



Boeing - St. Louis' Response OSHA Cr6 Rule

The formal risk assessment process, utilized within the **Boeing Limited** Boeing-St. Louis Environmental, Safety & Health Strategic Operating Plan (ESHSOP) activity, identified Hexavalent Chromium as the # 1 Environmental and Safety/Health (ESH) 2006 issue at Boeing-St. Louis.

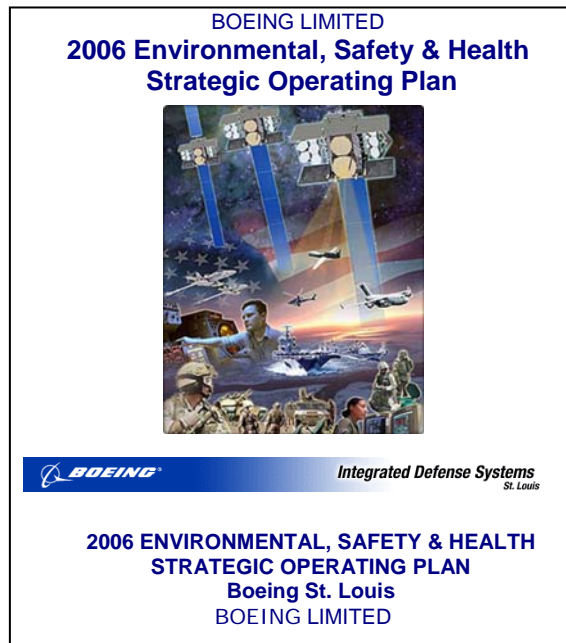


Fig. 1 – Formal Boeing – St. Louis Plan

In response to this and other inputs relative to the far-reaching proposed rule being developed by the Occupational Safety & Health Administration (OSHA), a formal integrated approach was utilized to include potentially affected internal organizations along with external customers and suppliers.

Note: The specific approach by this group incorporated appropriate information from

and complimented other activities at the Boeing-Enterprise, Boeing Commercial Airplane (BCA), Integrated Defense Systems (IDS), and Government Relations Organizations.

The overall goal of this creative and thorough team approach was to prepare for and ensure future regulatory compliance and provide the best possible solutions for Boeing-St. Louis, based on an optimum balance of risk, timing and cost. As a result of the 2005/2006 effort, Boeing-St. Louis is prepared to implement all actions necessary (including capital improvements) to ensure compliance.

The OSHA proposed rulemaking for Hexavalent Chromium arguably presented one of the most difficult regulatory and technical challenges for Boeing-St. Louis in recent history. Short term and long term recommendations are presented to management for consideration. In the case of Hexavalent Chromium, the obvious long term solution is to eliminate the material from aerospace coatings and processes. Since this has not been realized and chrome continues to be used for numerous technical reasons, the urgency of preparing for compliance with the proposed rulemaking became critical and was addressed in the short term recommendation.

A Natural Work Group (NWG) was formed comprised of representatives from Environmental Assurance (EA), Safety Health & Environmental Affairs (SHEA), Materials & Process (M&P) Engineering, Industrial Engineering, Facilities Services, and others as needed on an ad hoc basis. The process began by utilizing and supplementing

information previously captured under the Company and IDS initiatives along with a thorough, detailed review of the proposed rule and how it would specifically affect Boeing-St. Louis.

Note: Coordination with the IDS Chrome Committee was important to avoid duplication of effort.

A NWG Task Schedule, divided into the following three sections, was developed: PLANNING based on the activities noted in the 2005 Milestone Chart provided at the kickoff meeting;

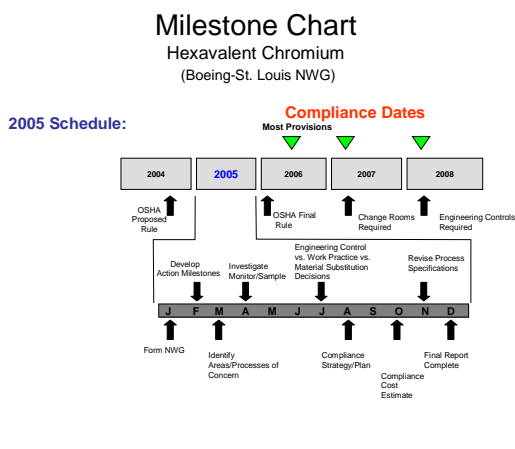


Fig. 2 – Milestone Chart –Hexavalent Chromium. Note: Compliance Dates Changed in Final Rule.
(Double click left on the chart for a full view)

IMPLEMENTATION based on activities noted in the OSHA Proposed Standard, also provided at the kickoff meeting; and COMPLIANCE VALIDATION (EA Project Documentation Practice). The NWG was comprised of a core group of experts and also subdivided into sub-groups led by appropriate subject matter experts that addressed specific aspects of the proposed rule and relevant activities.

The sub-groups consisted of teams covering the following issues: Affected Documentation, Communication of Hazards, Paint Operations Consolidation, Engineering Controls, Exposure Monitoring, Housekeeping, Hygiene Areas/Change Rooms, Medical Surveillance, Phantom Works, Protective Clothing/Equipment, Recordkeeping, Regulated Areas, and Respiratory Protection.



