Mopec®

Better By Design™

Optimize Your Laboratory for Safety and Efficiency

Best Practices in Maintenance, Engineering, Air Handling and Ergonomic Design

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INTRODUCTION

If you work in a laboratory environment, you know the importance of safety, ergonomics and workflow in developing an efficient workspace. Interconnected processes and systems such as equipment functions, building operations, and industry procedures must be considered in order for your laboratory to operate effectively. This guide will share best practices in laboratory maintenance, engineering, air handling and ergonomic design.

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MAINTAINING EQUIPMENT

A safe laboratory starts with cleanliness

All the greatest equipment in the world means nothing if it is not properly maintained. Make sure everyone in your laboratory is focused on keeping equipment clean and sanitary.

New equipment can last for years when properly maintained. Invest in the care of your equipment by using proper cleaning solutions and tools.

Here are some basic recommended equipment maintenance rules that everyone in the laboratory should keep in mind:

- Do not use cleaners containing chlorine
- Never clean equipment with products containing wire or steel wool
- Remove all grime, tissue and particulates daily
- Clean equipment and instruments after each use
- Rinse all surfaces after cleaning or disinfecting
- All stainless steel should be protected by a polish

Keep proper cleaners and tools in stock

All Mopec cleaners, disinfectants and deodorizers are safe to use on stainless steel surfaces. We recommend using Scotch-Brite® commercial scouring pads for product application, especially if scrubbing is needed.

DID YOU KNOW? Surface damage due to improper use or cleaning can void a manufacturer's warranty. Be sure to read all care instructions before cleaning equipment.

QUICK TIP: Soaking instruments with an enzyme cleaner is the safest way to remove tissue debris. If scrubbing is preferred, an instrument cleaning brush is recommended to protect hands from sharp objects.

ERGONOMICS

Now that the laboratory is clean, ensure that it is also ergonomically sound.

We know that laboratory professionals spend long hours in the workplace. Mopec designs ergonomic-friendly equipment to provide comfort with features that help reduce the amount of reaching and bending while working.

Why are ergonomics so important?

Ergonomics are employed to fulfill health and productivity goals. It is relevant to the design of workstations as safe furniture and easy-to-use interfaces on machines and equipment. Proper ergonomic design is necessary to aid in the prevention of repetitive strain injuries, which can develop over time and lead to long-term disability.

Ergonomic adjustments don't have to be large-scale lab redesigns. Updating tools and accessories can also be helpful. Here are some ergonomic workstation features you can incorporate into your laboratory:

Adjustable workstation height:
An elevating workstation provides flexibility to adapt to various heights.

Magnetic instrument toolbar:
Keep instruments at your fingertips. Eye-level access helps reduce back strain and bending.

Flat screen/keyboard arm mount systems:
Move the adjustable arm to a position that requires less torso twisting.

Adjustable storage shelves:
Customize the spacing of storage shelves to accommodate laboratory workflow.

Ergonomic instruments:
Instruments should be selected for ease of use and comfortable grip.

Ergonomics *is the study of designing equipment and devices that fit the human body, its movements, and its cognitive abilities. This scientific discipline is concerned with understanding the interactions among humans and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance.*

Source: The International Ergonomics Association

ELEVATING TABLES AND WORK STATIONS

Mopec elevating tables and work stations are designed to meet OSHA standards and eliminate common risk factors. Equipment with an adjustable height feature can lessen the risk of injury and improve employee productivity.

Take a look at preferred and best work zone criteria to determine if your facility's equipment is providing the best working environment for your staff:

Preferred work zones

- As far forward as your hand when your arm is fully extended without leaning over
- Feet extended just beyond the shoulders in each direction
- Upper level at shoulder height
- Lower level at tip of fingers with hands at the side

Best work zones

- As far forward as your wrist when you hold your arm slightly bent
- As wide as the shoulders
- Upper level at about heart height
- Lower level at about waist height

ENGINEERING CONTROL

What is formalin?

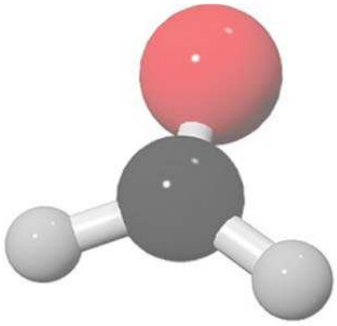
The term “formalin” is used to describe a saturated solution of formaldehyde dissolved in water. Methanol is often added to stabilize the solution. Formalin is typically:

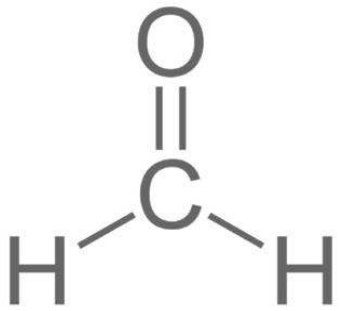
- 37% formaldehyde by weight (40% by volume)
- 6-13% methanol by volume in water

What is formaldehyde?

