PRISM Analytical Technologies

Sample Report

IAQ Commercial Survey™
Formaldehyde

Air Analysis For: Recent renovation
Location Tested: 123 W. Maple Ave.
Boston, MA 25478

Sampling Professional: Alex Carter
Air Quality Inspections
3212 NW 12th St.
Baltimore, MD 21224
U.S.A.

Client Sample ID: Kitchenette
Sample Volume (L): 5.0
Date Sampled: 03/02/2017
Sample Type: TDT 112J
Sample Condition: Acceptable

Report Number: 6010
Laboratory ID: 6010-2

Thank you for using IAQ Commercial Survey!
If you have questions about your report, please contact your service provider who performed this test.

Order Date: 03/07/2017
Scan Date: 03/08/2017
Report Date: 03/09/2017

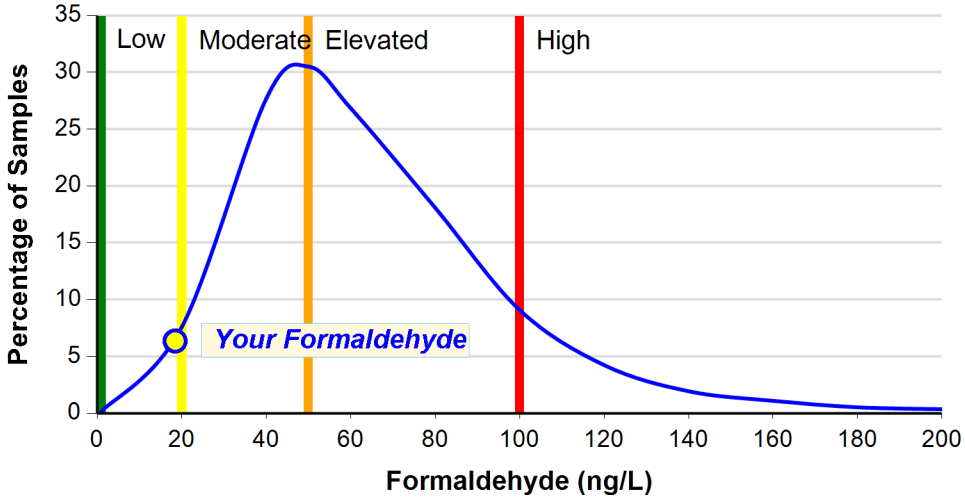
Formaldehyde Concentration: 19 ng/L (16 ppb)

Your Formaldehyde Level (Highlighted)

Low	Moderate	Elevated	High
< 20 ng/L < 16 ppb	20-50 ng/L 16-40 ppb	50-100 ng/L 40-80 ppb	> 100 ng/L > 80 ppb

Recommendation: No significant formaldehyde issues.

All IAQ Survey Formaldehyde Results



This chart represents the Formaldehyde distribution of over 7,000 samples.

Approximately half the samples have concentrations in the 30-70 ng/L range.

The chart above shows the formaldehyde concentrations for all locations tested using IAQ Survey. Results for this air sample are displayed on the chart as a yellow circle. The blue curved line represents the relationship between the percentage of locations (indicated on the vertical y-axis) and the formaldehyde concentration (indicated on the horizontal x-axis). The green, yellow, orange, and red vertical bars represent divisions between Low, Moderate, Elevated, and High formaldehyde concentrations.

Formaldehyde concentrations can vary depending on environmental conditions such as temperature, humidity, and ventilation rate. As temperature and humidity increase, the formaldehyde concentration will increase and as the ventilation rate increases, the formaldehyde concentration will decrease.

Prism Analytical Technologies, Inc., the creator of IAQ Commercial Survey, has been performing air quality assessments to industry and environmental consultants since 1995. Prism Analytical Technologies, Inc. (ID 166272) is accredited by the AIHA Laboratory Accreditation Programs, LLC (AIHA-LAP, LLC) in the Unique Scope accreditation program for Formaldehyde as documented by the Scope of Accreditation Certificate and associated Scope. Reference internal SOP 523.

Formaldehyde Exposure Guidelines

The US Occupational Safety and Health Administration (OSHA) has set a workplace **permissible exposure limit** (PEL) of 940 ng/L (750 parts per billion). The National Institute for Occupational Safety and Health (NIOSH) has set a **recommended exposure limit** (REL) of 20 ng/L (16 ppb) with a 120 ng/L (100 ppb) 15 minute ceiling limit.

