed on the employee's medical and work history related to Cr(VI) exposure, health effects associated with Cr(VI) exposure, and smoking.
4. WAC 296-62-08023(4) requires the employer to ensure that the PLHCP has a copy of the standard, and to provide the PLHCP with a description of the affected employee's former and current duties as they relate to Cr(VI) exposure; the employee's former, current, and anticipated exposure levels; a description of any personal protective equipment used or to be

used by the employee, including when and for how long the employee has used that equipment; and information from records of employment-related medical examinations previously provided to the affected employee that are currently within the employer's control.

5. WAC 296-62-08023(5) requires employers to obtain from the examining PLHCP a written opinion containing the results of the medical examination with regard to Cr(VI) exposure, the PLHCP's opinion as to whether the employee would be placed at increased risk of material health impairment as a result of exposure to Cr(VI), and any recommended limitations on the employee's exposure or use of personal protective equipment. The PLHCP must also state in the written opinion that these findings were explained to the employee.
 - a. Under the standards, the PLHCP may not include findings or diagnoses that are unrelated to Cr(VI) exposure in the written opinion provided to the employer.
 - b. The employer shall obtain the written opinion within 30 days of the examination and must provide a copy of the written opinion to the employee within two weeks of receiving it, to ensure that the employee is informed of the opinion in a timely manner. If a PHLCP is also providing the employer with written opinions related to other DOSH-regulated substances, the PHLCP can issue a single written opinion addressing all covered substances to which an employee is exposed.
6. Inspection Guidelines. The compliance officer shall make sure that the employer has included the appropriate employees in the medical surveillance program. Employers with dipping and coating operations also covered under Chapter 296-835 WAC, *Dip Tanks*, or WAC 296-155-170 must make *periodic* examinations available to employees working with chromic acid regardless of the level of exposure, in accordance with those standards. The compliance officer shall ask selected employees if they were offered medical examinations by their employer. Although DOSH's health standards require employers to provide employees an opportunity for medical examinations, employees are not required to take them. Employers should continue to offer a medical examination to each authorized employee whenever it comes due again, even if the employee has previously refused such an examination.

Where employees have been evaluated by a health care provider, the compliance officer shall ask employees if the evaluation took place prior to or within 30 days of beginning their Cr(VI) work assignments. Employees shall be interviewed to determine if the employer is requiring

employees to pay for the examinations or to undergo medical testing at unreasonable times or places.

Health care providers may also be contacted to determine whether the appropriate information was provided by the employer.

The compliance officer may need to ask the employer for copies of the written medical opinions. Since records are often kept at contractors' main offices, a compliance officer will likely not be able to verify content of the written opinion on a construction job site. The compliance officer shall ask some of the employees if they have received a copy of the physician's written opinion.

7. Citation Guidelines. If Cr(VI) medical surveillance from a PLHCP was not made available by employers to their employees in accordance with the exposure criteria of WAC 296-62-08023(1) and the frequency requirements of WAC 296-62-08023(2), the appropriate subsections shall be cited. For example, if no medical surveillance was provided when employees were exposed at or above the action level for 30 or more days a year, WAC 296-62-08023(1)(a)(i) shall be cited. (Have monitoring data to support the citation.) Or if employees told their employer that they were experiencing signs or symptoms of Cr(VI) exposure, and the employer did not make medical surveillance available at that time, WAC 296-62-08023(2)(d) shall be cited.

If annual or other periodic medical surveillance was not made available to employees performing dipping and coating operations involving Cr(VI) exposures, but the employer demonstrated that exposures were not above the action level on 30 or more days per year, WAC 296-835-11050 shall be cited. (See Section VI, *Interface with Other Standards*, subsection A.3. below.)

WAC 296-62-08023(3), or applicable subsections, shall be cited if the medical examinations did not include the required element(s).

WAC 296-62-08023(4) shall be cited if the examining PLHCP was not provided the required information by the employer. The appropriate subsection shall be cited for the elements not provided, i.e., WAC 296-62-08023(4)(a)(d).

If there is no written opinion, WAC 296-62-08023(5)(a) shall be cited. If employees remember seeing the written opinion, but the employer cannot find it, the recordkeeping provision, WAC 296-62-08027(4)(c) shall be cited. If employees were not given a copy of the written opinion, WAC 296-62-08023(5)(c) shall be cited. Citations shall be issued only when it can be established that two or more employees did not receive a copy.

L. Communication of Chromium (VI) Hazards to Employees.

WAC 296-62-08025 sets forth requirements intended to ensure that the dangers of Cr(VI) exposure are communicated to employees. The hazard communication requirements of this standard complements existing requirements of WAC 296-800-170, *Employer Chemical Hazard Communication*, which covers employees exposed to airborne Cr(VI) or who have skin or eye contact with Cr(VI).

