

Hexavalent Chromium Procedure



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This document has been reviewed by a Y-12 DC / UCNI-RO and has been determined to be UNCLASSIFIED and contains no UCNI. This review does not constitute clearance for Public Release.
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RC-UPF DMC
 02/28/18 08:52

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REVISION LOG

Revision	Description	Intent	Non Intent
0	Initial Issue	N/A	

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1.0 INTRODUCTION

1.1 Purpose

This procedure describes the processes to be implemented at the Uranium Processing Facility (UPF) construction site and support areas to prevent worker exposure to all forms and compounds of hexavalent chromium [Cr(VI)].

1.2 Scope

This document provides direction for managing exposures in compliance with the Occupational Safety and Health Administration (OSHA) standard, set forth in 29 CFR 1926.1126, *Chromium (VI)*.

It applies to construction craft and non-manual workers assigned to locations within the UPF construction site and/or support areas where exposure to Cr(VI) may occur during specific construction tasks. Applicability to subcontractors is in accordance with the contract language.

The procedure **does not** apply where the Project has objective data demonstrating that a material containing chromium, or a process involving chromium, cannot release dust, fumes, or a mist of Cr(VI) in concentrations at or above 0.5 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) as an eight-hour time-weighted average (TWA), under any expected conditions, or as otherwise indicated in the OSHA standard.

2.0 RESPONSIBILITIES

2.1 Project Manager

The Project Manager is responsible for the following:

- ensuring the timely implementation of the Cr(VI) program
- providing the necessary resources for compliance
- providing for assessments to ensure compliance

2.2 Construction Manager

The Construction Manager is responsible for the following:

- ensuring the implementation of this procedure
- ensuring that the best practices, as described in this procedure, are followed at the construction site
- ensuring that construction supervisors and craft comply with Cr(VI) program requirements and that subcontractors comply with their Cr(VI) program

2.3 Project ES&H Manager

The Project Environmental, Safety, and Health (ES&H) Manager is responsible for the following:

- working with Construction to implement a Cr(VI) program
- ensuring Project compliance with the Cr(VI) procedure
- conducting internal assessments to ensure compliance

- designating the Project Cr(VI) Competent Person
- ensuring compliance by providing the necessary resources to the Competent Person

2.4 Project Cr(VI) Competent Person (With Assistance, As Necessary, from ES&H Support Staff)

The Competent Person is responsible for the following:

- reviewing material assessment and determining if potential risk to Cr(VI) exists
- conducting exposure assessments
- assisting training department as needed with worker-supervisor and awareness training.
- selecting and distributing respiratory protection equipment, conducting respirator training and fit testing, and arranging for medical qualification
- scheduling medical surveillance and notifying craft supervision of appointments
- conducting air, wipe, and bulk sampling, as appropriate, and communicating results to construction
- posting sampling results
- reviewing subcontractor Cr(VI) programs for compliance with the intent of this procedure
- monitoring compliance of subcontractor Cr(VI) programs with assistance from the Subcontract Technical Representative (STR)
- working with Project Procurement/Contracts to inform laundering or cleaning services that handle protective clothing or equipment contaminated with Cr(VI) of the potentially harmful effects of exposure to Cr(VI) if reusable clothing is provided
- maintaining hard copy/electronic records of sampling, equipment calibration, fit testing, and medical surveillance, as required
- maintaining onsite copies of the material safety data sheets (MSDSs) for all chromium-containing materials brought onsite

2.5 Project Field Engineer/Engineering

The Project Field Engineer, or designee is responsible for the following:

- conducting a material assessment for chromium- or Cr(VI)-containing materials (e.g., stainless steel, chrome alloy metals, paints, grits) at least three months prior to commencing activity
- providing the material assessment to the Project ES&H Lead
- specifying engineering controls that meet capture velocity requirements, and working with vendors on specific needs
- consulting with Construction, Engineering and Technology welding group to obtain the latest effective engineering control methodology and data
- designing change room facilities, as required

2.6 Construction Supervisor

The Construction Supervisor (e.g., site superintendent) or designee is responsible for the following:

- providing readily accessible hand and face washing facilities capable of removing Cr(VI) from the skin
- establishing change room facilities, as required

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- requiring and monitoring use of appropriate engineering controls, personal protective equipment (PPE), sampling equipment, and proper work practices (e.g., housekeeping, welding techniques, high-efficiency particulate air [HEPA] vacuuming, removal of protective clothing)
- ensuring that rotation of workers is not used as a method of mitigation to control exposures
- designating exclusion zones, post signage, and monitor activities within exclusion zones
- identifying and communicating to the Project Cr(VI) Competent Person regarding which employees need to be included in the Medical Surveillance Program
- ensuring that craft have received appropriate level of Cr(VI) training before they perform Cr(VI)-related tasks
- ensuring that ES&H is informed of work activities so that sampling can be conducted
- ensuring that a job hazard analysis (JHA) is completed and implemented

3.0 GENERAL WORK PROCESS

Cr(VI) is a toxic chemical form of chromium, produced entirely from industrial processes. As a result of the widespread use of chromium in building materials, construction workers can be exposed to significant amounts of this compound. Exposures typically occur during welding, painting, abrasive blasting, and working with treated wood products. On this project welding and hot cutting on/with chromium-containing alloy steels and stainless steel involve the greatest risk of exposure because Cr(VI) is found as a significant by-product in the metal fumes.

The primary routes of entry for Cr(VI) are inhalation and ingestion. Skin absorption is another potential route of entry during work with Cr(VI)-containing paints and freshly treated wood, and during abrasive blasting operations. When inhaled, swallowed, or absorbed through the skin, Cr(VI) can upset the gastrointestinal tract; damage the lungs, liver, and kidneys; and cause reproductive disorders. It may cause a variety of diseases, including lung cancer, leukemia, and Hodgkin's disease.

The project must assess its materials and processes to determine potential onsite chromium/Cr(VI) sources and potential for exposure. Two assessment activities must be completed as initial processes to determine the risk from Cr(VI).

First, a material assessment led by the Project Field Engineer, with input from the Project Welding Engineer and assistance from the Project Industrial Hygiene (IH) Lead, will determine the presence of chromium in Project-specified materials. The material assessment is the basis for determining the need for a Project Cr(VI) Competent Person and the need for exposure assessments.

