



Hexavalent Chromium (Chrome Six)

Part I - General

A. Purpose

1. This chapter describes requirements for contractor compliance with OSHA regulations for hexavalent chromium (hereafter referred to as Chrome Six). It also describes shipyard-specific work controls designed to standardize Chrome Six activities and minimize interference with other operations in the shipyard.
2. Contractors working at the shipyard, especially those performing welding and burning and who disturb or remove dried paint, may encounter Chrome Six in their projects. Much of the dried paint on shipyard facilities and vessels (other than new construction vessels) contains chromate; therefore, activities that require paint removal or working on painted surfaces may result in Chrome Six exposure. Also, many types of hot work activities described below may result in employee exposure to Chrome Six. Contractors performing these operations or working in the vicinity of these activities may be subject to Chrome Six controls.
3. In general, contractors are required to evaluate their operations to determine their potential for performing work that may involve Chrome Six. If such work is to be performed, contractors are required to work in accordance with applicable OSHA regulations and to perform required air sampling, training and medical surveillance. In addition, contractors are required to follow Newport News Shipbuilding specific requirements detailed in this chapter.

B. Scope

The scope of this chapter includes any contractor activity that involves or generates Chrome Six.

C. Applicability

1. This chapter applies to any work performed at Newport News Shipbuilding facilities and on vessels where Newport News Shipbuilding is a higher-tier contractor.
2. This chapter provides minimum requirements for performing Chrome Six work at Newport News Shipbuilding. It does not relieve the contractor of any responsibility for compliance with requirements of OSHA hexavalent chromium regulations, including but not limited to:
 - a. performing work assessments,
 - b. implementing controls,



- c. providing PPE,
- d. performing training and medical surveillance,
- e. recordkeeping, and
- f. any other provision of the applicable OSHA hexavalent chromium regulation.

D. References

1. Occupational Safety and Health Standards for Shipyard Employment, 29 CFR 1915.1026, "Hexavalent Chromium"
2. Occupational Safety and Health Standards for the Construction Industry, 29 CFR 1926.1126, "Hexavalent Chromium"

E. Definitions

1. Chromate: Chrome Six, combined with another element, such as in lead chromate, zinc chromate, potassium chromate, sodium chromate, etc.
2. Chrome: Chromium
3. Chrome-containing metal: For the purpose of this chapter, any metal that is greater than 2.5% chromium
4. Chrome-containing paint: Chrome primer or any other paint which contains at least 0.05% chromium when dried.
5. Chrome Six: Chromium of valence state positive six. Also called Hexavalent Chromium, HexChrome, Chromium (VI), Cr(VI), Cr+6 or Cr6+.
6. Chrome Six Work: Any work that requires any level of work controls or PPE to comply with OSHA regulations or to meet the requirements of this chapter.
7. Chrome Six Work Area: Area demarcated by ropes and signs in accordance with the requirements of this chapter. Not all work which involves or may create Chrome Six requires establishing Chrome Six Work Areas.
8. Exposure limits: Limits established by OSHA, which trigger various aspects of the Hexavalent Chromium regulation, as follows:
 - a. Permissible Exposure Limit (PEL): 5 micrograms of Chrome Six per cubic meter of air averaged over eight hours. This is abbreviated as 5µg/m³, 8-hr TWA.



- b. Action Level: 2.5 $\mu\text{g}/\text{m}^3$, 8-hr TWA. Employees who are potentially exposed to this level at least 30 days per year are required to be placed into a medical surveillance program.
- 9. Hot Work: For the purpose of this chapter, hot work operations are those that use an electric arc or flame to heat, burn, cut or weld metal.
- 10. Paint removal: For the purpose of this chapter “paint removal” refers to the removal of a dried paint coating using chemical or mechanical methods.



Part II – Requirements

A. Written Program

Contractors with employees who are exposed to Chrome Six above the action level at Newport News shall have a written program that explains how the contractor complies with the requirements of 29CFR1915.1026 or 29CFR1926.1126 (whichever is applicable) and with Newport News specific requirements described below. The written program should describe the contractor's process for compliance with the major elements of the applicable standard and with Newport News specific requirements when working at the shipyard.

B. Notification of Work

Contractors shall notify NNS of Chrome Six work by completing and submitting form NN 9319, *Contractor Notification of Chrome Six Work*. This form is available in appendix 2 of this chapter or from Forms Viewer (requires NNS computer access).

C. Training and Medical

1. Contract employees who perform Chrome Six work must be trained as to the requirements of the appropriate OSHA regulation and to the requirements of this chapter. This includes:
 - a. Paint removal work, where the chromium content of the paint is at least 0.05%
 - b. Hot work (other than grinding) on any metal covered in Appendix 1 of this section.
 - c. Work with any chromate-containing compound.
 - d. Any employee who enters a demarcated Chrome Six Work Area must be trained (in addition to following any other requirements established by the lead organization for that work area).
2. Medical examination may be required for some personnel in accordance with OSHA regulation.