WAC 296-800-17005 requires employers to develop and implement a written hazard communication program that provides for employee training, and WAC 296-62-08025 requires employers to provide that training at the time of initial assignment.

1. WAC 296-62-08025(1) makes clear that the hazard communication requirements are in addition to those in WAC 296-800-17030 that already require employers to provide Cr(VI)-exposed employees with training on the following:
 - a. Health hazards associated with Cr(VI) exposure
 - b. The location, manner of use and release of Cr(VI)
 - c. Engineering controls and work practices associated with the employee's job assignment
 - d. The purpose, selection and use of respirators and protective clothing
 - e. Emergency procedures
 - f. Measures employees can take to protect themselves.

2. WAC 296-62-08025(2) lists three additional requirements:
 - a. The employer shall ensure that each employee can demonstrate knowledge of the contents of the Cr(VI) standard;
 - b. The employer shall ensure that each employee can demonstrate knowledge of the purpose and description of the medical surveillance program required under the Cr(VI) standard; and,
 - c. The employer shall make a copy of the Cr(VI) standard readily available to employees without cost.

Whether an employee can “demonstrate knowledge” requires professional judgment based on answers given during an employee interview. Employees should know that Cr(VI) is hazardous, where and how it is used and controlled in the workplace, the signs and symptoms of exposure, and that medical examinations are to be made available under certain conditions.

3. Inspection Guidelines. The compliance officer shall review the employer's written hazard communication program to determine whether it includes information and training on Cr(VI) hazards and control measures. The

compliance officer shall question affected employees to see if they have ever had training on the Cr(VI) standard, if they understand the Cr(VI) medical surveillance program, and if a copy of the Cr(VI) standard was made available to them.

4. Citation Guidelines. When affected employees received no Cr(VI) information or training, WAC 296-62-08025(1)(a) and (1)(b) shall be cited. If WAC 296-800-17030 is cited, it shall be grouped with WAC 296-62-08025(1). When employees cannot demonstrate knowledge of the contents of the Cr(VI) standard and the Cr(VI) medical surveillance program, WAC 296-62-08025(2)(a) shall be cited. If the employer did not make a copy of the Cr(VI) standard readily available to affected employees without cost, WAC 296-62-08025(2)(b) shall be cited.

M. Recordkeeping.

WAC 296-62-08027 requires employers to maintain exposure and medical surveillance records. The recordkeeping provisions of these standards are consistent with Chapter 296-802 WAC, *Employee Medical and Exposure Records*. These records shall be available to employees so that they can examine the determination made by the employer.

The Cr(VI) standards require that exposure monitoring and medical surveillance records include the employee's Social Security number. Employers must grant access to exposure and medical records upon request by employees and their designated representatives, and by DOSH, per WAC 296-802-400. If the employer provides other parties access to the exposure records, the Social Security numbers may be expunged from the records prior to allowing access.

The Chapter 296-802 WAC, *Employee Medical and Exposure Records*, requires that employee exposure records be kept for at least 30 years and that medical records be kept for the duration of the employee's employment plus an additional 30 years.

1. WAC 296-62-08027(2) requires employers who use historical monitoring data to conduct exposure determinations to maintain records of this data. The records of historical monitoring must demonstrate that the data were obtained using a method sufficiently accurate under WAC 296-62-08009(5). The records must also show that the work being performed, the Cr(VI)-containing material being handled, and the environmental conditions at the time the historical monitoring data were obtained closely resemble those elements of the job for which exposure is being determined. Other data relevant to operations, materials, processing, or employee exposures must also be included in the records.

2. WAC 296-62-08027(3) requires employers who use objective data to conduct exposure determinations to maintain records of this data. The records must include: the chromium-containing material in question; the source of the objective data; the testing protocol and results of testing, or analysis of the material for the release of Cr(VI); a description of the process, operation, or activity involved and how the data support the determination; and other data relevant to the process, operation, activity, material, or employee exposures.
3. WAC 296-62-08027(4) requires employers to establish and maintain an accurate medical surveillance record for each employee subject to the medical surveillance requirements of the standards. Medical surveillance records are required to include the following information: The name, Social Security number, and job classification of the employee; a copy of the PLHCP's written opinions; and a copy of the information provided to the PLHCP. This information includes the employee's duties as they relate to Cr(VI) exposure, Cr(VI) exposure levels, and descriptions of personal protective equipment used by the employee (see WAC 296-62-08023(4)).

DOSH does not require the employer to create and maintain multiple copies of medical records. If records of previous employment-related medical exams are within the control of the employer, they do not need to be reproduced.

4. Inspection Guidelines. If the employer is following the scheduled monitoring option for exposure determinations, the compliance officer shall review the employer's air monitoring data to determine whether the employer is keeping an accurate record of all measurements taken as set forth in this recordkeeping paragraph. If the employer is following the performance-oriented option, or is using objective data to support a determination that the Cr(VI) standard does not apply per WAC 296-62-08003 the compliance officer shall ask the employer for relevant records. (See Section A.2.c, above, for evaluation criteria and enforcement policy where objective data are used by the employer to support a determination that the standard does not apply.)