Second, a Cr(VI) worker exposure assessment must be completed for potential inhalation and skin contact/absorption hazard(s). The Project Cr(VI) Competent Person can complete this exposure assessment.

A management process flow chart is provided in Appendix B, *Hexavalent Chromium Process Flowchart*.

Step 1 Chromium Material Assessment

The Project ESH Manager or designee will accomplish the following concerning the material assessment phase:

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- Consult with the Project Field Engineer (PFE) to ascertain whether any chromium-containing materials are onsite or are expected to be used onsite at a future date. This consultation may include a review of engineering specifications, MSDSs, pipe class sheets, and manufacturer's product information sheets for chromium- or Cr(VI)-containing materials. UCN-23300, *UPF Chromium Material Assessment Information*, or equivalent, must be completed by the PFE.
 - The PFE provides a copy of the completed assessment to the Project ES&H Lead.
 - The Project ES&H Lead determines the need for a Project Cr(VI) competent person based on the review of the material assessment and corporate requirements.

Step 2 Evaluate Material Assessment for Profiling

The Project Cr(VI) Competent Person shall review the material assessment and determine the exposure assessment strategy and path forward.

The Project Construction Manager and ES&H manager shall be notified of the decision for or against an exposure assessment.

Step 3 Conduct Exposure Assessment Profiles

This assessment is conducted at the Project site by the Cr(VI) Competent Person to ascertain the potential for airborne exposure based on specific work operations, materials, and conditions. Appropriate controls must be addressed for materials that pose a skin hazard, such as Cr(VI)-containing paint, abrasive blasting grit, and freshly treated wood, regardless of any potential for airborne contamination.

The Project Cr(VI) Competent Person shall perform the following:

- Obtain required air sampling equipment and sampling media needed for the worker exposure assessment.
- Prescribe appropriate and approved respirators to protect against Cr(VI) exposure during the worker exposure assessment.
- Assist Construction by performing worker exposure assessments necessary to validate the acceptability of engineering controls.

Step 4 Cr(VI) Program Implementation

Elements of an effective Cr(VI) protection program may include exposure assessments, engineering controls, exclusion zones, PPE, work practice controls, medical surveillance, training, and documentation of controls via the work package process and in accordance with Y17-95-64-823, *UPF Safety Task Analysis and Risk Reduction Talk/Job Hazard Analysis Program (STARRT/JHA) Process*.

4.0 EXPOSURE DETERMINATION/SAMPLING

The Project shall determine the representative eight-hour TWA exposure for each employee exposed to Cr(VI). (For > eight-hour exposure periods, 10- or 12-hour TWAs are determined, as applicable.) This determination shall be made by either scheduled monitoring or a combination of verification sampling and sampling data obtained from other Bechtel projects or facilities sufficient to accurately characterize employee exposure to Cr(VI).

Air sample results are obtained to comply with regulatory sampling requirements, verify sampling data obtained from other Bechtel projects, determine the adequacy of engineering controls, determine the need for and adequacy of respiratory protection, and establish the applicability of medical surveillance requirements.

4.1 Extended Work Shifts

When employee exposure periods exceed eight hours, then the results of personnel air sampling are time-weighted to 10 hours for exposure periods from 481 minutes to 600 minutes (> 8 hours to 10 hours). Results are time-weighted to 12 hours if the exposure period is 601 minutes to 720 minutes (> 10 hours to 12 hours). Permissible Exposure Limits (PELs) shall be adjusted for 10 hours and 12 hours. The method used to adjust the PEL is as follows:

$(8 \text{ hours} \div \text{hours worked}) \times \text{PEL} = \text{Adjusted PEL}$.

- For purposes of adjusting the PEL, hours worked will be 8, 10, or 12.

If exposure periods exceed 12 hours, contact the project industrial hygienist.

4.2 Scheduled Monitoring Option

Project IH personnel shall perform initial worker exposure assessments to determine the eight-hour TWA (10-hour or 12-hour TWAs, if applicable) exposure for each employee on the basis of a sufficient number of personal breathing zone air samples to accurately characterize full-shift exposure on each shift, for each job classification, in each work area. When conducting exposure sampling on a welder, then the sampling cassette shall be positioned inside the welding helmet. If the helmet is integrated into a powered air-purifying respirator (PAPR), the cassette shall be positioned outside the helmet and respirator assembly. Where the Project conducts representative sampling, instead of sampling all employees in order to meet this requirement, the Project shall sample the employee(s) expected to have the highest Cr(VI) exposures.

If two initial air sampling episodes, or a combination of representative historical sampling and one verification sampling episode, indicate that employee exposures are below the 2.5 $\mu\text{g}/\text{m}^3$ action level, then the Project may discontinue sampling for employees whose exposures are represented by such sampling. The two sampling episodes should be separated by at least seven days to ensure that any anomalies are addressed.

If initial air sampling reveals employee exposures to be at or above the 2.5 $\mu\text{g}/\text{m}^3$ action level, but below the 5.0 $\mu\text{g}/\text{m}^3$ PEL, then the Project shall perform periodic sampling at least every six months. If periodic sampling indicates that the employee exposures are below the 2.5 $\mu\text{g}/\text{m}^3$ action level, and the result is confirmed by the result of another sampling event taken at least seven days later, then the Project may discontinue the sampling for employees whose exposures are represented by such sampling.

If air sampling reveals employee exposures to be above the 5.0 $\mu\text{g}/\text{m}^3$ PEL, then the Project shall perform periodic sampling at least every three months.

The Project shall perform additional sampling when there has been any change in the production process, raw materials, equipment, work practices, or control methods that may result in new or additional exposures to Cr(VI), or when there is reason to believe that new or additional exposures have occurred.

The Project shall use OSHA ID 215 (Version 2) or equivalent as the sampling and analytical method for Cr(VI) air samples. Samples must be shipped overnight to the laboratory within 24 hours of sampling. Samples from welding operations must be analyzed within eight days of sampling.

4.3 Area Sampling

NOTE: *Area samples must not be used to determine employee exposures.*

Area sampling is not an acceptable method for determining employee exposures. Area samples should only be collected to determine potential exposures in adjacent work areas, to establish exclusion zones, or to assess the effectiveness of local exhaust ventilation.

