

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

**Report Number:** 6010  
**Laboratory ID:** 6010-2

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

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

**Client Sample ID:** Kitchen  
**Sample Volume (L):** 5.0  
**Date Sampled:** 10/24/2016  
**Sample Type:** TDT 112J  
**Sample Condition:** Acceptable

**Order Date:** 10/25/2016  
**Scan Date:** 10/26/2016  
**Report Date:** 10/27/2016

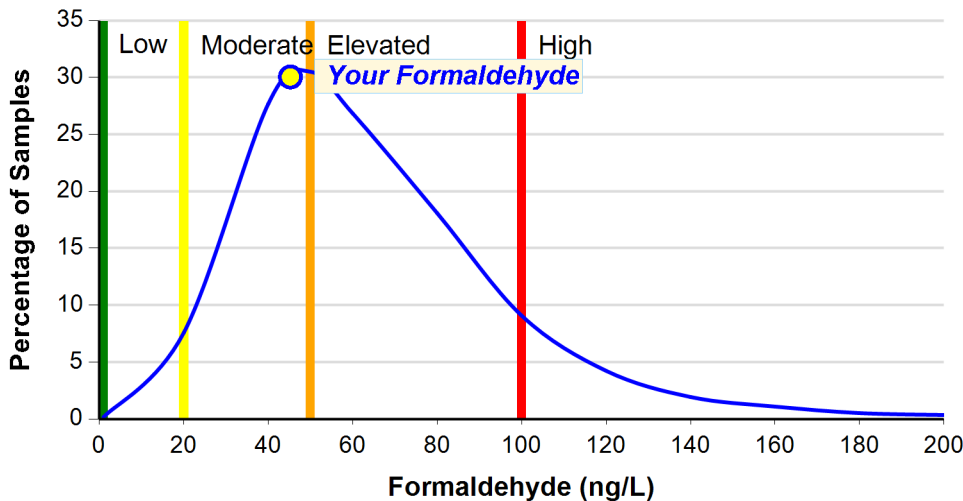
**Formaldehyde Concentration:** 45 ng/L (36 ppb)

**Your Formaldehyde Level (Highlighted)**

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

**Recommendation:** Moderate formaldehyde level but improvements can be achieved by locating and removing sources. See formaldehyde sources section for more information.

**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 homes tested using IAQ Home 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 homes (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.

### Formaldehyde Exposure Guidelines for Homes

Although there are no requirements set for formaldehyde concentration limits in homes, there are a number of recommendations that may be useful. Many organizations or government authorities suggest formaldehyde concentrations not exceed **100-120 ng/L (80-100 parts per billion or ppb)** and **50-60 ng/L (40-50 ppb)** for short term and longer term exposures, respectively. Some organizations or government authorities recommend more stringent levels for longer term exposures. In general, formaldehyde concentrations should be kept as low as reasonably achievable. Most homes measured by Prism's air test have concentrations in the range of 30 to 70 ng/L.

For an occupational exposure reference, the National Institute for Occupational Safety and Health (NIOSH) has set a recommended exposure limit (REL) of 20 ng/L (16 ppb). The Occupational Safety and Health Administration (OSHA) has set a workplace permissible exposure limit (PEL) of 940 ng/L (750 parts per billion).

The table below provides some information on the variety of recommendations for home environments.

Organization	Concentration		Year Issued	Comments
	ng/L	ppb		
WHO	100	80	1987	0.5 hour
LEED*	32	27		4 hour
California	94	76	1999	1 hour (acute)
	33	27	2004	8 hour (interim)
	3	2	2005	Annual average (chronic)
Canada	120	100	2005	1 hour
	50	40	2005	8 hour
UK	100	80	2004	0.5 hour
Germany	120	100	1977	
France	50	40	2008	2 hour (proposed)
	10	8		Long-term (proposed)
Norway	100	80	1999	0.5 hour
	60	50	1990	24 hour
Australia	100	80	2009	
China	100	80	2003	1 hour
Japan	100	80	1997	0.5 hour
Hong Kong	100	81	2003	Good
	30	25		Excellent

Sources:

Salthammer et al., Chem Rev., 2010, 110, 2536-2572 (for all except as listed below)

\* Green Building Council Leadership in Energy & Environmental Design (LEED)

Note: Concentration can be expressed in several ways and various organizations may use different units.

1 ng/L = 1 µg/m³ = 0.001 mg/m³

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 a home, although building products typically make up a large proportion of the concentration. Any recent renovation or new materials brought into the home 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 the formaldehyde in your home 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

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 \(1990\)](#)

Health Canada: [Residential Indoor Air Quality Guideline-Formaldehyde](#)

US Consumer Product Safety Commission (CPSC) [Update on Formaldehyde \(2013\)](#)

Environmental Health (US) - [Formaldehyde Exposure in Homes: A Reference Guide for State Officials to use in Decision Making](#)

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](#)

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

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This analysis was performed by Prism Analytical Technologies, Inc. (Prism) using the Hantzsch, or acetylacetone (acac), method. This test method has been correlated with or is compliant with the California Air Resources Board (CARB) § 93120, European DIN Standard EN-717, and ASTM methods D-5582 and E-1333. It has also been compared with DNPH testing used in NIOSH 2016 and found to be in good agreement. The AIHA Laboratory Accreditation Program (AIHA-LAP), LLC is currently reviewing this method for accreditation as a Unique Scope; approval is pending. The results contained in this report are dependent upon a number of factors over which Prism has no control, which may include, but are not limited to, the sampling technique utilized, the size or source of sample, and the ability of the sampler to collect a proper or suitable sample. Therefore, the opinions contained in this report may be invalid and cannot be considered or construed as definitive and neither Prism, nor its agents, officers, directors, employees, or successors shall be liable for any claims, actions, causes of action, costs, loss of service, medical or other expenses or any compensation whatsoever which may now or hereafter occur or accrue based upon the information or opinions contained herein.

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