The compliance officer shall also review the employer's medical surveillance records for employees exposed to Cr(VI). Whenever reviewing medical opinions, the compliance officer shall follow chapter 296-802 WAC, *Employee Medical Exposure Records*.

The records shall be examined to determine if the employer is keeping employee exposure records for at least 30 years, and medical records for the duration of the employee's employment plus 30 years. Also note, WAC 296-802-60005 requires that employers ceasing to do business shall

transfer all employee exposure and medical records to the successor employer, if applicable.

5. If the employer is not maintaining employee exposure records or medical surveillance records in accordance with Chapter 296-802 WAC, *Employee Medical and Exposure Records*, WAC 296-62-08027(4)(c), shall be cited and grouped with the appropriate provision of chapter 296-802 WAC. For example, if employee air monitoring records were not being maintained for at least 30 years, WAC 296-62-08027(4)(c) shall be cited and grouped with a violation of WAC 296-802-20010.

VI. Interface with Other Standards.

A. Other DOSH Standards.

1. Chapter 296-841 WAC, *Airborne Contaminants*.

Several other standards that specifically refer to Chapter 296-841 WAC, *Airborne Contaminants* are indirectly affected by the Cr(VI) standard. For example, the ventilation requirements in WAC 296-835-11010 and WAC 296-155-170, in their requirements for operations where abrasive blasting of coated materials may create exposures to hazardous dusts, require the employer to keep the concentration of respirable dust or fume in the breathing zone of the abrasive-blasting operator below the levels specified in the applicable Airborne Contaminants standard. Similarly, the shipyard standard for *Mechanical paint removers*, WAC 296-304-03005, requires employers to provide eye and respiratory protection to employees working in areas where unsafe concentrations of abrasive materials and dusts are present. Other standards which similarly refer to *Airborne Contaminants* include those for welding and cutting operations (see Section 2, below).

2. Chapter 296-24 WAC, Part I, *Welding, Cutting and Brazing*; WAC 296-304-040, *Welding, Cutting and Heating*; WAC 296-56-60235, *Welding, Cutting, and Heating*, and Chapter 296-155 WAC, Subpart H, *Welding and Cutting*.

These standards contain requirements for welding and cutting operations, in which hexavalent chromium is one of the metals of toxic significance. In evaluating compliance with the following provisions, the compliance officer may also need to determine whether employees are exposed above the new Cr(VI) PEL:

- a. WAC 296-24-71501, *Maximum allowable concentration* and WAC 296-24-71523, *Cutting of stainless steels*.
- b. WAC 296-304-04001(1), *Mechanical ventilation requirements* and (3), *Welding, cutting or heating of metals of toxic significance*.

- c. WAC 296-304-04005(3), *Protection against toxic preservative coatings.*
 - d. WAC 296-56-60235(6)(a), *Mechanical ventilation requirements*; (3) *Welding, cutting or heating of toxic metals*, (4), *Inert-gas metal-arc welding*; and WAC 296-304-04005, *Welding, cutting and heating in way of preservative coatings.*
 - e. WAC 296-155-415(1), *Mechanical ventilation*, (3), *Welding, cutting or heating of metals of toxic significance*, and (5) (*General welding, cutting, and heating*),
 - f. WAC 296-155-04005(c), *Protection against toxic preservative coatings.*
3. Chapter 296-835, *Dipping and Coating Operations (Dip Tanks).*

The Dip Tanks standard contains requirements in which objects are immersed in hazardous liquids for the purpose of cleaning or coating. Hexavalent chromium may be one substance used in dip tanks, e.g., chromic acid in electroplating. Provisions that have potential for interplay with the Cr(VI) standards are:

- a. WAC 296-835-100, *Scope*
 - b. WAC 296-835-11010, *Provide proper ventilation for the vapor area*; WAC 296-835-11015, *Take additional precautions if you recirculate ventilation system exhaust air into the workplace*; WAC 296-835-11050, *Protect employees that use liquids that may burn, irritate, ,or otherwise harm the skin;*; and WAC 296-835-11025, *Periodically inspect your dip tanks and associated equipment and correct any deficiencies.*
4. WAC 296-62-07521, *Lead*; WAC 296-155-176, *Lead.*
- Occupational exposures to lead chromate (PbCrO_4) – which is a common paint formulation that contains both lead and Cr(VI) – are also regulated by the Lead standard. DOSH’s enforcement policy prior to the Cr(VI) standard required compliance officers to apply the Lead standard to lead chromate exposures, and any air samples collected where lead chromate was present were only analyzed for lead because the lead PEL - $50 \mu\text{g}/\text{m}^3$ - was more protective than the previous PEL for chromates (CrO_3) – $100 \mu\text{g}/\text{m}^3$.