Formaldehyde is a colorless, strong-smelling gas often found in aqueous (water-based) solutions. It is commonly used as a preservative in medical laboratories and mortuaries. Formaldehyde is also found in many products such as:

- Glue
- Plywood
- Chemicals
- Pressed wood products
- Household cleaners
- Paper product coatings
- Permanent press fabrics





OSHA GUIDELINES

OSHA guidelines for formalin are based on formaldehyde:

Chemical name: Formaldehyde
Chemical family: Aldehyde
Chemical formula: HCHO
Molecular weight: 30.03
Components and contaminants:
37.0% Formaldehyde
63.0% Water

Description: Colorless liquid, pungent odor
Boiling point: 214 degrees F (101 degrees C)
Specific gravity: 1.08 (H(2)O=1 at 20 degrees C)
pH: 2.8-4.0

Solubility in water: Miscible
Solvent solubility: Soluble in alcohol and acetone
Vapor density: 1.04 (Air = 1 at 20 degrees C)
Odor threshold: 0.8-1 ppm

What is OSHA?

Congress created the Occupational Safety and Health Administration (OSHA) to assure safe and healthy working conditions for working men and women. OSHA sets and enforces standards and provides training, outreach, education and assistance.

OSHA provides air handling regulations that your laboratory is required to adhere to by law. Failure to meet OSHA regulations can result in citations that could lead to less funding for your laboratory.

This guide will go over the specifics of OSHA requirement as they relate to air handling and show you how you can stay up to date on OSHA regulations and meet OSHA requirements.

What are OSHA requirements?

OSHA requirements cover many aspects of a laboratory. The area of focus in this guide will be formaldehyde.

OSHA requirements detail the Permissible Exposure Limit (PEL) of formaldehyde within your laboratory. The recommendations outlined in the OSHA regulations provide guidelines for achieving the PEL, yet they are not specific to exact methods and/or necessary style of equipment. The regulations do note which types of equipment are OSHA-approved for the criteria that you are striving to maintain.

OSHA Permissible Exposure Limit (PEL)

OSHA's PEL for formaldehyde focuses on three specific requirements:

Time-Weighted Average (TWA: The PEL for formaldehyde in the workplace is 0.75 parts formaldehyde per million parts of air, measured as an eight-hour time-weighted average.

Short-Term Exposure Limits (STEL:
The second PEL is a short-term exposure limit of 2 ppm, which is the maximum exposure allowed during a 15-minute period.

Action Level: The PEL standard's trigger for increased industrial hygiene monitoring and initiation of worker medical surveillance. This trigger is 0.5 ppm when calculated as an eight-hour TWA.

Decreasing formalin exposure is essential for a safe laboratory.

MONITOR THE AIR IN YOUR WORK ENVIRONMENT

One very effective way to test the air quality of your facility is by using badges. Data collection can be administered with formaldehyde vapor monitors, which are called Formaldehyde Monitor Badges. Technicians wear Formaldehyde Monitor Badges on their laboratory coats to measure exposure to vapors and make sure they do not exceed the allowable levels within an eight-hour period. The badges are mailed to a laboratory to be analyzed, returning results that are accurate within 16% and .75ppm at eight hours.

A basic understanding of engineering air handling and controls

Conservation of mass and conservation of energy are the two basic principles of fluid mechanics that govern the flow of air in industrial ventilation systems. Another condition to understand is escape velocity at +/- 10% hood conditions of 100 feet per minute.

TERMS

Air Changes per Hour (AC/H): AC/H is the measure of how many times the air within a defined spaced is replaced. The measurement calculates the amount of the air volume added or removed from a space—and divided by the volume of the space—within an hour.

Capture velocity: The velocity of air induced by a hood in order to capture emitted contaminants external to the hood.

Dilution ventilation (General exhaust ventilation): A form of exposure control that involves providing enough air in the workplace to dilute the concentration of airborne contaminants to acceptable levels.