Although these formaldehyde concentration limits are applicable to all types of workplace environments, most office or retail locations without additional occupational exposure (e.g., industrial or manufacturing processes generating formaldehyde) typically have formaldehyde concentrations less than 100 ng/L (80 ppb). Most indoor environments measured by Prism's air test have concentrations in the range of 30 to 70 ng/L.

The table below provides some of the limits applicable to workplace environments. In general, formaldehyde concentrations should be kept as low as reasonably achievable.

Organization	Concentration		Type
	ng/L	ppb	
OSHA	630	500	Action Level (8 hour)
	940	750	PEL (8 hour)
	2,500	2,000	STEL (15 min)
NIOSH	20	16	REL (8 hour)
	120	100	Ceiling (15 min)
ACGIH	370	300	TLV (8 hour)
LEED	32	27	Green Building (4 hour)
WHO	100	80	Short-Term (0.5 hour)

OSHA: Occupational Health and Safety Administration
NIOSH: National Institute for Occupational Safety and Health
ACGIH: American Conference of Governmental Industrial Hygienists
LEED: Leadership in Energy & Environmental Design (Green Building Council)
WHO: World Health Organization

PEL: Permissible Exposure Limit
REL: Recommended Exposure Limit
TLV: Threshold Limit Value
TWA: Time Weighted Average
STEL: Short Term Exposure Limit

Note: Concentration can be expressed in several ways and various organizations may use different units.
1 ng/L = 1 $\mu g/m^3$ = 0.001 mg/m^3
1 ppb = 0.001 ppm
To convert between the two sets of units listed above the molecular weight of formaldehyde must be used, which produces the conversion factors below:
ppb concentration = ng/L concentration * 0.8 or ng/L concentration= ppb concentration * 1.25

Major Health Effects of Formaldehyde Exposure

Health effects vary depending on the individual. Common symptoms of acute exposure include irritation of the throat, nose, eyes, and skin; this irritation can potentially exacerbate asthma symptoms and other respiratory illnesses. Long term, or chronic, exposure may also cause chronic runny nose, chronic bronchitis, and obstructive lung disease. In 2004, the International Agency for Research on Cancer (IARC) reclassified formaldehyde from "probably carcinogenic to humans" to "carcinogenic to humans" related to nasopharyngeal cancer. Since many factors are involved in the development of cancer, no definitive "safe level" of exposure has been established. The best way to reduce the risk of cancer is to limit exposure.

Formaldehyde Sources

There are many possible sources for formaldehyde in the indoor environment, although building products typically make up a large proportion of the concentration. Any recent renovation or new material brought into the building is likely to increase the formaldehyde levels. The concentration will decrease over time as the materials off gas, so increasing the ventilation as much as possible is typically the best way to quickly decrease formaldehyde after recent renovation or installation of new materials.

- Products that contain urea-formaldehyde (UF) resins
  - particleboard, hardwood plywood paneling, medium density fiberboard
- Products that contain phenol-formaldehyde (PF) resins (lower concentrations of formaldehyde than UF resins)
  - softwood plywood, flake or oriented strand board
- Pre-finished engineered flooring
- Insulation
- Glues and adhesives
- Paints and coatings
- Textiles
- Disinfectant cleaning products and soaps
- Preservatives
- Personal care products, especially certain hair products
- Cosmetics
- Pet care products
- Bactericides and fungicides
- Combustion byproduct (burning)
  - Tobacco smoke and fuel-burning appliances (gas stoves, kerosene space heaters and fireplaces)

Formaldehyde is also produced naturally in living systems, e.g., trees and other plant life, and during decay and combustion processes. Formaldehyde is also involved in atmospheric processes. Outdoor concentrations of formaldehyde from both natural and man-made sources can range from less than 1 ng/L in remote areas to 10-20 ng/L in urban environments.

Additional Resources

US OSHA Toxic and Hazardous Substances-Formaldehyde
US OSHA Fact Sheet-Formaldehyde
US NIOSH Formaldehyde
World Health Organization (WHO) Air Quality Guidelines for Europe, 2nd Edition (2000): pg 87-91
Europe: Report No. 7-Indoor Air Pollution by Formaldehyde in European Countries (1990)
US Consumer Product Safety Commission (CPSC) Update on Formaldehyde (2013)
US Environmental Protection Agency: Formaldehyde
US Agency for Toxic Substances and Disease Registry (ATSDR):Formaldehyde ToxFAQs™
US National Institutes of Health (NIH): ToxTown: Formaldehyde
Chemical Reviews (Journal): Formaldehyde in the Indoor Environment
Household Products Database: Formaldehyde

These results are authorized by the Laboratory Director or approved representative.