However, the new Cr(VI) standard lowers the permissible limit for Cr(VI), so that it now provides greater protection to employees exposed to lead

chromate. Specifically, where airborne exposures are from lead chromate, and exposures are limited to the new Cr(VI) PEL of 5 µg/m³, the corresponding lead exposure is effectively limited to 20 µg/m³, which is two and a half times lower than the lead PEL of 50 µg/m³.

Where there are lead chromate exposures, DOSH will apply both the Cr(VI) standard and the Lead standard. Current laboratory analytical methods cannot accurately measure both lead and hexavalent chromium from one air sampling cassette. Thus, where it is practical for the compliance officer to collect dual air samples for operations involving exposures to lead chromate, sampling and analyses shall be performed for both hexavalent chromium and lead.

Note: Dual sampling for lead and Cr(VI) may be performed with one sampling pump attached to two sampling cassettes using a “Y” splitter in the connecting tubing. Employees are thus only encumbered by one pump. However, if the pump fails, both samples may be lost. The compliance officer should therefore contact the analytical laboratory for specific procedures prior to collecting dual air samples for lead and Cr(VI).

If it is only practical to collect one air sample, the compliance officer should consider preferentially sampling for Cr(VI) because of its lower PEL. On the other hand, sampling for lead may be more appropriate where potential reproductive hazards of lead are present to pregnant employees or those of child-bearing age. The compliance officer shall consult with his/her supervisor to determine the best sampling strategy in such cases.

OSHA reviewed existing toxicological studies and did not find data showing that the common effects of lead and Cr(VI) are *known* to be additive. Therefore, compliance officers are instructed to *not* apply the mixture formula in WAC 296-841-20005(5) until any additive health effects become known.

Where the compliance officer finds overexposures to both lead and Cr(VI) in workplaces using lead chromates, violations of both the Cr(VI) PEL and the lead PEL shall be cited. Two separate penalties shall be assessed. Additionally, violations of other applicable provisions of both the Lead and Chromate (VI) standards that are triggered by their PELs, such as respiratory protection and exposure monitoring, shall be cited as appropriate.

5. Chapter 296-848 WAC, *Arsenic*.

Occupational exposures to compounds containing both arsenic and Cr(VI) (such as arsenical pesticides, e.g., chromated copper arsenate, that may be used in pressure-treated wood), are also regulated by the Inorganic

Arsenic standards. No specific DOSH enforcement policy has directed compliance officers to preferentially air sample for arsenic, although the compliance officer is expected to apply the strictest exposure limit when measuring employee exposures.

Note that any operations involving the *application of pesticides*, such as CCA, are not covered by Chapter 296-62 WAC, Part I-2, *Hexavalent Chromium* or chapter 296-848 WAC, *Arsenic*. Furthermore, chapter 296-848, *Arsenic* additionally excludes employee exposures in agriculture and resulting from uses of arsenic-preserved wood. Thus, industrial operations involving the *manufacture of pesticides* are covered by both the Arsenic standards and Cr(VI) standards, but construction operations utilizing pesticide-treated products are only covered by the Cr(VI) standards.

Current laboratory analytical methods cannot accurately measure both arsenic and hexavalent chromium from one air sampling cassette. Thus, where it is practical for the compliance officer to collect dual air samples for operations involving exposures to compounds containing arsenic and hexavalent chromium, sampling and analyses shall be performed for both chromium and inorganic arsenic. (Note, see Section VI.A.4, above, for further discussion on dual sampling.) If it is only practical to collect one air sample, the compliance officer should consider preferentially sampling for Cr(VI) because of its lower PEL.

OSHA reviewed existing toxicological studies and did not find data showing that the common effects of Cr(VI) and arsenic are known to be additive. Therefore, compliance officers are instructed **not** to apply the mixture formula in WAC 296-841-20005(5) until any additive health effects become known.

Where exposures exceed both the arsenic and Cr(VI) PELs, violations of both the Cr(VI) PEL and the arsenic PEL shall be cited, and two separate penalties shall be assessed. Additionally, violations of other provisions of both the Arsenic and Cr(VI) standards that are triggered by their PELs, such as respiratory protection and exposure monitoring, shall be cited when appropriate.

6. Chapter 296-842 WAC, Respirators.

Chapter 296-842 WAC contains requirements for program administration, worksite-specific procedures, employee training, fit testing, and respirator use, cleaning, maintenance and repair. WAC 296-842-12005 requires the employer to implement a respiratory protection program in accordance with WAC 296-842-12005.

