Keeping Prep Room Employees Safe

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NFDA issues a ground-breaking report on prep room ventilation, with recommendations to reduce health risks associated with formaldehyde use.

On September 30, NFDA issued a new report on ventilation in the preparation room, along with practical, cost-effective recommendations for removing formaldehyde vapors during embalming. "Formaldehyde Vapor Reduction in the Funeral Home Preparation Room: Recommendations for Effective Preparation Room Ventilation" is based on a year-long study of funeral homes and their ventilation systems, along with an evaluation of ventilation engineering practices for the control of formaldehyde.

Both international and domestic agencies have been examining the effects of formaldehyde use because of increasing concern about its health effects. In 2004, the International Agency for Research in Cancer (IARC) found a link between formaldehyde and nasal cancer. In 2009, IARC found a link between formaldehyde and leukemia, with the findings based, in part, on the National Cancer Institute's 20-year study of embalmers. Currently, the National Academy of Sciences is reviewing the U.S. EPA's proposed risk assessment of formaldehyde issued in draft June 10. (The EPA's risk assessment has been in progress for more than 10 years.) The National Toxicology Program (NTP) of the U.S. Department of Health and Human Services has also studied formaldehyde to determine if evidence exists to support a finding that formaldehyde causes cancer. Currently, NTP plans to designate formaldehyde as a carcinogen in its Twelfth Report on Carcinogens, which is due out in early 2011.

Against this backdrop, NFDA commissioned a study of ventilation in the preparation room, since ventilation has been found to be the single most effective way to control formaldehyde va-

por levels – and thus associated health risks – in the preparation room. Because there are no consensus ventilation standards that apply to funeral home preparation rooms, NFDA undertook its study to fill that void and to further NFDA's mission to educate and protect funeral directors and make sure they're informed about important issues affecting their health and safety.

The ventilation study supplements NFDA's 2009 Formaldehyde Best Management Practices (see page 82), providing funeral directors with guidance on work practices that will reduce formaldehyde exposure in the prep room. At the time of the study's release, William C. Wappner, then NFDA president, said: "Whether formaldehyde is ultimately determined to cause cancer in funeral directors or not, there is no good reason for any person to be exposed to a toxic compound in the preparation room when simple, cost-effective measures can be taken to reduce that exposure."

Scope of the Study

The objective of the study was to identify those features of an effective ventilation system that would remove formaldehyde from the breathing zone of the embalmer. The study was conducted by William Ridenhour, a leading HVAC (heating, ventilating and air conditioning) consultant whose experience includes designing and auditing laboratories for the federal government. Using his experience and knowledge of formaldehyde and its properties, Ridenhour inspected funeral homes to examine their ventilation systems. He also conducted an extensive literature search to identify those preparation room activities that were shown to produce the most significant formaldehyde rates. This research enabled Ridenhour to assess how ventilation systems addressed formaldehyde vapors and what improvements could be made.

Key Findings

Several key findings emerged from Ridenhour's research:

- Air change rate alone (that is, the number of times per hour fresh air enters the preparation room) does not guarantee effective formaldehyde removal. The study recommends no less than 15 air changes per hour, although attention needs to be given to other factors as well.
- The flow of air in the prep room is key. Sources of air supply and grilles for air removal must be located so that airflow is controlled and formaldehyde vapors do not reach the embalmer's breathing zone.
- A local exhaust ventilation (LEV) device should be evaluated as an addition to the ventilation system. An LEV, designed with a small hood attached to a flexible arm and located between the embalmer's breathing zone and the embalming table, can capture formaldehyde vapors at their source. LEVs have been used in many settings to remove toxic gases.
- A ventilation system needs to reflect the funeral home's business, including the number of embalming tables and whether they are in use at the same time, whether more than one embalming is performed daily, the percentage of autopsied and organ donor cases and use of cavity fluid, osmotic gel and accessory compounds, which are considered to cause the highest formaldehyde-generation rates.

The report concludes that an effective ventilation system designed, operated and maintained to meet the criteria in the study, can be effective in removing formaldehyde vapors from the breathing zone of the embalmer and lowering overall levels of formaldehyde. The design, installation, maintenance and alteration of the preparation room ventilation system should always be in consultation with an HVAC professional to ensure that the system is functioning effectively to reduce formaldehyde exposure to the greatest extent possible.