D. Determination of chromium in paint

1. Dried paint shall be evaluated to determine chromium content prior to performing dust-producing work by using one of the following methods:



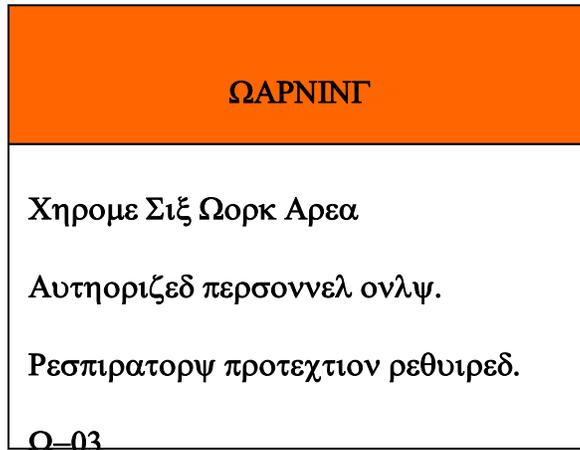
- a. Samples may be taken by a state-licensed lead inspector using state-approved sampling methods.
 - b. Samples may be taken by an unlicensed individual using the guidelines in Appendix 3 of this chapter.
 - c. Contractors may rely on a manufacturer's (not supplier's) statement that the paint is chromium free. If more than one type of paint is present then this will be required for each layer. The absence of chromium on a Material Safety Data Sheet may not be used as evidence that paint does not contain chromium.
2. Samples shall be analyzed for total chromium and that value shall be taken to be the chrome six content.

E. Chrome Six Work Areas

1. Contractors shall establish Chrome Six Work Areas, demarcated by rope and signs, for the following jobs:
 - a. Hot work jobs in specific situations identified in Appendix 1.
 - b. Paint removal operations when blasting, grinding or sanding on paints with 0.05% or more Chrome and for other paint removal jobs where agreed to with the Contract Coordinator.
2. Posted Chrome Six Work Areas are not required for other jobs unless specifically directed by the shipyard.
3. Chrome Six Work Areas shall be demarcated with white or brown rope and with the sign shown below.
 - a. The rope shall be placed so that no personnel may enter the area without crossing the rope boundary.
 - b. Signs shall be posted so that they are visible to personnel approaching the roped area from any direction.
 - c. Where feasible, an entire enclosed or confined space should be isolated with ropes and signs. In other situations, confined, enclosed and open areas, ropes should extend out at least five feet from the source of each operation in the Work Area.
 - d. For certain hot work operations, ropes and signs are required only if there are three or more workers within a 200 square foot area (see Appendix 1). Two



hundred square feet refers to a contiguous area, such as a single enclosed or confined space or ship compartment, or any open area.



Sign for Chrome Six Work Area

4. Only personnel who are wearing appropriate personal protective equipment (PPE), have permission of the lead organization for the work area and meet other regulatory requirements may enter a Chrome Six Work Area.
5. Persons who enter Chrome Six Work Areas must be trained.
6. No person in a Chrome Six Work Area is permitted to have with them, or to use, any food, beverages, tobacco products, gum, or cosmetics.
7. The NNS Contractor Coordinator will provide ropes and signs required by this chapter.

F. Engineering Control of Chrome Six

1. Use of engineering controls shall be the primary method to control potential employee exposures to Chrome Six. To the extent feasible, engineering controls shall be designed to minimize the need for employee manipulation of the control device.
2. Contractors shall ensure that ventilation is utilized for control of Chrome Six where required by this chapter.
3. Contractors shall ensure proper use of the ventilation to provide adequate capture of contaminants.



4. Contractors shall regularly inspect ventilation equipment to ensure that it is operating properly. If equipment operation degrades to any significant extent, Chrome Six work shall be stopped and not permitted to resume until repairs have been made.
5. Temporary ventilation used for control of Chrome Six is not required to be labeled.

G. Hygiene

Contractors shall ensure that employees wash their hands and faces immediately after contact with chrome-containing paint and prior to eating, drinking, smoking and applying cosmetics.

H. Application of Chrome-Containing Paint

1. Contractors shall not apply chrome-containing paint without written approval from the Newport News EH&S Department.
2. Requirements for application of chromate-containing coatings will be determined on a case basis by consultation between the contractor, the contractor coordinator and the Newport News EH&S office.

I. Disposal

1. Debris, including contents of vacuum cleaners, associated with Chrome Six work shall be sealed in properly labeled plastic bags and turned-over to the shipyard for disposal. See the Waste Management chapter of this manual for labeling procedures.
2. The shipyard Contractor Coordinator will provide specific instructions for disposal of waste.