7. Chapter 296-802 WAC, Employee Medical and Exposure Records. The Employee Medical and Exposure Records rules are incorporated by reference into the recordkeeping requirements, WAC 296-62-08027. Employers are required to retain medical and exposure records, transfer them, and allow employees and DOSH compliance officers to access them in accordance with Chapter 296-802 WAC.
8. WAC 296-800-170, Employer Chemical Hazard Communication.
 - a. WAC 296-800-170 is referenced in WAC 296-62-08017(2) on removal and storage of protective work clothing and equipment. Specifically, where bags or containers of contaminated clothing or equipment are removed for laundering, cleaning, maintenance, or disposal, they shall be labeled in accordance with WAC 296-800-170. (When sent to another business, labeling must meet the requirements of 296-839-40005.)
 - b. Similarly, under WAC 296-62-08021(3)(b), bags or containers of Cr(VI) waste, scrap, or debris consigned for disposal are required to be labeled in accordance with WAC 296-800-170. (When sent to another business, labeling must meet the requirements of 296-839-40005.)
 - c. WAC 296-800-170 is also referenced in WAC 296-62-08025 requiring communication of Chromium (VI) hazards to employees. As noted above, where employees are exposed to Cr(VI), there is a pre-existing duty under WAC 296-800-17030 to provide communication and training on health hazards associated with chemical exposure; on the location, manner of use and release of Cr(VI); on engineering controls and work practices associated with the employee's job assignment ; on the purpose, selection and use of respirators and protective clothing ; on emergency procedures ; and on measures employees can take to protect themselves .
 - d. Manufacturers of any materials containing Cr(VI) must revise their material safety data sheets (MSDSs), to update the PEL for Cr(VI) ingredients. Additionally, even though the Cr(VI) standard specifically excludes portland cement, Chapter 296-839 WAC contains no such exclusion. Therefore, manufacturers of portland cement must continue to provide information about Cr(VI) hazards on their MSDSs. Similarly, employers with employees who are exposed to portland cement must continue to communicate Cr(VI) hazards to affected employees.
9. WAC 296-800-230, *Drinking Water, Bathrooms, Washington Facilities, and Waste Disposal*; WAC 296-304-06013, *Health and Sanitation*; and WAC 296-155-140, *Sanitation*.

WAC 296-62-08019 references DOSH's general sanitation requirements, which already addresses change rooms (employers shall provide change rooms in conformance with WAC 296-800-230 for general industry and shipyards, and WAC 296-155-17321 for construction); washing facilities (employers shall provide washing facilities in conformance with WAC 296-800-230 for general industry and shipyards, and WAC 296-155-17321 for construction); and, eating and drinking areas (employers shall provide eating and drinking areas in conformance with WAC 296-800-230 for general industry and shipyards, and WAC 296-155-17321 for construction).

10. WAC 296-800-160, *Personal Protective Equipment*.

The Cr(VI) standards' requirements for protective clothing and equipment are essentially equivalent to the requirements in WAC 296-800-160. The additional requirements in the Cr(VI) standards address practices associated with the use of protective clothing and equipment, e.g., removal, storage, cleaning, and replacement.

11. WAC 296-800-150 and WAC 296-56-60115(3).

Although not referenced in the Cr(VI) standard, these other standards include a provision for employers to provide emergency showers and eyewashes where there are exposures to corrosives or otherwise acute acting contaminants, such as the chromic acid commonly used in plating shops. This Directive contains instructions for compliance officers to consider grouping the appropriate general first aid standard with the Cr(VI) standard's section on hygiene areas and practices where violations are found involving emergency showers in workplaces with exposures to chromic acid.

B. Other Agencies' and Organizations' Standards.

1. Environmental Protection Agency (EPA).
 - a. Clean Air Act (CAA), 42 USC § 7401 (1970). The CAA requires the EPA to develop and enforce regulations to protect the general public from exposure to airborne contaminants that are known to be hazardous to human health. The EPA established the National Emissions Standards for Hazardous Air Pollutants (NESHAP) to protect the public. Chromium is one of the hazardous air pollutants regulated, and the EPA promulgated the Chromium NESHAP in 40 CFR Part 63, Subpart N.

The Chromium NESHAP, 40 CFR Part 63, Subpart N, specifies air pollution control techniques to be used to control chromium emissions

from hard and decorative chromium electroplating and chromium anodizing tanks.

