



Safety

How Air Sampling Protects Workers from Invisible Workplace Hazards

James Langford | Jul 11, 2024

Breathing is such a basic requirement for life that your body usually handles it involuntarily, inhaling about 20,000 times every day.

But while vital, breathing isn't risk-free. Inhaling low-quality or polluted air—whether you're outdoors or indoors, at home or on the job—can weaken your body, leading to long-term illness and in the most severe cases, death.

While hazards vary by location, some have been linked to specific settings and industries. Manufacturing and metalworking operations, for instance, can produce airborne contaminants including dusts, welding fumes, gases, solvent vapors and mists that may cause both immediate and cumulative harm to workers' health.

To protect employees, the U.S. Occupational Safety and Health Administration has set a wide array of rules that require steps from ventilating workplaces to using personal protective equipment and collecting and testing air samples to ensure known toxins don't exceed safe levels.

"Some specific diseases have been linked to specific air contaminants or indoor environments, like asthma with damp indoor environments," the *agency explains*. Exposures to other hazards, such as asbestos and radon, "do not cause immediate symptoms but can lead to cancer after many years."

Permissible Exposure Levels

Symptoms of exposure to poor indoor air quality vary depending on the type of contaminant, OSHA *notes*. Many can easily be mistaken for symptoms of illnesses such as allergies, colds and flu.

A clue in some cases is that "people feel ill while inside the building and the symptoms go away shortly after leaving the building, or when away from the building for a period of time," OSHA says.

Although the agency lacks an overall air quality standard, it can penalize businesses under the general duty clause of the U.S. Occupational Safety and Health Act—which requires businesses to provide

hazard-free workplaces—as well as under more granular rules.

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OSHA Standard **1910.1000** details permissible exposure limits for scores of substances from aluminum dust to carbon dioxide, chlorine and phosphorous, using eight-hour time-weighted averages, which it defines as an employee's average exposure during any eight-hour shift of a 40-hour workweek. Exposure caps are detailed in the regulation's tables **Z-1**, **Z-2** and **Z-3**.

For hazards whose exposure limits aren't defined in those tables, air monitoring isn't **explicitly required** under OSHA regulations, though the agency has long maintained that it's the most accurate way to identify and measure contaminants.

Such monitoring doesn't typically entail evaluating air quality for individual employees, relying instead on representative samples, which **may be collected** by techniques such as pumping air into a vessel or through a medium like a sorbent tube or a filter cassette, the agency says.

Air Sampling Techniques

Filter cassettes are basic air sampling tools, according to *Environmental Express*, a maker of collection and analysis equipment for water, air and soil. They may be used in tandem with devices such as air sampling pumps, impingers that help with particulates from the air and bubblers that help with vapors.

"Sampling is a method of measuring the concentration of hazardous substances in the air in order to assess the potential risk to employees," according to the British consulting firm *Orbis Environmental*. "The results of air sampling can be used to identify the source of a problem, determine the extent of exposure and evaluate the effectiveness of control measures."

Common types of sampling, according to OSHA, include:

- **Integrated sampling:** Relies on methods and equipment that provide sampling over a specified time period. Samplers may be changed several times during an eight-hour shift, yielding a time-weighted average that can be compared with an agency standard.
- **Direct reading/instantaneous sampling:** Uses technologies that deliver immediate results to compare concentrations against a ceiling, the maximum exposure that regulators consider safe.
- **Breathing zone sampling:** Collects samples in the breathing zone of a specific worker wearing a sampling device.
- **Area sampling:** Obtains samples in an area representative of a typical work process, a "worst case" or where multiple workers were exposed to a chemical. They're taken in a fixed location and may show the potential risk from airborne contaminants to employees working there.
- **Bulk sampling:** Takes samples of a raw material or contaminant to determine its chemical makeup. These samples may be used individually or along with samples to gauge the level of worker risk.

"Breathing unhealthy air at work can be dangerous, but it's also preventable," the American Lung Association says. "Understanding what makes indoor air unhealthy and the specific pollutants that might be present in your workplace is the first step to addressing the problem. Then, you can take action to protect yourself from indoor air pollution."

What air sampling methods does your business use? Tell us in the comments below.