4.4 Air Monitoring Records

The Project shall maintain accurate records of all air monitoring and equipment calibration conducted using the Air Sampling Data Sheet, (UCN-23297, *UPF Cr(VI) Air Sampling*, or equivalent), and the Air Sample Results spreadsheet, which incorporates necessary calculations.

As soon as possible, but not more than five working days after results are received, the Project shall either post the sample results in an appropriate location accessible to all affected employees, or shall notify each affected employee individually of the results in writing (UCN-23298, *UPF Cr(VI) Employee Notification*, or equivalent). Whenever the exposure determination indicates that the employee exposure is above the PEL, the Project shall describe in the written notification the corrective action being taken to reduce employee exposure to or below the PEL.

4.5 Wipe and Bulk Sampling

The Project shall collect representative wipe samples in lunch rooms and break rooms on a monthly basis (initially) to verify that administrative controls are effective and areas are maintained as free as practicable of Cr(VI). The Project shall utilize OSHA method W4001, or an equivalent alternative, as the sampling and analytical method for wipe sampling. Surface wipes shall be obtained by a Competent Person trained in the procedural criteria.

The Competent Person shall wipe approximately 100 cm² of horizontal surface from tables, chairs, or other eating/drinking area surfaces. The Bechtel administrative control limit for surface contamination has been set at 0.1 µg/100 cm² of surface area. Any detection of hexavalent chromium at or above this limit shall require that eating and drinking facilities be thoroughly cleaned and re-wipe analyzed to ensure that surface contamination remains below the Bechtel administrative control limit. The wipe sampling frequency may be reduced to quarterly if wipe sample results stay below the administrative control limit of 0.1 µg/100 cm² for at least 3 months.

The Project may collect bulk samples to determine the presence/absence of Cr(VI). A bulk sample may include such substances as abrasive blasting grit, welding debris, welding rods, paint chips, blocks of alloy, or even samples of liquids such as paints. Typically, this type of information will be available within the MSDS; however, if confirmation is required, the material may be sampled and analyzed for chromium or Cr(VI) content. Contact laboratory for guidance on bulk sampling protocol.

5.0 ENGINEERING AND WORK PRACTICE CONTROLS

Engineering controls are the primary method of controlling exposure to Cr(VI). Construction shall use engineering and work practice controls to reduce and maintain employee exposures to Cr(VI) at, or below, the action level (AL) of 2.5 µg/m³, unless Construction can demonstrate that such controls are not feasible or where employees are exposed above 5.0 µg/m³ PEL for fewer than 30 days per year. Projects are also encouraged to use

engineering controls to maintain exposure levels below the 2.5 µg/m³ AL to reserve cost from medical, training, and other similar controls.

Welder technique, body positioning relative to wind, air movement, and orientation to the weld are variables shown to influence welder exposures. Supervisors are to instruct welders on proper head and body orientation and welding technique and periodically review welder position to ensure that welders use best practices.

Rotation of workers will not be used to achieve compliance with the PEL.

If engineering and work practice controls are not sufficient to reduce employee exposure to, or below, the AL, then Construction shall use these controls to reduce employee exposure to the lowest levels achievable, and shall supplement these controls with use of respiratory protection if the potential for exposures still exceeds the PEL.

Engineering controls, such as local exhaust ventilation equipment, shall not discharge unfiltered air into occupied areas within four feet of an employee. Filtered air shall not be subject to the four-foot exclusion zone requirement. Building HVAC systems shall not be used as exhaust systems for Cr(VI) control.

The Project shall implement the following engineering controls for substances containing or emitting Cr(VI). Section 11.0, *Specific Work Process*, should be referenced for further specifications on these operations.

5.1 Painting Process

- Assess available paints and, when feasible, substitute Cr(VI)-free paints, or
- Use airless application methods if practical and if a substitute paint is not feasible.

5.1.1 Surface Coating Removal Prior to Welding or Torch Cutting

- Determine if the paint being removed contains Cr(VI). If it does, then perform the following:
 - Remove all surface coating to no less than four inches on each side of the proposed weld.
 - Avoid the use of significant dust-creating tools to remove surface coatings. Where dust is created, use appropriate respiratory protection, such as a P100/N100 half-face piece respirator.

5.2 Welding, Torch Cutting, or Plasma Arc Cutting

- Use material with the lowest chromium content possible for welding processes.
- Use local exhaust ventilation with the inlet of the exhaust hose positioned as close to the welding operation as possible (10-12 inches) to remove the fumes from the welder's head position. One unit should be used per welder. A reasonable capture velocity of 100-150 feet per minute (fpm) at the source will be adequate. The project has the discretion to determine the appropriate ventilation equipment that meets or exceeds this capture velocity. The Lincoln Electric Mobiflex NF-100 (735 cubic feet per minute [cfm]) unit is an example of a credible local exhaust ventilation unit.
- Establish exclusion zones at least 4 feet around the welding ventilation exhaust locations to minimize exposure to other workers, unless the exhaust is filtered.
- Use of local exhaust systems integrated with tools, such as welding guns, shall provide sufficient capture velocity.

5.3 Abrasive Blasting

- Use Cr(VI)-free abrasive blasting grit where possible. Apply Cr(VI) requirements if Cr(VI) is present in grit or on blasted materials.

See Section 11.0 for further requirements.

5.4 Confined Work Areas

NOTE: *The adequacy of the ventilation systems must be verified through personal air sampling.*

When welding on, or with, chromium-containing materials (filler or base materials) inside a confined area, qualified levels of mitigation must be employed in accordance with testing results, regardless of the level or percentage of chromium contained in the materials.

Qualified mitigation measures must include the following:

- Local exhaust ventilation capable of maintaining a velocity of 100-150 fpm at the source. Local exhaust ventilation must be exhausted outside the confined space unless the exhaust is filtered.
- General ventilation (i.e., blowing/exhausting fresh air into the work areas), providing 2,000 cfm per welder as required by OSHA 1910.252(c)(2), or one air change every five minutes. General ventilation used must not interfere with the efficiency of the local exhaust.