- b. Resource Conservation and Recovery Act (RCRA), 42 USC § 6901 (1976). RCRA gave EPA the authority to control hazardous waste, including generation, transportation, treatment, storage, and disposal. In 40 CFR 261.24, RCRA lists chromium as one of several toxic substances that may characterize a hazardous waste. 40 CFR 261 also lists specific wastes that are hazardous because of their chromium content. RCRA focuses only on active and future facilities and does not address abandoned or historical sites.
 - c. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or “Superfund”), 42 USC § 9601 (1980). CERCLA provides for a Federal “Superfund” to clean up uncontrolled or abandoned hazardous waste sites as well as accidents, spills, and other emergency releases of pollutants and contaminants into the environment. Through the Act, EPA has power to seek out those parties responsible for any release and assure their cooperation in cleanup. 40 CFR 302.4 includes chromium on its list of CERCLA hazardous substances.
 - d. Toxic Substances Control Act (TSCA), 15 USC § 2601 (1976). TSCA gives EPA the ability to track the 75,000 industrial chemicals currently produced or imported into the United States. EPA screens these chemicals and can require reporting or testing of those that may pose an environmental or human-health hazard. EPA can ban the manufacture and import of chemicals that pose an unreasonable risk. 40 CFR 749.68 regulates hexavalent chromium-based water treatment chemicals in cooling systems.
 - e. Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), 7 USC § 136 (1996). FIFRA provides federal control of pesticide distribution, sale, and use. FIFRA gives EPA authority to study the consequences of pesticide usage and to require users (farmers, utility companies, and others) to register when purchasing pesticides. All pesticides used in the U.S. must be registered (licensed) by EPA. Registration assures that pesticides will be properly labeled and that if used in accordance with specifications, will not cause unreasonable harm to the environment. Pesticide users also must take exams for certification as applicators of pesticides.
2. Go to Department of Ecology and Department of Health for Washington-specific environmental rules.

3. Occupational Exposure Limits of Other Agencies and Organizations.

OSHA's PEL of an 8-hour TWA at $5 \mu\text{g}/\text{m}^3$ shall be enforced by OSHA compliance officers for occupational exposures to all Cr(VI) compounds. Employers may further limit their workplace exposures to lower levels recommended by other agencies and organizations. For example, NIOSH has a recommended exposure limit of $1 \mu\text{g}/\text{m}^3$ for chromic acid and chromates as a 10-hour TWA. In addition, the American Conference of Governmental Industrial Hygienists (ACGIH®) recommends Biological Exposure Indices (BEIs®), as urine levels of chromium, to measure an employee's body burden from exposures to water soluble Cr(VI) fume at the end of the employee's work shift and work week.

VII. Drafting DOSH Citations for Cr(VI) Violations.

The compliance officer shall follow the general procedures for writing DOSH citations in the DOSH Compliance Manual, and any specific procedures in this Cr(VI) Directive. The recommended classification of violations shall be as per the DOSH Compliance Manual. Violations of the Cr(VI) standards will generally be classified as "serious" given the potential for severe impairment of health.

The general procedures for classifying and grouping violations in the DOSH Compliance Manual shall be followed. This Cr(VI) Directive also contains some specific instructions for grouping violations of multiple provisions within the Cr(VI) standards and for grouping violations of one or more provisions of a Cr(VI) standard and other DOSH standards. Deviations that appear appropriate, however, may be addressed with the Statewide Compliance Manager.

VIII. Training for DOSH Personnel.

Inspectors and consultants must be prepared for inspections where Cr(VI) exposures are expected.

A. Per L&I Internal Safety and Health (ISH) Policy 8.11, *Evaluation of Workplace Hazards*, inspectors and consultants must be knowledgeable of:

1. Potential hazards which may be encountered at the site, including the potential hazards of Cr(VI), including skin irritation and lung cancer.
2. Appropriate PPE to be worn. Each compliance officer and consultant who will be expected to use PPE shall be trained in the proper care, use, and limitations of the PPE. Use of respiratory protection by DOSH personnel is addressed in L&I Policy 8.22, *Respiratory Protection*.

3. Emergency procedures.
 4. Disposal of Cr(VI) waste generated by the compliance officer or consultant, housekeeping practices, and hygiene provisions.
- B. In addition, inspectors and consultants must be knowledgeable of the contents of Chapter 296-62 WAC Part I-2, *Hexavalent Chromium*, and this Directive.

IX. Medical Examinations for DOSH Personnel.

Many of the hazards that compliance officers and consultants may encounter are specifically addressed by the medical surveillance requirements in DOSH standards. ISH Policy 8.24, *Medical Surveillance Program*, states that supervisors and managers are responsible for enrolling employees in the medical surveillance program.

ISH Policy 8.22, *Respiratory Protection*, requires that all L&I employees including compliance officers and consultants be medically evaluated and found eligible to wear the respirator selected for their use prior to fit testing and first-time use of the respirator in the workplace. Compliance officers and consultants who are required to wear any respiratory protection shall be medically cleared via the medical surveillance program, contained in ISH Policy 8.24.

X. Protection of DOSH Personnel.

Compliance officers and consultants are reminded to use appropriate personal protective equipment when they are exposed to a hazard. Compliance officers and consultants shall not enter a Cr(VI)-regulated area, or other area where exposures are likely to exceed the PEL, unless it is absolutely necessary. For inspection and air sampling activities, remote operations are encouraged when practical.

A. Personal Protective Equipment (PPE).

Supervisors and managers shall ensure that appropriate PPE is available for compliance officers and consultants.

