

Hexavalent Chromium

This document is an overview of amendments made to several OSHA Standards that were published as a Final Rule on February 28, 2006. These changes address workers' exposure to Hexavalent Chromium, (Chromium VI), and include three new Sections to 29 CFR. Refer to the Federal Register, Document 71:10099-10385 for a copy of the complete Publication, which includes a preamble, the three new Sections, listing of other amendments and changes to tables.

Amended Standards

- 1910: Safety & Health Regulations for General Industry
- 1915: Occupational Safety and Health Standards for Shipyard Employment
- 1917: Marine Terminals
- 1918: Safety and Health Regulations for Longshoring
- 1926: Safety & Health Regulations for Construction

The three new sections are:

- o 1910.1026
- o 1915.1026
- o 1926.1126

Refer to the end of this document for a more complete reference guide to the major amendments and additions.

Overview of the standards

The following is a very brief listing of key points addressed in the new standard.

- **Scope**
 - o 1910.1026: general industry
 - o 1915.1026: shipyards, marine terminals and longshoring
 - o 1926.1126: construction
- **Permissible Exposure Limit**
 - o A TWA of 5 $\mu\text{g}/\text{m}^3$ (0.005 mg/m^3)
- **Determining the worksite concentration & notification of exposed employees**
- **Respiratory protection**
- **Protective work clothes and equipment**
- **Areas free from contamination for changing, washing, eating & drinking**
- **Housekeeping guidelines**
- **Medical Surveillance**
- **Training and Hazard Communication**
- **Record Keeping**

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Compliance Deadlines:

- **November 27, 2006** (*9 months from date of Final Rule Publication*): Applies to employers with 20 or more employees.
 - o All obligations of the new section applicable to the employer's industry except engineering controls.
- **May 30, 2007** (*15 months from date of Final Rule Publication*): Applies to employers with 19 or fewer employees.
 - o All obligations of the new section applicable to the employer's industry except engineering controls.
- **May 31, 2010** (*3 years and 3 months from date of Final Rule Publication*): Applies to all employers.
 - o Engineering controls, if feasible, must be in place.

Industrial Profile

OSHA has identified as many as thirty industries where hexavalent chromium [Cr(VI)] is used and estimates approximately 1 million workers are exposed to Cr(VI) on a regular basis. Industries include:

- Chromate Ore
- Electroplating
- Welding, specifically stainless steel (including shipyards)
- Painting, (including aerospace industry)
- Chromate pigment production and use
- Steel mills
- Iron & steel foundries

Applications where Cr (VI) may be found include:

- **Welding:** Stainless has a very high chrome content of 10% to 40%. The presence of chrome is what gives the weld its incredible strength and hardness. Welders will use stainless when welding any equipment that will take a lot of hard pounding and abrasions, such as crane buckets, bulldozer blades and stone crushing equipment.
- **Metallurgical:** Chromium is used to produce stainless steel, alloy steel and nonferrous alloys. Chromium is alloyed with other metals and plated on metal and plastic substrates to improve corrosion resistance and provide protective coatings for automotive and equipment accessories.
- **Chemical Industry:** Used in pigments, metal plating and chemical synthesis as ingredients and catalysts.
 - o High quality pigments in textile dyes, paints, inks, glass and plastics
- **Portland Cement:** It is not intentionally added to Portland cement, but is often present as an impurity

Respiratory Protection

Employers first need to do a site assessment and determine their employees' level of exposure to hexavalent chromium. If the employer finds that the worksite exposure is above the permissible level, then the employer should attempt to engineer out the contaminant exposure. If that is not feasible, then respiratory protection shall be provided.

- **Site Assessment:** Determine the employees' 8 hour time weighted average exposure to Cr(VI).
 - o Below the PEL of 5 µg/m³
 - Respiratory protection is not required.
 - o At or above the PEL of 5 µg/m³
 - Implement engineering controls to bring the exposure down to less than the PEL or;
 - if engineering controls are unfeasible, provide respiratory protection as part of a complete Respiratory Protection Program
- **Engineering Controls:** Lower the exposure so it is below the PEL through engineering controls and/or work place practices
 - o Increased ventilation or other methods of decreasing contaminant levels.
 - o Change the method of manufacture and/or materials used to eliminate or decrease exposure to Cr(VI).
 - o Exception to the requirement: OSHA recognizes the difficulty in establishing engineering controls in the aerospace industry, where whole aircraft or aircraft parts are being worked on. For that reason, aerospace employers only need to bring the worksite concentrations for CR (VI) to or below 25 µg/m³, or five times the PEL, rather than to the PEL. As with all industries, respirators are to be used to protect workers when the exposure is above the PEL.

- **Provide Respirators:** When the exposure is above the PEL and engineering controls are either inadequate in lowering the exposure so it is below the PEL, or if engineering controls are unfeasible, than respiratory protection shall be provided.
 - o **<2.5 µg/m³** (<0.0025 mg/m³); **under the action level**
 - ▮ no respiratory protection is required.
 - o **<5 µg/m³** (<0.005 mg/m³); **under the PEL**
 - ▮ no respiratory protection is required.
 - o **5 µg/m³ to <50 µg/m³** (0.005 to <0.05 mg/m³); **worksite concentrations up to 10 times the PEL**
 - ▮ Air-Purifying Half Mask with particulate filters
 - CFR-1 with:
 - o Non-oil particulates: 42N95
 - o Particulates with oil aerosols: 42R95
 - 5500 or 7700 Series with:
 - o Non-oil particulates: 7506N95 or 7506N99,
 - o Particulates with oil aerosols: 7506R95, 75FFP100, 75FFP100NL, or 7580P100

For welding

 - 5500 or 7700 with 75FFP100, 75FFP100NL, or with BP1002 backpack adapter & 7580P100 filters

Note: Cr(VI) can irritate the eyes, and direct contact with the eyes may cause permanent damage. A full facepiece respirator will provide eye and face in addition to respiratory protection.