6.0 RESPIRATORY PROTECTION PROGRAM

The Project will follow the applicable requirements of Y73-050, *Respiratory Protection Manual*. The Project shall provide respiratory protection for employees during:

- periods necessary to install or implement feasible engineering and work practice controls
- work operations, such as maintenance and repair activities, for which engineering and work practice controls are not feasible
- work operations for which the employer has implemented all feasible engineering and work practice controls and such controls are not sufficient to reduce exposures to or below the PEL
- work operations where employees are exposed above the PEL for fewer than 30 days per year, and the project has elected not to implement engineering and work controls to achieve the PEL
- emergencies

7.0 EXCLUSION ZONES, SIGNS, AND LABELS

7.1 Exclusion Zones

NOTE: *Eating, smoking, drinking, chewing tobacco, chewing gum, or applying cosmetics is not permitted during any activities involving Cr(VI) regardless of whether it is taking place in an exclusion zone.*

An exclusion zone is an area of demarcation where employee exposures to airborne concentrations of Cr(VI) exceed, or can reasonably be expected to exceed, the PEL of 5.0 µg/m³. The primary purpose of an exclusion zone is to prevent entry of unprotected and/or untrained personnel into areas where Cr(VI) is present.

Based on air sampling data, exclusion zones should be established at least six feet from Cr(VI) welding operations (at point of fume generation) and at least four feet around unfiltered welding exhaust locations to minimize exposure to other workers.

Eating, smoking, drinking, chewing tobacco, chewing gum, or applying cosmetics shall not be permitted in the exclusion zone.

The Project shall provide employees who enter an exclusion zone during welding operations with approved respirators.

Establishment of exclusion zones shall be overseen by the Project Cr(VI) Competent Person.

7.2 Warning Signs

Signs shall be placed at the approaches to exclusion zones.

Signs shall be located at such a distance that personnel may read the sign and take the necessary protective steps before entering the area.

Signs shall be, at a minimum, ten-inch by seven-inch signs displaying the following legend:

DANGER

HEXAVLENT CHROMIUM

AUTHORIZED PERSONNEL ONLY

7.3 Labels

Labels shall be used to affix warning statements to packages that include such items as used coveralls, wastes, or other such items containing Cr(VI).

The Project shall affix labels or handwritten text displaying the following legend:

DANGER

CONTAINS HEXAVLENT CHROMIUM

AVOID CREATING DUST

8.0 PROTECTIVE CLOTHING AND LAUNDRY CONSIDERATIONS

Where a hazard is present, or is likely to be present from skin or eye-contact with Cr(VI), such as during painting, abrasive blasting, or handling of freshly treated wood, the employer shall provide appropriate personal protective clothing and equipment to protect against chromium compounds that present a hazard to the skin.

The Project shall furnish employees with protective clothing to cover the areas where skin or eye contact may occur. If appropriate for the conditions, then Project may furnish disposable protective clothing in lieu of reusable cloth coverings.

Protective clothing is not required for welding operations.

Whenever protective clothing is required because of a skin or eye-contact hazard, the Project shall ensure that an employee's outer garments are removed when the employee exits an established exclusion zone or enters a change room.

The Project shall 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 shall advise that the clothing and equipment should be laundered or cleaned in

a manner that minimizes skin and eye contact and effectively prevents the release of airborne Cr(VI) in excess of the 5.0 $\mu\text{g}/\text{m}^3$ PEL. See 29 CFR 1926.1126(g), 1910.1026(h), and 1910.1915.1026(g) for further guidance.

9.0 HYGIENE AND HOUSEKEEPING

9.1 Housekeeping

In addition to the specific hygiene and housekeeping requirements in this procedure, the project will also comply with applicable requirements of UPF-CP-201, *General Housekeeping*. Good housekeeping practices must be maintained. Welders and welding support personnel who perform work in exclusion zones must HEPA vacuum or remove their clothing prior to entry into eating and drinking areas and prior to exiting the work site. PPE used by such personnel must be removed prior to entry into eating and drinking areas and prior to exiting the work site.

Dry sweeping and compressed air are prohibited as means for cleaning or removing Cr(VI) debris.

9.2 Change Rooms/Washing Facilities

Where protective coveralls are worn over street clothing for painting and freshly treated wood handling operations, and the street clothing is not removed, change rooms are not required. Contamination of street clothing must be prevented during removal of protective clothing. Change rooms are required if street clothing is removed.

Change rooms are required for abrasive blasting operations involving Cr(VI) contamination since protective clothing should not be worn over street clothing, due to the high potential for ripping/tearing the Tyvek.

Change rooms are not required for welding operations.

The Project shall ensure that change rooms are equipped with separate storage facilities for protective clothing and equipment and for street clothes, and that these facilities prevent cross-contamination.

The Project shall provide readily accessible hand and face washing facilities, provided with potable water and capable of removing Cr(VI) from the skin, and shall instruct employees working with chromium materials to use these facilities when necessary.

Employees who have potential exposure to Cr(VI) over 0.5 $\mu\text{g}/\text{m}^3$ shall 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.

9.3 Eating and Drinking Areas

The Project shall ensure that designated eating and drinking areas and surfaces are maintained as free as practicable of Cr(VI). Regular cleaning schedules shall be established for eating and drinking areas. The Project shall ensure that welders and welding support personnel who perform work in exclusion zones do not enter eating and drinking areas until work clothing has either been removed or HEPA vacuumed. This requirement also applies to other craft personnel who may have Cr(VI)-containing debris on their clothing (e.g., carpenters who disassemble scaffolds after Cr(VI) work). This precaution is to ensure that Cr(VI) does not accumulate in the area or expose other employees to an ingestion hazard.

To ensure that eating and drinking areas and surfaces are maintained as free as practicable of Cr(VI), the Project shall collect initial representative wipe samples in eating and drinking areas on a monthly basis by the method specified in Section 4, *Exposure Determination/Sampling*.

10.0 MEDICAL SURVEILLANCE

Medical Surveillance shall be provided for all UPF employees who are or may be exposed to airborne concentrations of Cr(VI) at or above the action level ($2.5 \mu\text{g}/\text{m}^3$) for 30 or more days per year within any 12-month period. Y-12 National Security Complex (Y-12) occupational health services (OHS) or subcontractor equivalent will provide the medical evaluation.

10.1 Participation in Medical Program

The Project shall ensure that all required medical examinations and procedures are performed by, or under the supervision of, a physician or other licensed health care professional (PLHCP), at no cost to workers. The Project shall provide medical examinations that comply with the following:

- within 30 days after initial assignment, unless the employee has received a Cr(VI)-related medical examination that meets the requirements of this paragraph within the last twelve months
- annually
- within 30 days after a PLHCP's written medical opinion recommends an additional examination
- whenever an employee shows signs or symptoms of the adverse health effects associated with Cr(VI) exposure
- within 30 days after exposure during a situation which results in an uncontrolled release of Cr(VI)
- At the termination of employment, unless the last examination was less than six months prior to the date of termination.