1. Compliance officers and consultants shall wear appropriate respiratory protection when entering a Cr(VI)-regulated area, or other area where exposures are likely to exceed the PEL.

In many cases, a compliance officer or consultant may find that an employer's exposure determination is inadequate or has not been performed at all, so professional judgment may be needed in anticipating exposure during a brief entry into a regulated area for inspection. Compliance officers and consultants shall comply with the department's respiratory protection program, as it may require the use

of respiratory protection during even brief entries into Cr(VI)-regulated areas (or any other areas with carcinogenic or acute inhalation hazards).

Select respirators in accordance with the respirator selection procedures in ISH Policy 8.22, *Respiratory Protection*. Respirators shall also meet DOSH's assigned protection factors (APFs), as set forth in Chapter 296-842 WAC, *Respirators*.

2. Besides respiratory protection, compliance officers and consultants shall wear appropriate protective work clothing and equipment as needed to avoid skin and eye contact from Cr(VI) compounds. Such clothing and equipment may include disposable coveralls with hood, foot coverings or boots, gloves, safety goggles and/or face shield.
3. Whenever handling Cr(VI) materials, such as when collecting wipe or bulk samples, compliance officers and consultants shall wear PVC or nitrile gloves with sufficient chemical resistivity and degradation resistance as per the manufacturer's performance specifications. Do not wear powdered gloves. Additionally, if 1% NaOH-coated, binderless quartz fiber filters are used for wipe sampling, gloves must provide sufficient protection from the caustic NaOH coatings on the filters.

B. CSHO Exposure Determination.

Supervisors and managers shall ensure that Cr(VI) exposure determinations, in accordance with the provisions of Chapter 296-841 WAC, Airborne Contaminants, are made for compliance officers and consultants who may be required to enter regulated areas for significant durations or who may otherwise be significantly exposed or potentially significantly exposed to Cr(VI) during worksite inspections or sampling activities.

Copies of sampling results along with a narrative describing the exposure situation will be sent to the inspector's or consultant's supervisor and to Internal Safety and Health.

C. Cleaning, Hygiene, and Waste Disposal.

Prior to site entry, compliance officers and consultants shall determine if hygiene facilities and disposal containers exist, whether they are adequate for the expected conditions at the site, and if they will be available for DOSH's use.

1. If washing facilities exist, when compliance officers or consultants enter areas at worksites where skin or eye contact with Cr(VI) compounds is likely, they shall use the employer's change rooms, washing facilities, and disposal containers for donning, doffing, and disposing of protective clothing and removing Cr(VI) from the skin.

2. If washing facilities are nonexistent, inadequate, or not available for use, a compliance officer or consultant shall determine if adequate hygiene can be provided. If it is determined that cleaning and hygiene cannot be adequately provided, a supervisor shall be contacted for guidance.

Approved:



Michael Silverstein, MD., Assistant Director
Department of Labor and Industries
Division of Occupational Safety and Health

[Appendices A, B, and C, are attached to this directive]

APPENDIX A
CR(VI) Compounds and
Typical Industries/Operations With CR(VI) Exposures

Common Cr(VI) Compounds	
Acid copper chromate (ACC) - formulation of cupric oxide, CuO, and chromic acid, CrO ₃	Chromic sulfate, Cr(OH)SO ₄
Ammonium dichromate, (NH ₄) ₂ Cr ₂ O ₇	Lead chromate, PbCrO ₄
tert-Butyl chromate, [(CH ₃) ₃ CO] ₂ CrO ₂	Potassium chromate, K ₂ CrO ₄
Calcium chromate, CaCrO ₄	Potassium dichromate, K ₂ Cr ₂ O ₇
Chromated copper arsenate (CCA) - formulation of arsenic pentoxide, As ₂ O ₅ , chromic acid, CrO ₃ , and cupric oxide, CuO	Sodium chromate, Na ₂ CrO ₄
	Strontium chromate, SrCrO ₄
Chromic acid (H ₂ CrO ₄), chromium trioxide (CrO ₃), or chromium oxide	Zinc chromate, ZnCrO ₄

APPENDIX A – CONTINUED
CR(VI) Compounds and
Typical Industries/Operations With CR(VI) Exposures

Typical Industries/Operations with Cr(VI) Exposures	
Industry/Operation	Comment / Typical Cr(VI) Chemical Used
Manufacture of chromates	Various Cr(VI) compounds
Iron and steel foundries; steel mills; forging	Chromium metal, Cr(VI) fume
Welding ¹ of stainless steel or Cr(VI) coatings	Cr in steel oxidized to Cr(VI) fume when welded or torch-cut
Manufacture of pesticides (applications are excluded from Cr(VI) standards)	CCA and ACC
Manufacture of glass	Sodium dichromate dihydrate, Na ₂ Cr ₂ O ₇ [H ₂ O] ₂
Cleaning laboratory glassware	Potassium dichromate
Electroplating; chrome plating	Chromic acid
Construction with pressure-treated wood (manufacturing of pressure-treated wood is excluded in the Cr(VI) standards)	CCA and ACC
Operations with portland cement	Excluded from Cr(VI) standards
Manufacture of chromate pigments and dyes	Dichromates, lead chromate (chrome yellow); strontium chromate; zinc chromate
Painting (aerospace, auto body repair, traffic markings); paint removal from steel structures	Lead chromate, zinc chromate, strontium chromate
Fiberglass production	Cr(VI) contaminants formed in furnace