The report includes a five-step guide that provides a cost-effective strategy to help funeral home owners assess and, where necessary, take action to improve the ventilation systems in their prep rooms. The guide is available to *all* funeral professionals on the NFDA website at *www.nfda.org/ventilation*. NFDA members can download the entire report free of charge. Printed report copies are also available to NFDA members at no cost; nonmembers can order a printed copy of the study for $70. Funeral professionals should call NFDA at 800-228-6332 to request their printed copy.

Useful References

AIHA: American Industrial Hygiene Association
ANSI: American National Standards Institute
ASHRAE: American Society of Heating, Refrigerating and Air Conditioning Engineers
CDC: Centers for Disease Control and Prevention
IBC: International Building Code
NFPA: National Fire Protection Agency
NIH: National Institutes of Health
NIOSH: National Institute for Occupational Safety and Health
OSHA: Occupational Safety and Health Administration
UBC: Uniform Building Codes

Five-Step Guide for Effective Prep Room Ventilation

An essential preliminary step is to assemble all information about your current ventilation system and make sure you have a basic working understanding of the system, its components and its operation. Locate the most recent OSHA test results (maintain all ventilation system and OSHA test results in one place).

Step 1: Complete Formaldehyde Ventilation Assessment

Completing the Funeral Home Preparation Room Formaldehyde Ventilation Assessment will provide your funeral home with the following:

- A guide to the important elements of a well-functioning ventilation system
- Details about your own ventilation system

• Information about how prep room activities and choice of products influence ventilation considerations

• Information for an HVAC expert to use in evaluating or revising an existing preparation room ventilation system or designing a new system for a renovated preparation room or one that is to be constructed.

Step 2: Complete Expert HVAC Consultation

NFDA strongly recommends periodic re-evaluation of your prep room ventilation system by an experienced HVAC consultant, ideally an expert who has done prior work with prep room ventilation or hazardous substance capture and control.

Arrange for a consultant to assess your prep room ventilation if you lack information about the system or if you have not used an HVAC expert in the last three years to ensure that the ventilation system continues to function effectively to remove as much formaldehyde as possible.

Ventilation is determined in relation to site-specific factors, including prep room design and configuration, and the nature and size of the funeral home's business, number of tables in the preparation room, the extent to which tables are used simultaneously and the size and configuration of the preparation room. Any ventilation system must, at a minimum, meet local code and other regulatory requirements.

Provide a copy of your completed Funeral Home Prep Room Formaldehyde Ventilation Assessment to the HVAC expert before the expert's visit to your funeral home.

As part of the HVAC consultation, ask the expert to:

• Evaluate the effectiveness of prep room ventilation, not simply whether OSHA standards are met

• Identify short-term and long-term actions to enhance preparation room ventilation

• Identify improvement costs

• Assess the utility of installing a local exhaust ventilation (LEV) device as an adjunct to the existing ventilation system

• Recommend needed regular maintenance for prep room ventilation.

Step 3: Evaluate Recommendations

Evaluate the expert's recommendations to determine the actions to take that will provide the greatest short-term and long-term benefits.

Step 4: Make Simple Changes in Ventilation System

Major improvements in ventilation can often result with just simple changes in the system, such as resizing the exhaust fan or relocating and resizing the exhaust grille so that it is adjacent to the embalming table(s) and near the floor.

Step 5: Scheduling Implementation and Maintenance

Establish a schedule to implement the expert's recommendations for improving ventilation system effectiveness and maintaining the funeral home's ventilation system. A maintenance plan should include checks at least annually and should focus on equipment with mechanical parts. Ask the expert to show a funeral home employee how to maintain the system. Consider the following to achieve peak ventilation performance: Mechanical parts require regular lubricating, filters need to be changed and fans and other equipment should be cleaned to remove dust and dirt. Of course, if the funeral home's business has changed, promptly re-evaluate the effectiveness of the ventilation system.

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Abbreviations to Know

ACH or AC/HR: air changes per hour
CFM: cubic feet per minute
CFM/FT2: cubic feet per minute per square foot
FPM: feet per minute
HVAC: heating, ventilating and air conditioning
LEV: local exhaust ventilation
MSDS: material safety data sheet
PEL: permissible exposure limit
PPM: parts per million
STEL: short-term exposure limit
TWA: time-weighted average
WG: water gauge

Terms to Know

Air Change Rate: The rate at which outside air replaces indoor air in a space, expressed in one of two ways: 1) the number of changes of outside air per unit of time is called air changes per hour (ACH) or 2) the rate at which a volume of outside air enters per unit of time is called cubic feet per minute (CFM).