Recent Examination: An initial examination is not required to be provided if adequate records show that the employee has been examined in accordance with the requirements of this section within the past twelve months. In that case, such records shall be maintained as part of the employee's medical record and the prior exam shall be treated as if it were an initial examination.

A pre-employment medical examination that was required as a condition of employment by the Project shall not be used to meet the requirements of this paragraph unless the cost of such examination is borne by the employer and the criteria are consistent with the requirements of this document.

10.2 Information to be Provided to the PLHCP

The Project shall ensure that the PLHCP conducting the medical examination receives the following information at the time of the examination:

- a description of hexavalent chromium exposure hazard anticipated to be encountered
- a description of the affected employee's duties as they relate to the employee's exposure, the employee's representative exposure level or anticipated exposure level

A description of any personal protective and respiratory equipment used or to be used by the employee, and information from previous medical examinations of the affected employee that is not otherwise available to the examining PLHCP.

10.3 Examination Criteria

A medical exam shall consist of the following:

- a medical and work history, with emphasis on past, present, and anticipated future exposure to Cr(VI); any history of respiratory system dysfunction; any history of asthma, dermatitis, skin ulceration, or nasal septum perforation; and smoking status and history (the Project will provide the questionnaire to the employee)
- a physical examination of the skin and respiratory tract
- any additional tests deemed appropriate by the examining PLHCP

The employee shall complete questionnaire prior to visiting the PLHCP. A PLHCP shall provide an opinion to the Project as to whether the employee has any detected medical conditions that would place the employee at increased risk of health impairment as a result of work with Cr(VI) or use of a respirator. The PLHCP shall specify any limitations upon the employee's assigned work based on the medical examination. The written opinion shall be provided to the Project ES&H Lead. The Project will supply a copy of the PLHCP's opinion to the employee within two weeks after receiving it.

The Project is responsible for retaining medical records of its employees assigned to any Cr(VI) exclusion zone at the site. All medical records maintained by the Project must be maintained confidentially and in a locked cabinet, with authorization only to those individuals with a Need to Know (e.g., employee or authorized representative, ES&H Supervisor, and medical personnel). The Project ES&H Lead shall be responsible for these recordkeeping provisions. The Project will establish and maintain an accurate record for each employee covered by medical surveillance, including a copy of the PLHCP's written opinions and a copy of the information provided to the PLHCP. The Project will ensure that medical records are maintained and made available in accordance with 29 CFR 1910.1020, which is 30 years after termination of employment.

11.0 SPECIFIC WORK PROCESS

The degree of engineering controls will be based on the potential to generate airborne Cr(VI). Chromium content of base and filler metals less than 0.5% will not be considered a hazard unless future data indicate otherwise. Necessary control measures are determined utilizing the Job Hazard Analysis (UCN-23299, *UPF Cr(VI) Job Hazard Analysis*), Work Process Requirements for Cr(VI) Work (Appendix C, *Work Process Requirement for Cr(VI) Work*), and this section of this procedure.

Available data indicate that the following requirements are necessary based on the current established engineering controls:

- Shielded Metal Arc Welding (SMAW) and Flux Cored Arc Welding (FCAW).

Comprehensive data indicate that SMAW and FCAW welding processes on materials with 1.0% or greater chromium content pose a potential hazard of exposing workers to Cr(VI) concentrations that exceed the OSHA AL of 2.5 µg/m³ or the PEL of 5 µg/m³. Local exhaust ventilation, utilized as outlined in Section 5.0 of this document, can significantly reduce airborne concentrations of Cr(VI).

11.1 Chromium Content 0.5%–1.0%

Initial SMAW and FCAW on chromium content of less than 1.0% will not require any special controls. Exposures must be verified with air sampling.

11.2 Chromium Content of 1.0% or Greater

If base or filler metal contains chromium of 1.0% or more, then the work activity will commence with local exhaust ventilation as outlined in Section 5.0. If local exhaust ventilation is not feasible and the chromium content is between 1% and 3%, then a half-mask air-purifying respirator (APR) is required for the following work area confinement conditions:

- multiple welders inside buildings or fully/semi-enclosed spark/weather tents regardless of general ventilation or good natural air movement; or
- Single welders inside buildings or fully/semi-enclosed spark/weather tents without general ventilation/good natural air movement.

If base or filler metal contains chromium of 3% or more, then the work activity will commence with local exhaust ventilation, respiratory protection (half-mask APR), and an established exclusion zone in place until follow-up sampling indicates that respiratory protection and exclusion zones are not required.

If local exhaust ventilation is not feasible and chromium content is 3.0% or greater, then respiratory protection shall consist of a PAPR welding hood until air sampling indicates that a lower level of protection is adequate. Establishment of an exclusion zone is also required if local exhaust ventilation is not feasible.

Medical surveillance will be required if a worker will or may be in a Cr(VI) environment that can exceed the AL for 30 or more days in a 12-month period. In addition, respiratory medical surveillance must be provided for a worker to wear a respirator.

These specific requirements may be adjusted based on results of air sampling conducted during work activities. Local exhaust ventilation will always be required whenever it is feasible, along with follow-up testing.

11.3 Gas Metal Arc Welding (GMAW/MIG), STT, Grinding

Chromium Content 1% or Greater

Current information indicates that metal inert gas (MIG) and surface tension transfer (STT) welding operations and grinding operations would not result in airborne exposures exceeding the AL; however, data are limited, so initial sampling must be conducted and these work activities will commence with local exhaust ventilation. Awareness training is also required.

11.4 Gas Tungsten Arc Welding (GTAW/TIG) and Submerged Arc Welding (SAW)

Air sampling results indicate that there should be no anticipated exposure above the AL to Cr(VI) from these activities. At this time Cr(VI) awareness training is the only requirement imposed for Gas Tungsten Arc Welding (GTAW)/Tungsten Inert Gas (TIG) and Submerged Arc Welding (SAW). Verification sampling may be conducted to establish a negative exposure assessment for the project.

