

Controlling Exposure to Hexavalent Chromium in Aerospace and Air Transport Painting

Hexavalent chromium or Cr(VI) is a toxic form of chromium which can cause severe health effects to workers, including lung cancer. Chromium compounds are added to paints and primers to provide corrosion protection and to create specific colors. Painting operations in the aerospace and air transportation industries can expose workers to hazardous levels of Cr(VI). The OSHA Permissible Exposure Limit (PEL) for worker exposure to Cr(VI) is 5 µg/m³ [as an 8-hour-time weighted average (TWA)] and OSHA regulates worker exposure to this hazardous substance under its **Chromium (VI) standard, 29 CFR 1910.1026**.

Painting operations that expose workers to hexavalent chromium

Certain paints and primers may contain Cr(VI), a cancer-causing compound regulated by OSHA. Exposure to Cr(VI) can occur during the painting of aircraft exteriors, interiors or parts, and during the removal of chromate-based coatings. Job tasks that may expose workers to Cr(VI) include spray painting, sanding, grinding and abrasive blasting.



Spray painters applying a conversion coating treatment on the outside of an F15. (Photo courtesy of U. S. Air Force).

Small business owners should read OSHA's [Small Entity Compliance Guide for the Hexavalent Chromium Standards](#).

Health effects of exposure to Cr(VI)

- Lung cancer and nasal and sinus cancer
- Eye, nose and throat irritation
- Nasal septum ulcerations and perforations, gastritis, and gastrointestinal ulcers
- Contact dermatitis, irritation, ulcers, and sensitization from skin contact

For more information on Cr(VI) adverse health effects and protective measures see OSHA's [Health Effects of Hexavalent Chromium Fact Sheet](#).

Methods to reduce Cr(VI) exposure levels when spray painting aircraft parts

Spray painting aircraft parts can be done in a spray booth with a downdraft or cross-draft exhaust ventilation system to keep exposures below the OSHA PEL of 5 µg/m³.

Methods to reduce Cr(VI) exposure levels when spray painting assembled aircraft

Spray booths may not be feasible when painting assembled aircraft or large aircraft parts. Controlling Cr(VI) exposure can be challenging and requires careful planning to protect workers.

Ways to reduce or prevent worker exposure to hexavalent chromium

Substitute with chromate-free paints and coatings, if possible.

Use paints or coatings that contain less than 10 percent chromate, where product performance permits.

Keep unnecessary personnel out of area.

Apply the minimum required quantity of primer to avoid overspray.

Spray paint in the direction of the spray booth's exhaust intake so that overspray is pulled away from the worker's breathing zone.

Set the high volume, low pressure (HVLP) spray gun pressure at 10 psig or less.

Ensure that paint spray equipment and spray booth ventilation are in good working order.

Adjust the spray booth air velocity (**minimum 100 feet per minute**) to achieve optimum removal of overspray paint mist.

Inspect spray booth filters and door seals.

Mix smaller batches of primer and keep the number of spray painters to a minimum.

Work in tandem to avoid spraying towards another painter.

Check that the general ventilation system is operating (building exhaust fans).

Position aircraft in the hanger to best utilize the airflow of the building's general ventilation system.

Use fans and barriers (curtains) to create spray booth-like ventilation to guide the flow of air away from workers and toward externally located air-moving devices.

Paint during off-hours to limit exposure to other workers.

Use appropriate respiratory protection.

Some engineering controls, like dilution (general) ventilation, may not be effective when spray painting assembled aircraft (interior, exterior) and large aircraft parts (wings, tail sections, ailerons (wing turning mechanism, etc.) in hangers or other large buildings. OSHA's Cr(VI) standard provides that where employees are painting aircraft or large aircraft parts, engineering and work practice controls must be used to reduce Cr(VI) exposures to or below $25 \mu\text{g}/\text{m}^3$ (8-hour TWA), unless the employer can demonstrate that such controls are not feasible. The employer must supplement engineering and work practice controls with respirators to achieve worker protection to the PEL of $5 \mu\text{g}/\text{m}^3$ (8-hour TWA).

Schematic of a cross draft exhaust ventilation spray booth

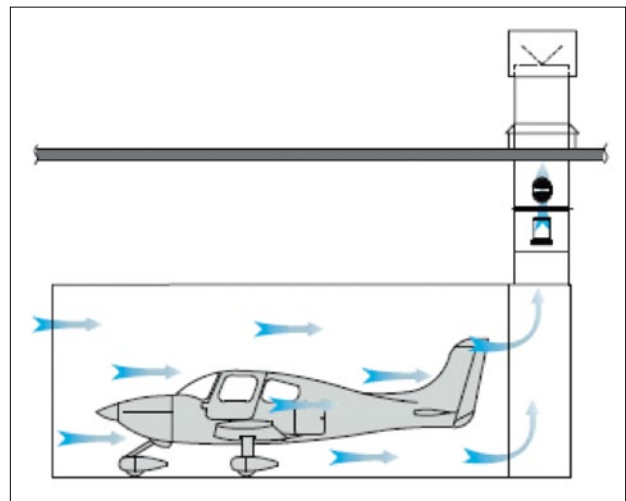


Image courtesy of Global Finishing Solutions

Control methods to reduce worker Cr(VI) exposure during paint removal

Sanding, grinding, and abrasive blasting to remove paint can be performed in spray booths or rooms with mechanical ventilation. In large hangers or rooms with only general ventilation, equipment can include local exhaust ventilation (LEV) to capture generated dust.

In addition:

- Use handheld powered sanding, cutting, and grinding equipment with attached LEV connected to high efficiency particulate air (HEPA) filtered exhaust.

- Do not use compressed air to blow dust off aircraft or parts.
- Use HEPA filtered vacuums or wet methods (spray mist) to reduce dust.
- Use ventilated, fully enclosed glove box abrasive blasting units for small objects.

- Conduct abrasive blasting in a dedicated room equipped with mechanical exhaust ventilation for large parts.

More Information

For more information on hexavalent chromium exposure, visit OSHA's website at www.osha.gov.

This is one in a series of informational fact sheets highlighting OSHA programs, policies or standards. It does not impose any new compliance requirements. For a comprehensive list of compliance requirements of OSHA standards or regulations, refer to Title 29 of the Code of Federal Regulations. This information will be made available to sensory-impaired individuals upon request. The voice phone is (202) 693-1999; teletypewriter (TTY) number: (877) 889-5627.

For assistance, contact us. We can help. It's confidential.



**U.S. Department of Labor
www.osha.gov (800) 321-OSHA (6742)**

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