FORMALDEHYDE VAPOR LEVELS IN MORTUARIES

Workers in mortuaries face a variety of occupational health hazards, including the potential for exposure to formaldehyde vapors. Formaldehyde in a water-based solution, such as embalming fluid, is known as *formalin*. Formalin vaporizes at room temperature, releasing formaldehyde gas, a nearly colorless gas with a strong, unpleasant odor.

The symptoms of exposure to formaldehyde vapors are stinging of the eyes and irritation of nasal passages, throat, and respiratory system. Chest tightness possibly followed by bronchitis, shortness of breath, coughing, and wheezing may result from overexposure. The Occupational Safety and Health Administration (OSHA) and the American Conference of Industrial Hygienists (ACGIH) consider formaldehyde a suspect human carcinogen.

The primary mission of the mortuary facility at the U.S. Naval Hospital, Rota Spain is as a contingency center in the event of mass fatalities from Southern Europe and Africa prior to their return to the U.S. Under non-contingency conditions, the workload varies from approximately two to ten cases per year.

Mortuary facility, US Naval Hospital Rota

Preservation products with formalin

A two-week preservation period is required for processing and returning the deceased from overseas to the continental U.S. Rota morticians would be at risk of exposure to formaldehyde during that period due to high concentrations of embalming fluid used to meet preservation requirements.

The mortuary had originally been designed with a non-recirculating general ventilation system that provided the embalming room with 12 room air changes per hour. Baseline screening and airborne formaldehyde vapor levels were measured in the embalming room by the industrial

hygiene department at U.S. Navy Hospital, Rota, during 1994 and 1995. Temporary control methods were implemented in accordance with the OSHA Formaldehyde Standard since airborne formaldehyde levels exceeded both the OSHA short-term exposure limit (STEL) and 8-hour permissible exposure limits (PEL).

Original autopsy room had general ventilation system with 12 room air changes per hour

Autopsy table without local exhaust ventilation

The morticians were enrolled in a respiratory protection program and were fitted with full-face air-purifying respirators with cartridges for protection against formaldehyde vapors. They were also enrolled in a medical surveillance program. The morticians were trained in formaldehyde hazard awareness and issued additional personal protective equipment (PPE), including disposable nitrile gloves and full rubber aprons for skin protection, and splash proof goggles for eye protection when respirators are not worn.

The Naval Hospital Rota Industrial Hygiene staff also recommended engineering controls to reduce formaldehyde vapors to within the OSHA STEL and PEL. Specifically, these involved installation of specialized autopsy/embalming tables with lateral exhaust air slots to capture formalin vapors before they could reach mortician's breathing zones. The Naval Facilities Engineering Service Center (NFESC) reviewed the design of the facility's proposed industrial ventilation system and performed final field acceptance tests.

NFESC smoke test demonstrates capture of vapors at autopsy table local exhaust system

Autopsy table with local exhaust system installed

As recommended by the industrial hygiene staff, the autopsy room's ventilation system was modified to provide 16 room air changes per hour to remove formaldehyde vapors more effectively. Local exhaust ventilation systems were also installed at the autopsy/embalming tables. These exhaust units have hoods and side slots that enhance the capture of formaldehyde vapors at their source. The successful combination of general and local ventilation engineering controls reduced formaldehyde levels to approximately 10% of the OSHA PEL of 0.92 milligrams of formaldehyde per cubic meter (mg/m3).

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