11.5 Plasma Arc, Thermal Cutting, and Arc Gouging

Air sampling data and published literature indicate that these processes may create an environment where Cr(VI) is present. Additionally, it is usually difficult to utilize and maintain effective engineering controls, such as local exhaust ventilation, for hot cutting processes in a construction environment.

Thermal cutting and arc gouging of metals containing $\geq 0.5\%$ chromium may create an environment where Cr(VI) is present. Because worker exposures can exceed the PEL, even with the use of local exhaust ventilation, work should commence with both local exhaust ventilation and respiratory protection in place until follow-up air sampling results are obtained on each scenario.

If local exhaust ventilation is considered effective as a result of visible fume/smoke capture, then a half-mask respirator may be used to commence work. If local exhaust ventilation is visibly ineffective or not feasible, then a PAPR welding hood shall be used for this activity. Air sampling data will be used to ensure the correct level of protection.

Initial work activities will commence with an established exclusion zone in place to limit unauthorized access. Medical surveillance will be required if a worker will, or may be, in a Cr(VI) environment that exceeds the $2.5 \mu\text{g}/\text{m}^3$ AL for 30 or more days in a 12-month period. In addition, respiratory medical surveillance will be required for the worker to wear a respirator.

11.6 Other Welding Activities

Refer questions to the Project ES&H Manager or IH Lead.

11.7 Associated Crafts

Craft associated with the welding process, such as fire watches, electricians, pipefitters, inspectors, and carpenters need to be considered. Welding support personnel who perform work in an exclusion zone shall adhere to the same requirements as the welders (e.g., respiratory protection, HEPA vacuuming their clothing) unless air sampling results indicate otherwise.

Note: Any personnel entering a location where Cr(VI) has ceased to be generated and is visually clear of fumes/smoke will not require a respirator.

11.8 Painting

Initial painting activities using chromate or chrome oxide paints require the use of a full-face-piece PAPR. Helpers associated with the painting operation are required to use, at a minimum, a full-face APR. Requirements will be placed in the corporate protective coatings specification that Cr(VI)-containing coatings will not be used unless there is no substitute.

Air sampling during spray painting will dictate whether control methods must be upgraded or downgraded. Protective clothing will be required for this activity.

Hexavalent chromium content will typically be obtained from information in the MSDS. If there is no information to confirm the presence or absence of chromates (unknown condition), the material must be sampled and analyzed for Cr(VI) content. The Project must use the Project Cr(VI) Competent Person (e.g., IH) for assistance and guidance.

11.9 Abrasive Blasting

Projects will be required to assess whether abrasive grit contains Cr(VI) contamination. When Cr(VI) is present at any level in the blasting grit, then the Project will be required to assess the use of an alternative grit. If a substitute cannot be obtained, then the following controls will be required:

- a defined abrasive blasting area shall be established where only medically qualified and trained personnel are allowed to be present
- The abrasive blasting operator must wear an approved supplied-air abrasive blasting hood
- a helper associated with the blasting operation working in support of the blasting operation will be required to wear a tight-fitting full-face-piece PAPR
- all persons who enter the defined blasting area will be required to wear protective clothing
- the Project will be required to have a change room facility consisting of a room to don, doff, and store street clothing and a separate room to don, doff, and store soiled clothing
- similar requirements will be initiated when the grit is non-contaminated, but the blasting will occur on Cr(VI)-containing material
- engineering specifications shall state that abrasive blasting grit contains no Cr(VI)
- Cr(VI) content will typically be obtained from information in the MSDS. If there is no information to confirm the presence or absence of chromates (unknown condition) in grit or paint, the material must be bulk sampled and analyzed for Cr(VI) content

11.10 Wood

Disposal and cutting of treated wood will be treated as follows:

- burning of Cr(VI)-treated wood is prohibited
- Cr(VI) Treated Wood Cutting (Dust Creating). The following controls will be in place for cutting the treated wood:
 - a half-mask APR (P100 or N100) will be used to minimize exposure from inhalation of dust (i.e., power cutting)
 - if the wood is freshly treated and has a liquid film, then protective clothing (Tyvek) is required to protect against skin contact

12.0 RECORDS

Records generated by this procedure shall be maintained in accordance with Y15-95-800, *UPF Document Management*. Record types for documents submitted to the UPF DMC are identified in ML-PS-801768-A001, *Uranium Processing Facility Project Master Document Type List*. Quality Type is listed as Quality-Lifetime (QA-L), Quality-Nonpermanent (QA-NP), or Non-Quality (Non-QA).

Records generated by Y-12 OHS will be maintained in accordance with Y15-101, *Records and Controlled Documents*. Consolidated Nuclear Security, LLC (CNS) craft personnel's personal sampling records (e.g., sampling conducted for work on the UPF Project) will be maintained by the UPF Project through the duration of the Project and then submitted to CNS for retention. Bechtel National, Inc. (BNI) employees' personal sampling records will

<i>Hexavalent Chromium Procedure</i>

be retained by BNI or as specified by contract. Subcontractors shall retain records as indicated in contractual documents.

Records generated during the performance of this procedure include:

Record Number	Record Title	Record Holder	System/Location	Quality Type
Document Specific	Employee Notifications	BNI	Secure files	Non-QA
Document Specific	Exposure and Sampling Records	BNI	Secure files	Non-QA
Document Specific	Medical Surveillance Records	Y-12 OHS	MOHIS	Non-QA
UCN-23297	UPF Cr(VI) Air Sampling	UPF DMC	InfoWorks	Non-QA
UCN-23298	UPF Cr(VI) Employee Notifications	UPF DMC	InfoWorks	Non-QA
UCN-23299	UPF Cr(VI) Job Hazard Analysis	UPF DMC	InfoWorks	Non-QA
UCN-23300	UPF Chromium Material Assessment Information	UPF DMC	InfoWorks	Non-QA

13.0 REFERENCES

13.1 Source References

10 CFR 851, *Worker Safety and Health Program*

29 CFR 1910.134, *Respiratory Protection*

29 CFR 1910.1200, *Hazard Communication*

29 CFR 1926.59, *Hazard Communication*

BESH-ES-IH C007, *USA Hexavalent Chromium Procedure*

UPF-CP-202, *UPF Hazard Communication Program*

UPF-CP-205, *Personal Protective Equipment*

UPF-CP-214, *Barricades and Signs*

Y78-002, *Identification of Employees Requiring Medical Certification, Qualification, or Surveillance*