¹ Factors that can affect the concentration of Cr(VI) in the welding fume include the composition of the base metal and the welding consumable (electrodes or welding rods), as well as the chromium content of surface coatings on the base metal. Exposures tend to be higher for welding on stainless steel (12-30% chromium) compared with welding on carbon steel (generally 3% chromium or less). Also, the more confined the working space or the absence of effective exhaust, the higher the concentration of welding fume.

The type of welding method used can also affect the fume generation rate (FGR) and, therefore, the welder's potential exposure to Cr(VI). Welding operations such as manual metal arc (MMA) welding or stick welding, also known as shielded metal arc welding (SMAW), tend to produce higher fume rates. Most repair welding is done using SMAW due to its low cost, portability, and ease of use. Other types of welding that also tend to produce high fume rates are gas metal arc welding (GMAW), also known as metal inert gas (MIG) welding, and flux-cored arc welding (FCAW); these methods are semi-automatic or automatic welding processes. Welding methods that tend to produce lower fume rates are gas tungsten arc welding, also known as tungsten inert gas welding, and submerged arc welding (SAW). (71 FR 10262)

Finally, welding parameters such as higher current/voltage and higher oxygen or carbon dioxide percentage in the shielding gas tend to increase the FGR. A suggested reference on characteristics of welding processes is Chapter III of the NIOSH Criteria for a Recommended Standard on Welding, Brazing, and Thermal Cutting.

APPENDIX B

Inspection Checklist for Worksites with Portland Cement

- **PPE:**
 - Appropriate PPE, such as boots and gloves, is provided wherever necessary and appropriate for the job.
 - Employees can clean or exchange PPE if it becomes ineffective or contaminated on the inside with portland cement while in use.
 - Equipment is maintained in a sanitary and reliable condition when not in use.
- **Sanitation:**
 - Washing facilities provided with clean water, non-alkaline soap, and clean towels.
 - Washing facilities are in near proximity to the worksite and adequate for the number of exposed employee and the size of the job.
- **Airborne exposures:**
 - 8-hour TWA exposures to portland cement or particulates not otherwise regulated (PNOR) do not exceed 10 mg/m³ PEL as total dust.
 - Construction operations with potential inhalation exposures include, but are not limited to, terrazzo work, mixing mortar, and mixing concrete.
 - Where exposures exceed the PEL, employees are provided respirators.
- **Hazard communication and training:**
 - MSDSs and labels for portland cement are maintained and made available to employees.
 - MSDSs indicate the hazards of portland cement, including hazards associated with the cement's hexavalent chromium content.
 - Employees are trained on:
 - Hazards associated with exposure to portland cement, including hazards associated with the cement's hexavalent chromium content.
 - Preventive measures, including proper use and care of PPE, and the importance of proper hygiene practice.
 - Access to hygiene facilities, PPE, and information (including MSDSs)
- **Recordkeeping:**
 - Employer records each case of occupational dermatitis that meets the recordability criteria in WAC 296-27-01101 in illness and injury logs.
 - Employer informs employees of how to report their work-related illnesses and injuries.

APPENDIX C

Acronyms

ACC	acid copper chromate
ACGIH®	American Conference of Governmental Industrial Hygienists®
APF	assigned protection factor
CCA	chromated copper arsenate
CERCLA	Comprehensive Environmental Response, Compensation & Liability Act
CFR	Code of Federal Regulations
CPL	Enforcement and Compliance Directive
Cr	chromium
CrO3	chromium oxide, chromium trioxide, or chromic acid
Cr(VI)	hexavalent chromium
Cr+6	hexavalent chromium ion
CSHO	compliance safety and health officer
CSP	Cooperative and State Programs Directive
EPA	Environmental Protection Agency
FGR	fume generation rate
FR	Federal Register
HCS	Hazard Communication standard
HEPA	high efficiency particulate air
ISO	International Organization for Standardization
MSDS	Material Safety Data Sheet
NESHAP	National Emission Standards for Hazardous Air Pollutants
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PEL	permissible exposure limit
PLHCP	physician or other licensed health care professional
PPE	personal protective equipment
PVC	polyvinyl chloride
RCRA	Resource Conservation and Recovery Act
TSCA	Toxic Substances Control Act
TWA	time-weighted average
USC	United States Code
µg/m ³	micrograms per cubic meter
WAC	Washington Administrative Code

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