



Cadmium-Plated Military Electrical Connectors and Fasteners

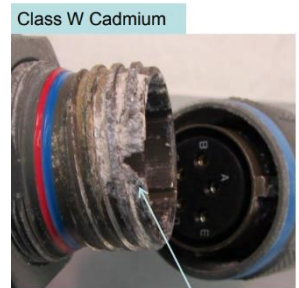
Recognizing, Evaluating, and Controlling Potential Exposures to Cadmium

BLUF: Industrial Hygienists need to be aware that some electrical connectors contain cadmium plating which could be subject to corrosion. White crystalline cadmium salt, also known as cadmium bloom, can be generated on the surface when the connector remains exposed to organic acids in an enclosed environment.

Background: Cadmium is a toxic metal which is regulated by the Occupational Safety and Health Administration (OSHA). Although it's used on certain types of military connectors and fasteners for its corrosion resistance properties, the surface coating can corrode under certain conditions.

Cadmium Component Information and Characteristics:

- Connector Examples:
 - MIL-DTL-38999N – Class Designators: W (Cadmium on aluminum) and J (cadmium on composite) as well as A, B, and U.
 - Olive Drab Color (or Yellow)
 - Circular or Rectangular Shape – Quick Disconnect
- Equipment Example:
 - Underwater Telephone Transmitter Electrical Connectors (AN/WQC-2)



Work Environment Factors: Shipping and storage containers with wood pallets can produce formic acid, which causes white crystalline cadmium salt deposits to form on the surface of metal plating (i.e., cadmium chloride, cadmium sulfate). This corrosion can present a health risk if the crystal salt deposits are disturbed during opening and inspection of equipment and parts containers, and the removal or refurbishment of affected parts. Cadmium bloom on hardware has usually been associated with entrapment of acidic vapors together with the cadmium in a sealed enclosure. Acids can be formed in hardware shipping containers when humidity and moisture react with glue, used in plywood or green wood pallets, to form corrosive formic acid.

Occupational Risk Considerations: IH professionals need to properly evaluate any workplace factors and processes that disturb the corrosion products resulting in airborne particulates. Common examples include the use of pneumatic tools (e.g., impact wrenches), wire brushing, applying heat to components, and metal cleaning using grinders or sanders. Limited exposure data is currently documented in the Defense Occupational and Environmental Health Readiness System – Industrial Hygiene (DOEHRS-IH). However, the current data indicate that there are no elevated exposures above the OSHA Medical Surveillance Action Level or Permissible Exposure Limit (PEL) during non-abrasive handling of electrical component. Abrasive means of cleaning components with cadmium corrosion, may lead to elevated exposures.

For any air sampling results involving cadmium plating connectors which exceeded the OSHA action level, please send a notification to IH Support at Navy and Marine Corps Force Health Protection Command via email: < usn.hamptonroads.navmcpubhlthcenpors.list.nmcphc-navyihssuptm@health.mil >



NAVY AND MARINE CORPS FORCE HEALTH PROTECTION COMMAND IMPROVING READINESS THROUGH PUBLIC HEALTH ACTION

Common Routes of Exposure:

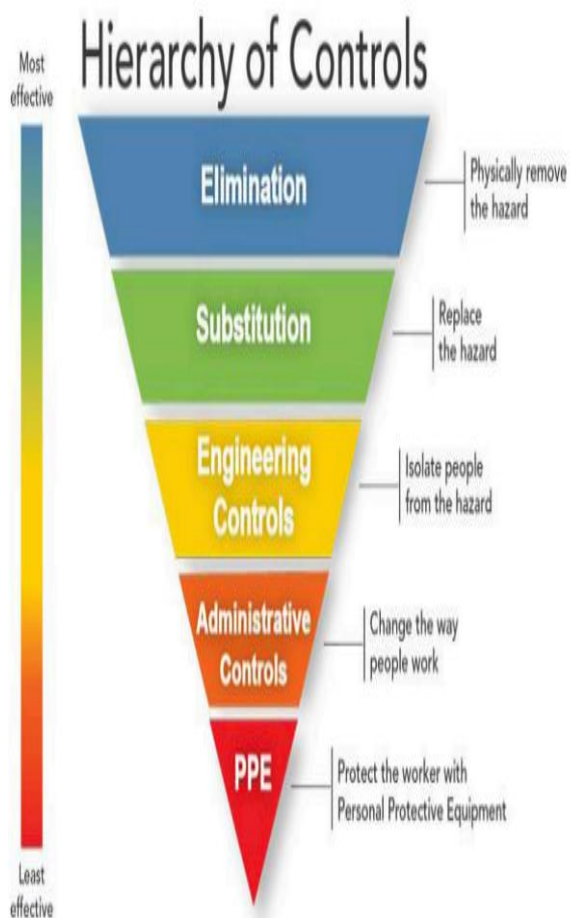


Inhalation: Occurs when unprotected exposure to airborne particulates enter the lungs.



Ingestion: Occurs by contact from contaminated hand(s) or object(s) to the mouth.

Controls: Exposure to cadmium can be reduced or completely mitigated by substitution, engineering controls, administrative/work practice controls, personal protective equipment (PPE), or a combination of these methods. While elimination and substitution are preferred, these methods may not always be feasible. Personnel should not solder, heat, or abrade the outer shell of the connectors due to the potential risk of elevated exposure profiles. It's not recommended to use power tools or any abrasive methods. The use wet methods could be recommended when aggressively removing corroded connectors or attempting to clean the cadmium corrosion while being mindful of any potential consequences to hazardous waste management. Chemical resistant gloves as well as eye protection should be considered. The following illustrates the hierarchy of controls arranged from the most to least effective:



Source: NIOSH.

Elimination / Substitution: Most connector specifications have alternate finishes that are approved by the Defense Logistics Agency and Society of Automotive Engineers (SAE). For example, MIL-DTL-38999N – Class Designators: T, and Z.

Engineering Controls: Processes involving cadmium should be performed with sufficient local exhaust ventilation. Ventilated tools can also reduce cadmium exposure.

Administrative/Work Practice Controls: To prevent corrosion, cadmium-plated parts should not be packed in non-ventilated containers or in direct contact with wood or cardboard, especially under high humidity or moisture conditions. See SAE-AMS-QQ-P-416 Series for packing limitation of cadmium-plated products. Personnel working with connectors with cadmium plating should be trained on the hazards of cadmium, basic understanding of cadmium blooming. The use of wet methods could reduce the potential for generating airborne dust during removal and cleaning. Personnel should wash hands with soap and water upon completion of work and prior to eating, drinking, smoking, or applying cosmetics.

PPE: Chemical resistant gloves could be recommended for any non-abrasive handling of electrical components. Specific risk characterization and assessment strategies are necessary for recommending additional PPE in the case of any abrasive handling processes.