13.2 Interfacing References

29 CFR 1910.1020, *Toxic and Hazardous Substances*

29 CFR 1926.1126, *Chromium (VI)*

UPF-CP-201, *General Housekeeping*

Y15-95-800, *UPF Document Management*

Y15-101, *Records and Controlled Documents*

Y17-95-64-823, *UPF Safety Task Analysis and Risk Reduction Talk/Job Hazard Analysis Program (STARRT/JHA) Process*

Y73-050, *Respiratory Protection Manual*

14.0 SUPPLEMENTAL INFORMATION

Appendix A, Acronyms and Definitions

Appendix B, Hexavalent Chromium Process Flowchart

Appendix C, Work Process Requirement for Cr(VI) Work

Appendix D, Hexavalent Chromium Compliance Flowchart

APPENDIX A

Acronyms and Definitions

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ACRONYMS:

AL	Action Level
APR	Air-purifying respirator
BNI	Bechtel National, Inc.
cfm	cubic feet per minute
CNS	Consolidated Nuclear Security, LLC
Cr(VI)	Hexavalent Chromium
ES&H	Environment, Safety, and Health
FCAW	Flux Cored Arc Welding
fpm	feet per minute
GMAW	Gas Metal Arc Welding
GTAW	Gas Tungsten Arc Welding
HEPA	high-efficiency particulate air
IH	Industrial Hygiene
JHA	Job Hazard Analysis
MIG	metal inert gas
MSDS	material safety data sheet
OHS	Occupational Health Services (Y-12)
OSHA	Occupational Safety and Health Administration
PAPR	Powered air-purifying respirator
PEL	Permissible Exposure Limit
PFE	Project Field Engineer
PLHCP	Physician or other Licensed Health Care Professional
PPE	personal protective equipment
SAW	submerged arc welding
SMAW	Shielded Metal Arc Welding
STARRT	Safety Task Analysis and Risk Reduction Talk
STT	Surface Tension Transfer
TIG	tungsten inert gas
TWA	time-weighted average
UPF	Uranium Processing Facility
Y-12	Y-12 National Security Complex

APPENDIX A Acronyms and Definitions

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DEFINITIONS:

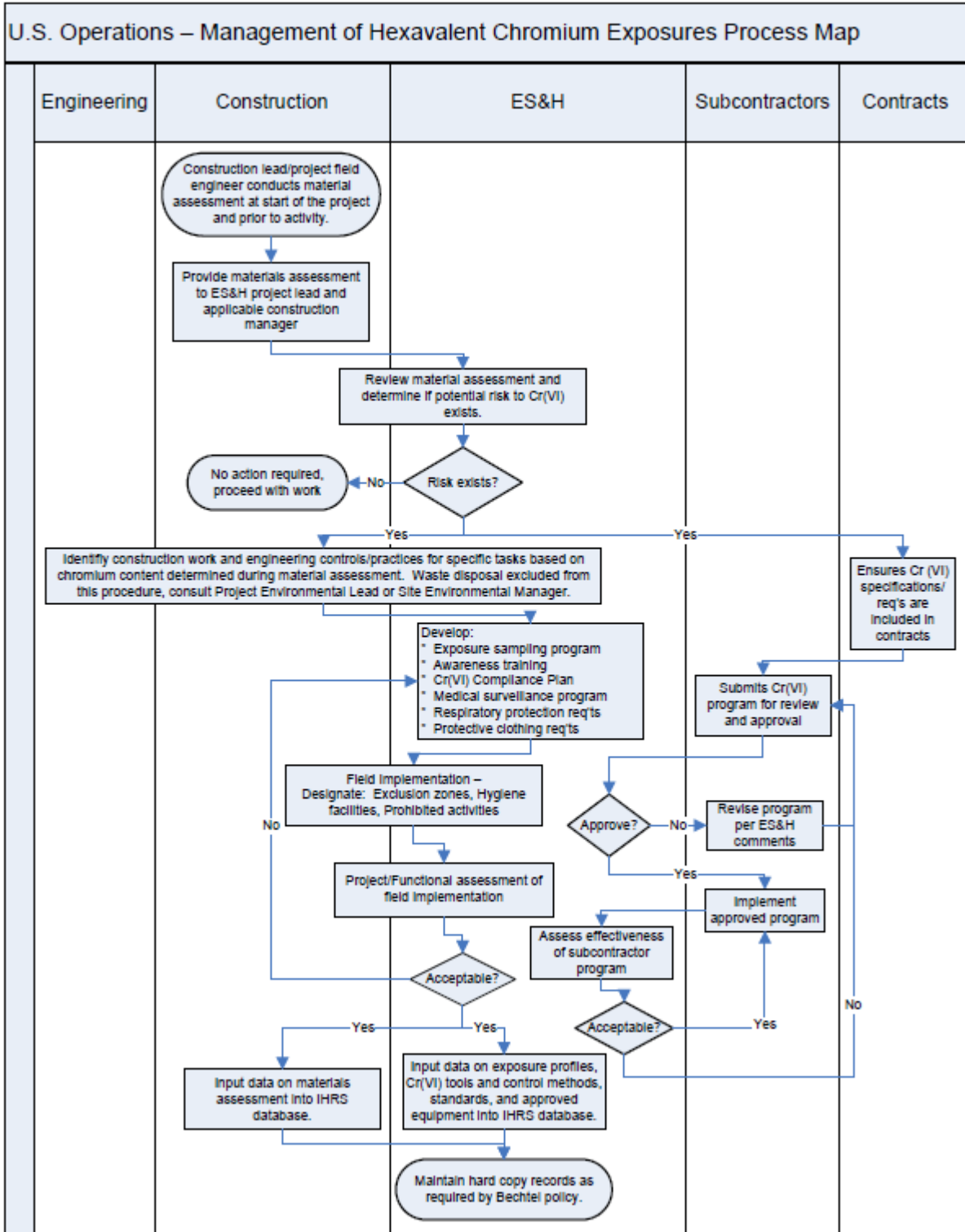
Action Level	A concentration of airborne Cr(VI) of 2.5 micrograms per cubic meter of air (2.5 µg/m ³) calculated as an 8-hour TWA.
Affected Employee	An employee who is or may be occupationally exposed to Cr(VI) and is covered under the Cr(VI) Standard (0.5 µg/m ³ , 2.5 µg/m ³ , 5.0 µg/m ³).
Breathing Zone	A location around an individual's head equivalent to the radius distance from the mouth to the lapel. For welders, the breathing sampling zone is under the welding hood.
Change Rooms	Rooms equipped with separate storage facilities for protective clothing and equipment and for street clothes, and which prevent cross-contamination.
Chrome Alloy Metal	Metal to which chromium has been added to enhance the corrosion-inhibiting properties.
Chromium-Containing Materials	Any product or material that contains hexavalent chromium or chromium compounds that may result in occupational exposure to hexavalent chromium.
Employee Exposure	The exposure to airborne Cr(VI) that would occur if the employee were not using a respirator.
Exclusion Zone	An area, demarcated by the project, where employee exposure to airborne concentrations of Cr(VI) exceeds, or can reasonably be expected to exceed, the permissible exposure limit (PEL) of 5.0 µg/m ³ .
High-Efficiency Particulate Air (HEPA) Filter	For the purpose of this procedure, a high-efficiency particulate air (HEPA) filter capable of retaining 99.97% of particles having a diameter of 0.3 micrometers or larger
Hexavalent Chromium or Cr(Vi)	Chromium with a valence of positive six, in any form and in any compound.
Hexavalent Chromium or Cr(Vi) Environment	Airborne levels of Cr(VI) at or above 0.5 µg/m ³ as an 8-hour TWA. This level applies to general awareness training; initial air sampling; wipe sampling of eating and drinking areas and washing facilities; and prohibition of eating, drinking, smoking, and chewing.
Industrial Hygienist	An experienced professional who is trained in the science devoted to the anticipation, recognition, evaluation, and control of those occupational health hazards or stresses arising in or from the workplace, which may cause sickness, impaired health and wellbeing, or significant discomfort among workers