Laminar flow (also streamline flow): Air flow in which air molecules travel parallel to all other molecules. Laminar flow is characterized by the absence of turbulence.

Return air: Air that is returned from the primary space to the fan for recirculation.

Velocity (V: The time rate of movement of air; usually expressed as feet per minute.

Air flow: Air flow is the means of moving air from one point to another.

Static pressure (SP: Static pressure is the force necessary to pull a given volume of air through equipment such as a grossing station, autopsy table, hood, duct, grill, etc. Static pressure can refer to:

- The pressure developed in a duct by a fan
- The force in inches of water measured perpendicular to flow at the wall of the duct
- The difference in pressure between atmospheric pressure and the absolute pressure inside a duct, or other equipment

Volumetric flow rate (CFM): The volume rate of air expressed in cubic feet per minute (CFM).

AIR CHANGE RECOMMENDATIONS

How many air changes are required in your laboratory?

In the United States and Europe, there aren't any prescriptive minimum requirements for air change rates in labs other than the ASHRAE 62.1-2010 fresh air requirements for university and college laboratories that correspond to about 1.2 ACH (.18 cfm/sq. ft or 0.9l/s/m2).

Mopec focuses on a more performance-based approach exceeds the ASHRAE minimum requirements and takes into account the specific conditions of a given laboratory space.

Building HVAC

Your HVAC system should be doing more than just providing comfort. It should be helping to restore clean air into the mix.

Additional air exchange systems include localized ventilation:

- BackDraft
- DownDraft
- TotalDraft

What is an acceptable quantity of air exchanges per hour?

OSHA recommends 4-12 (ACH AC/H), provided local exhaust is the primary method of control.

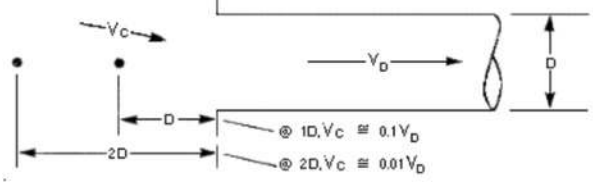
Extended formalin exposure poses serious health risks. Air handling is of utmost importance in every pathology laboratory.

OPTIMAL VENTILATION DESIGN

Best design practices

The approximate relationship of capture velocity (V_c) to duct velocity (V_d) for a simple plain or narrow flanged hood is illustrated below.

Relationship of Capture Velocity (V_c) to Duct Velocity (V_d).



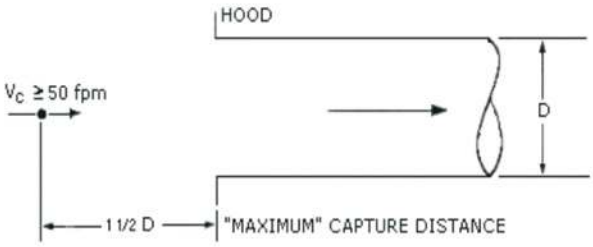
If an emission source is one duct diameter in front of the hood, and the duct velocity (Vd) is 3,000 feet per minute (fpm), then the expected capture velocity (Vc) is 300 fpm. At two duct diameters from the hood opening, capture velocity decreases by a factor of 10, to 30 fpm. At three duct diameters, capture velocity decreases by a factor of 100, to 3 fpm.

The sketch above shows a rule of thumb that can be used with simple capture hoods. If the duct diameter (D) is 6 inches, then the maximum distance of the emission source from the hood should not exceed 9 inches. Similarly, the minimum capture velocity should not be less than 50 fpm.

Supplemental air handling options

Sometimes, extra ventilation and optimized design aren't enough to neutralize residual formalin fumes in the busiest of laboratories. At peak workloads, your facility could find itself exceeding OSHA-recommended

Rule of Thumb for Maximum Capture Distance in Simple Capture Hoods



exposure rates for formalin, which could lead to temporary shutdowns or reduced operational capacity.

A portable room filtration module can help your laboratory meet increased workloads and employee safety standards. Portable room filters can be easily positioned throughout your laboratory, filtering problem areas to prevent formalin overexposure and help maintain a safe laboratory environment.

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ABOUT MOPEC

Mopec is committed to designing and manufacturing equipment and accessories to enhance your facility's safety, flexibility and productivity. Our technical prowess stems from a commitment to quality craftsmanship and high-touch service. Mopec is recognized globally for giving clients an unrivaled experience including design, manufacturing, installation and post-sales support. The industries we serve include anatomy lab, anatomic pathology, medical examiner/morgue and necropsy.

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