Air Handling Unit: For purposes of this report, AHU includes equipment such as a blower or fan, heating and/or cooling coils and related equipment, such as controls, condensate drain pans and air filters. It does not include duct work, registers or grilles, or boilers and chillers.

Breathing Zone: Area of a room in close proximity to an occupant's head in which occupants breathe as they stand, sit or lie down.

Capture Velocity: The velocity of air induced by a hood or local exhaust ventilation device to capture emitted contaminants as near to the point of generation as possible.

Chemical Hazard: Hazard from chemical hazardous materials such as acids, bases, solvents, cryogens, etc.

Cubic Feet Per Minute: The amount of air, in cubic feet, that flows through a given space in one minute. One CFM equals approximately two liters per second (l/s).

Diffusers and Grilles: Components of the ventilation system that distribute and return air to promote air circulation in the occupied space. As used in this report, supply air enters a space through a diffuser or vent and return air leaves a space through a grille.

Dilution Ventilation: One of the three types of workplace ventilation, which dilutes contaminants in the workplace air by blowing in clean air and exhausting dirty air.

Exhaust Ventilation: Mechanical removal of air from a portion of a building (e.g., from a piece of equipment, room or general area).

Hazard Control Ventilation: An industrial exhaust system that captures and removes contaminants emitted from local sources before dilution into ambient workplace air can occur. Includes chemical fume hoods, soldering bench hoods, extractor arms, glove boxes and biological safety hoods or cabinets.

HVAC: Heating, ventilating and air conditioning systems used in building design and construction to control temperature, humidity, odors, and air quality.

Indoor Air Pollutant: Particles and dust, fibers, mists, bio-aerosols, gases and vapors.

Indoor Air Quality (IAQ): Refers to the air quality within and around buildings and structures.

Indoor Air Quality Ventilation: One of the three types of workplace ventilation, which is used primarily to provide fresh, heated or cooled air to buildings as part of the heating, ventilating and air conditioning system.

Industrial Ventilation: The equipment or operation associated with the supply or exhaust of air by natural or mechanical means to control occupational hazards in the industrial setting.

Local Exhaust Ventilation: One of three types of workplace ventilation, which captures contaminant emissions at or very near the source and exhausts them outside, before dilution into the workplace ambient air can occur.

Negative Pressure: Condition that exists when less air is supplied to a space than is exhausted from it, rendering the air pressure within that space less than that in surrounding areas. Under this condition, if an opening exists, air will flow from surrounding areas into the negatively pressurized space.

Outdoor Air Supply: Air brought into a building from the outdoors (often through the ventilation system) that has not been previously circulated through the system.

Occupational Exposure Limit (OEL): An exposure limit that is the lower of the permissible exposure limit or threshold limit value (see permissible exposure limit or threshold limit value).

Permissible Exposure Limit: An exposure limit published and enforced by OSHA as a legal standard. A PEL can be either a time-weighted average (TWA) exposure limit (eight-hour), a 15-minute short-term exposure limit (STEL) or a ceiling (C), and may have a skin designation.

Positive Pressure: Condition that exists when more air is supplied to a space than is exhausted, rendering the air pressure within that space greater than that in surrounding areas. Under this condition, if an opening exists, air will flow from the positively pressurized space into surrounding areas.

Preventive Maintenance: Regular and systematic inspection, cleaning and/or replacement of worn parts, materials and systems. Preventive maintenance helps prevent parts, materials and systems from failure by ensuring that parts, materials and systems are in good working order.

Threshold Limit Value: Recommended guidelines for occupational exposure to airborne contaminants published by the American Conference of Governmental Industrial Hygienists (ACGIH). TLVs represent the average concentration for an eight-hour workday and a 40-hour workweek to which nearly all workers may be repeatedly exposed without adverse effect.

Vapors: Gases formed by the evaporation of a liquid.

Volatile Organic Compounds: Compounds that vaporize (become a gas) at room temperature. In sufficient quantities, VOCs can cause eye, nose and throat irritation; headaches; dizziness; visual disorders; and memory impairment. Some are known to cause cancer in animals and some are suspected of causing, or are known to cause, cancer in humans.