APPENDIX A Acronyms and Definitions

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Permissible Exposure Limit (PEL)	The PEL is an 8-hour TWA of 5.0 µg/m ³ of air determined in the individual's breathing zone. The PEL is adjusted for extended work exposure periods.
Personal Sampling	Air sampling to determine Cr(VI) concentrations within the breathing zone of an employee. For welders, the breathing zone is always under the welding hood.
Physician or other Licensed Health Care Professional (PLHCP)	An individual whose legally permitted scope of practice (i.e., license, registration, or certification) allows him or her to independently provide or be delegated the responsibility to provide some or all of the particular health care services required by this procedure. On Bechtel projects, a project registered nurse may perform Cr(VI) medical exams under the direction of the project physician, and with agreement of the criteria which will necessitate physician referral.
Project Cr(VI) Competent Person	An ES&H person, designated by the Project ES&H Lead, who is an industrial hygienist or has attended the Corporate Fundamentals of Industrial Hygiene course or equivalent, who has experience and knowledge and is capable of identifying existing and potential Cr(VI) hazards, and has the authority necessary to take prompt corrective measures to eliminate or control Cr(VI) hazards. The Project Cr(VI) Competent Person works with Construction to identify and qualify control methods.
Verification Sampling	Air sampling conducted to verify sampling data obtained internally from other Bechtel projects or facilities. The data being verified must reflect workplace conditions closely resembling the processes, types of materials, control methods, work practices, and environmental conditions in the project's current operations.

APPENDIX B Hexavalent Chromium Process Flowchart



Hexavalent Chromium Procedure

APPENDIX C

Work Process Requirement for Cr(VI) Work

Process	Local Exhaust Ventilation if Feasible ⁽¹⁾	Respiratory Protection ⁽⁴⁾⁽⁷⁾		Exclusion Zone (with Local Exhaust)	Training ⁽⁸⁾	Protective Clothing ⁽⁹⁾	Cr(VI) Medical ⁽²⁾	Air Sampling
		With Local Exhaust	Without Local Exhaust					
<u>SMAW & FCAW</u> 0.5%–<1%	No	No	No	No	Awareness	No	No	Initial
1%–< 3% chromium	Yes	No	Half-Face APR	No	Worker Supervisor	No	No (if LEV)	Initial
≥ 3% chromium	Yes	Half-Face APR	PAPR ⁽³⁾	Yes	Worker Supervisor	No	Yes	Yes
<u>GMAW, STT, Grinding</u> ≥ 1% chromium	Yes	No	Half-Face APR	No	Awareness	No	No	Initial
<u>GTAW, SAW</u>	No	No	No	No	Awareness	No	No	Verification Only
<u>Thermal Cutting⁽⁵⁾</u> ≥ 0.5% chromium	Yes	Half-Face APR (if effective local exhaust)	PAPR ⁽³⁾	Yes	Worker Supervisor	No	Yes	Yes
<u>Painting</u>	Yes		PAPR ⁽³⁾	Yes	Worker Supervisor	Yes	Yes	Yes
<u>Abrasive Blasting</u>	NA		Supplied Air Abrasive Blasting Hood	Yes	Worker Supervisor	Yes	Yes	Yes
<u>Treated Wood⁽⁶⁾</u>	NA		Half-Face APR	Yes	Worker Supervisor	Yes	Yes	Yes

¹ Considerations for feasibility may include factors such as work location, conditions, and whether the work is stationary or constantly moving.

² Medical surveillance applies when exposures exceed the action level for 30 or more days in a 12-month period.

³ The PAPR must have a protection factor of 1000 or above to be acceptable.

⁴ Respiratory protection may be upgraded or downgraded based on sampling results.

⁵ Thermal cutting includes arc gouging, plasma cutting, oxy-acetylene cutting, and oxy-lance cutting on chromium materials.

⁶ Respirators are required for dust-generating activities involving cutting of treated wood. Protective clothing is required for handling freshly treated wood where liquid is present.

⁷ Confined work area conditions will affect the guidance provided in this chart. Adequate ventilation is required in all cases where there are confined areas. Consult an ES&H professional for respiratory protection level required.

⁸ Worker Supervisor training becomes a requirement for employees and their supervisors who may be exposed to levels at or above the AL.

⁹ Change rooms are also required when it is necessary to remove street clothing, such as during Cr(VI) abrasive blasting operations.

APPENDIX D Hexavalent Chromium Compliance Flowchart