 - o **50 µg/m³ to <125 µg/m³** (0.05 to <0.125 mg/m³); **worksite concentrations up to 25 times the PEL**
 - ▮ PAPR Loose Fitting Facepiece with HEPA filters
 - PA101 Primair with CA101 or CA101D Compact Air blower/battery assembly, and 40HE HEPA filters.
 - o **125 µg/m³ to <250 µg/m³** (0.125 to <0.25 mg/m³); **worksite concentrations up to 50 times the PEL**
 - ▮ Air-Purifying Full Facepiece with particulate filters
 - 5400 or 7600 Series with 7580P100 or 75FFP100 filters
 - o Non-oil particulates: 7506N95 or 7506N99,
 - o Particulates with oil aerosols: 7506R95, 75FFP100, 75FFP100NL or 7580P100

For welding

 - 5400W or 7600W (w/welding adapter), with 75FFP100, 75FFP100NL or 7580P100 filters - ▮ PAPR Half Mask with HEPA filters
 - 5500 or 7700 Series with CA102 or CA102D Compact Air blower/battery assembly, and 40HE HEPA filters

For welding

 - 5500 or 7700 Series with CA102 or CA102D Compact Air blower/battery assembly and 40HE HEPA filters
 - ▮ Supplied Air Half Mask
 - 5500 or 7700 Series with CF2007 airline adapter.

For welding

 - 5500 or 7700 Series with CF2007 airline adapter
- o **250 µg/m³ to <5,000 µg/m³** (0.25 to <5 mg/m³); **worksite concentrations up to 1,000 times the PEL**
 - ▮ PAPR full facepiece or hood with HEPA filters
 - 5400 or 7600 Series with CA102 or CA102D Compact Air PAPR blower/battery assembly, and 40HE HEPA filters
 - PA111 or PA121 Primair Plus hood with CA101 or CA101D Compact Air blower/battery assembly, and 40HE HEPA filters

For welding

 - 5400W or 7600W Series (w/ welding adapter), CA102 or CA102D Compact Air PAPR blower/battery assembly, and 40HE HEPA filters

► Supplied Air Full Facepiece or Hood

- 5400 or 7600 Series with CF2007 airline adapter for continuous flow
- 7800 Series continuous flow supplied air with P100 for entry, egress or escape
- 85300 Series continuous flow hoods
- 85400 or 85500 Series pressure demand airline

For welding

- 5400W or 7600W Series (w/welding adapter) with CF2007 airline adapter for continuous flow
- 7800 Series with 8404 welding adapter, and P100 for entry, egress or escape
- 85400 or 85500 Series with 8402 welding adapter

o **>5,000 µg/m³ or unknown (>5 mg/m³)**

► Pressure Demand Airline with egress or Self-Contained Breathing Apparatus

- 85500 Series
- 800 Series SCBA

For welding

- 85500 Series with 8402 welding adapter

Hexavalent Chromium:

Hexavalent Chromium is chromium with a valence of positive six, in any form and in any compound, also referred to as Cr(VI).

Chromium hexavalent Cr(VI) compounds, often called hexavalent chromium, exist in several forms. Chromates are often used as pigments for photography, and in pyrotechnics, dyes, paints, inks and plastics. They can also be used for stainless steel production, textile dyes, wood preservation, leather tanning, and as anti-corrosion coatings.

The National Institute for Occupational Safety and Health (NIOSH) Pocket Guide to Chemical Hazards provides information on hexavalent chromium compounds under the following categories:

- Chromium Acid and Chromates
- Chromyl Chloride

Prior to this Standard revision the PEL as stated in 29 CFR 1910.1000 Table Z had a ceiling value of 100 µg/m³ (100 microns per cubic meter) measured as chromium (VI) and reported as chromium anhydride (CrO₃). The amount of chromium (VI) in the anhydride compound equates to a PEL of 52 µg/m³. This ceiling limit applies to all forms of hexavalent chromium, including chromium acid and chromates, lead chromate and zinc chromate. The PEL for hexavalent chromium in the construction industry was 100 µg/m³ as a time weighted average (TWA) PEL, which also equates to a PEL of 52 µg/m³. With these amendments, a PEL for Chromium (VI) for General Industry, Shipyards, and the Construction Industry is established at 5 µg/m³. The new Ruling also amends Table Z to reflect this change.

Health Effects from Exposure:

There are several health risks to long term exposure to hexavalent chromium.

- Possible risk of lung cancer
- Asthma
- Damage to nasal passages
- Dermatoses

Cancer: OSHA has made a preliminary determination that all Cr(VI) compounds (e.g. water soluble, insoluble and slightly soluble) possess carcinogenic potential and this present a lung cancer risk to exposed workers.

Eyes: Direct contact with chromic acid or chromate dust can cause permanent eye damage

Respiratory Tract: Cr(VI) can irritate the nose, throat and lungs. Repeated or prolonged exposure can damage the mucous membranes of the nasal passages and result in ulcers. In severe cases, exposure causes perforation of the septum (the wall separating the nasal passages).

Skin: Prolonged skin exposure can result in dermatitis and skin ulcers. Some workers develop an allergic sensitization to chromium. In sensitized workers, contact with even small amounts can cause a serious skin rash.

Kidney: Kidney damage has been linked to high dermal exposures.