Fig. 3 – Spray painting large parts or entire planes in hangers

The general charter of the group was to:

- (1) Identify/Prioritize Boeing-St. Louis areas of potential exposure to hexavalent chromium (proposed for further regulation by OSHA).
- (2) Reduce risk in identified areas by eliminating/reducing product use or ensuring workers are otherwise protected.
- (3) Verify compliance prior to the final rule issuance date.
- (4) Document in Final Report

Information gathered by each sub-group was shared with the entire NWG in formal monthly meetings to ensure progress was being made and the entire effort was on track for compliance with the upcoming standard. The sub-groups met more often as appropriate for each team. The entire effort was coordinated utilizing a SharePoint website specifically dedicated to this activity. Status of the activity was communicated through IDS Committee, Program Points of Contact (POC) and Directives Review Committee meetings, along with specific presentations to internal engineering groups and others.

Also as part of the St. Louis effort a detailed, yet simple to understand, guidance document was developed which was later issued and used across numerous IDS Sites. In addition, on-site guidance and other assistance was provided to Boeing San Antonio, Boeing Macon and Boeing Operations at Fallon Naval Air Station (NAS).

Numerous requests for information were responded to by Boeing-St. Louis and Boeing continues to communicate with customers, suppliers and others relevant to this issue.

The following is the Boeing supplier portal website:

http://www.boeing.com/companyoffices/doingbiz/supplier_portal/BSP_External.html

Other Accomplishments of the NWG:

- Possibilities for Paint Area Consolidation
 - Joined a larger St. Louis Wide Team looking at all processes.
- Engineering Controls
 - Begin implementation of HEPA vacuum sanders, grinders, etc.
 - Budget Approved (2006)
 - Central vacuum systems vs. Portable units
 - Will use both types
- Training
 - Assist in training module development and ensure all appropriate personnel are trained.
- Affected Documentation
 - Identified Process Specifications (Approximately 400 IDS Wide reference use of chrome)
 - Adapt to any changes plus possible standard safety warning for continued use. Could modify Material Methods Procedures (MMP's). Develop Hazard Communication Information Sheets (HCIS's) and reference in procedures.
- Exposure Monitoring

- 2005/2006 Hex Chrome Sampling Plan developed

The proposed rule requires employers to institute engineering controls and work practices to **reduce exposure to the lowest feasible level** even if these measures alone would not reduce the concentration of airborne Cr (VI) to or below the PEL. The NWG along with the technology group within EA has an additional objective to reduce exposures with existing technology and continue to research alternatives to reduce hexavalent chromium in our processes.



Fig. 4 –Scuff Sanding of Chromated Primers with HEPA Vacuum Engineering Control

A sub-group within the NWG has worked with vendors who supply High Efficiency Particulate Air (HEPA) vacuums to ensure we are ready to install both central and portable systems in a timely fashion. This effort will further reduce exposures and thus cost savings will occur in the requirement of change rooms, regulated areas and many other aspects of the expanded standard provisions.

EA continues to work on formal teams such as the Joint Services, Hard Chrome Alternatives Team (HCAT). All chrome plate replacement data and activity for Department of Defense (DoD) is shared on the HCAT website (www.hcat.org). Data sharing helps reduce Research and Development (R&D) costs for DoD and aerospace companies and assists in implementation of chrome free technology such as High Velocity Oxygen Fuel (HVOF) thermal spray. In addition, EA presented information relative to the Boeing-St. Louis efforts to eliminate hexavalent chromium from our coatings processes at the Air Force's Corrosion Control Conference. This annual conference is where the customer, suppliers, and

manufacturers exchange relevant information. Many specific projects within EA are striving to eliminate chrome from Boeing-St. Louis by development of new technology from comprehensive R&D development programs/tools. Examples include:

- MMS-423 qualification testing of a production size batch of next generation non-chrome primer candidates.
- University of Missouri - Rolla's cerium conversion coating process is being optimized.
 - Salt spray corrosion resistance for 2024 aluminum alloy
 - Bath life for Ce conversion coating solution
- Boeing – Madrid continues to work on Zr-Mn-Mo-Ti conversion coating development
 - Adding conductive polymers to coating system
- Aerospace Chrome Elimination (ACE) meetings
 - Implementation of non-chrome primer at most aerospace locations does not appear to be possible by Nov. 2006
 - Determining costs for compliance with proposed OSHA rule
- Boeing working with DEFT Inc. to develop/improve non-chrome primer implementation on F-15 Program at Warner Robins Air Logistics Command (ALC)

The following describes how this effort supports Boeing Policy 4, Safety, Health and Environmental Affairs and aligns with Vision 2016:

The Boeing-St. Louis Environmental Assurance Division along with the Environmental and Hazardous Materials Services, and Occupational Safety and Industrial Hygiene Departments, routinely conducts strategic planning jointly. The result of this annual effort is the Boeing-St. Louis Environmental, Safety & Health Strategic

Operating Plan (ESHSOP). This planning has resulted in an improved understanding for environmental, safety/health issues as they relate specifically to Boeing-St. Louis technology, facilities, production, customers, and employees.

Conducting this planning has provided assurance that our organization is actively working to protect the health and safety of workers as well as the environment and surrounding community while responding to constantly changing statutory, regulatory and customer requirements.



Fig. 5 - Interior Primer Reactivation

This activity is consistent with Total Quality Management Principles and the concept of ISO 14000 Standards along with Company Policies and Vision. This also aligns us more closely with our customer's philosophy, including but not limited to, the new direction of the Defense Acquisition System and guidance from DoD series 5000 Directives.

This specific effort clearly addresses: 1. Detailed customer knowledge and focus 2. Large-scale integration 3. Customer satisfaction 4. People working together 5. A diverse and involved team and 6. Good corporate citizenship.

In addition, it highlights the Boeing commitment to provide employees with a safe and healthful workplace, along with the use of research in science and technology to improve worker safety & health, our community, and company value.

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