Appendix 1: Hot Work

**Minimum of Requirements for Hot Work Operations
 On Chrome-containing Metals or Using Chrome-containing Filler Materials**

Hot Work Operation	Confined Spaces	Enclosed Spaces, Ships and Modules	Enclosed Shop Spaces	Open Shops and Hangar Bay	Open Areas (Outdoors)
CAC-A	LEV and GV SAR R&S	LEV and GV SAR R&S	LEV and GV SAR R&S	LEV SAR R&S	AV SAR R&S
SMAW	LEV APR <i>See Note 1</i>	LEV APR <i>See Note 1</i>	LEV APR <i>See Note 1</i>	LEV APR <i>See Note 1</i>	AV APR <i>See Note 1</i>
FCAW	LEV APR <i>See Note 1</i>	LEV APR <i>See Note 1</i>	LEV APR <i>See Note 1</i>	LEV APR <i>See Note 1</i>	AV APR <i>See Note 1</i>
GMAW	LEV APR	LEV APR	LEV APR	LEV APR	AV APR
GTAW	LEV	GV	AV	AV	AV
PAW/PAC	LEV APR <i>See Note 1</i>	LEV APR <i>See Note 1</i>	LEV APR <i>See Note 1</i>	LEV APR <i>See Note 1</i>	AV APR <i>See Note 1</i>
Torch Burning, Cutting, Heating	LEV	GV	AV	AV	AV

This table applies to use of metals with nominally more than 2.5% chromium, such as stainless steel, Inconel, and Hastalloy. This includes, but is not limited to, any use of the following filler materials:

SMAW			GMAW		FCAW
E8018B3L	Mil-8N12H	E320	ER320	Mil-410	E308LT-1
Mil-9016-B3L	Mil-1N12	ECoCr-A	ERNiCrMo-4	E410 NiMo	E309LT-1
Mil-9018-B3	E410	Mil-	Mil-EN82H	Mil-308, 309,	E316LT-1
Mil-9018-B3L	NiMo-15/16	308,309,310,	Mil-EN625	310, 316, 347	
	Mil-410-15/16	316, 347			



Notes

1. Ropes and signs are required where three or more persons are conducting these operations within a 200 square foot area.
2. When there are multiple SAW operations using Mil-100S-2F flux in the same enclosed space, additional GV is required.



Hot Work Abbreviations	
CAC-A	Carbon arc cutting – Air; carbon arc gouging
SMAW	Shielded metal arc welding; stick welding
FCAW	Flux-cored arc welding
GMAW	Gas metal arc welding, MIG welding
GTAW	Gas tungsten arc welding, TIG welding
SAW	Submerged arc welding
PAW/PAC	Plasma arc welding or cutting
PPE & Ventilation Abbreviations	
LEV	Local exhaust ventilation. For temporary LEV, duct must be maintained within one duct diameter of source; if this is not feasible, see text of this chapter for additional requirements.
GV	General mechanical exhaust ventilation
AV	Adequate ventilation. General ventilation or natural ventilation must be sufficient to prevent fumes from passing through the employee's breathing zone.
LEV and GV	Both LEV and GV are required. On shipboard and in enclosed shop areas, this means at least two exhaust tubes are required, one being used as LEV.
APR	Air-purifying respirator unless contractor provides objective data to demonstrate a lower level of protection is allowable.
SAR	Supplied air respirator unless contractor provides objective data to demonstrate a lower level of protection is allowable.
R&S	Chrome Six ropes and signs



Appendix 2: Notification Form

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Contractor Notification of Chrome Six Work

Contact Information

Company name: _____

Name of on-site representative: _____

Phone number of on-site representative: _____

Name of NGNN Contractor Coordinator: _____

Description of Work

Location of Chrome Six work: _____

Description of Chrome Six work: _____

Duration of Chrome Six work: From (date) _____ to (date) _____

Fax or deliver completed form to: O27 Admin Office
B. 79, Floor 1
FAX 688-6007



Appendix 3: Paint Sampling to Determine Chromium Content

- A. Obtain three samples for each color of paint in or on each functional area. Do not combine samples. Use the results from the sample with the highest percentage chromium to determine Chrome Six requirements. A single sample of each color is sufficient for contiguous areas of approximately ten square feet or less.
- B. Sample takers shall wear impermeable gloves. Coveralls may be necessary to protect against contamination while collecting overhead samples, or while collecting large numbers of samples. For overhead work, at a minimum, face shields or goggles are required.
- C. No food, drink, tobacco, cosmetics, or personal items shall be stored or used in areas where paint samples are being taken or in any other area where the possibility of contamination exists. After taking samples, personnel shall wash their hands and faces.
- D. Sample collection steps:
 - 1. Mark off an area adequate to provide enough paint for the analysis (consult your laboratory to determine the amount needed for a detection limit of 0.05%).
 - 2. Do not take the sample from an area where rust has caused the paint to blister and not be firmly attached to the surface. Score the paint with a knife around the edge of the area. Remove the paint inside the scored area down to bare metal.
 - 3. Collect all paint chips and shavings in the sample bag. Be careful to get all the paint from each layer, so that the sample is truly representative of the entire coating system.
 - 4. Identify each specific sample location with a sticker that has on it a number that corresponds to the specific sample, for ease of future reference and verification.
 - 5. After removal of residual paint chips from disposable coveralls, containment and gloves, the PPE may be disposed of as non-hazardous waste (during sampling activities only).
 - 6. Ensure that the area is maintained as free as practical from accumulations of paint chip debris and other potentially contaminated materials. All paint chip debris shall be collected for hazardous waste determination.
 - 7. Paint chip samples shall be analyzed by a laboratory that is AIHA accredited to analyze lead samples.