

# INDOOR AIR QUALITY

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## INTRODUCTION

In a nationwide random sampling of office workers, published by Cornell University, 24% perceived air quality problems in their work environments, and 20% believed that their work performance was hampered accordingly.

Over the past few decades Indoor Air Quality (IAQ) has become a major issue. Changes in our workforce and lifestyle have increased recognition of the indoor environment. According to the Environmental Protection Agency (EPA), the average person living in the United States spends up to 90% of his/her time indoors. Approximately 75% of the workforce are currently employed in office environments.

## WHY BE CONCERNED ABOUT INDOOR AIR QUALITY?

Whether you're a building owner, building manager or tenant, good indoor air quality enhances occupant health, comfort and workplace productivity.

Failure to respond promptly and effectively to IAQ problems may:

- Increase health problems such as cough, eye irritation, headache and allergic reactions.
- Reduce productivity due to discomfort or increased absenteeism.
- Accelerate deterioration of furnishings and equipment.
- Strain relations between landlords and tenants, employers and employees.
- Create negative publicity that could put rental properties at a competitive disadvantage.
- Increase the likelihood of litigation and insurance claims.

## WHAT ARE THE HEALTH EFFECTS OF POOR INDOOR AIR QUALITY?

Poor indoor air quality is usually caused by external contaminants being brought into the building, internal contamination of the area or inadequate ventilation/air circulation.

Complaints arising from poor indoor air generally fall into three categories:

- **Indoor Air Pollution (IAP)** Generally considered to be a concern when an irritant is thought to be present, and perhaps concentrated, in the building. Inadequate ventilation and circulation rates may prevent removal or dilution of the potentially offending substances.
- **Sick Building Syndrome (SBS) or Tight Building Syndrome (TBS)** Generally characterized by non-specific respiratory complaints, such as a cold or flu. Usually results from an inadequate outdoor air supply and/or heating, ventilation, and air conditioning system. A characteristic of SBS is that symptoms seem to clear up after the occupant leaves the building for a short period of time.
- **Building Related Illness (BRI)** Clinically diagnosed illnesses caused by specific microorganisms. Legionnaires Disease and Pontiac fever are currently the most recognized examples.

## WHAT ARE THE PRIMARY SOURCES OF IAQ PROBLEMS?

The primary source of IAQ problems may be from inadequately designed, maintained and/or operated ventilation systems and airborne presence of biological and/or chemical contaminants.

Addressing the design and maintenance of ventilation systems and limiting the existence of the contaminants will help to reduce potential IAQ incidents.

## INADEQUATE VENTILATION

Poor ventilation is the leading problem with IAQ, accounting for well over half of the cases.

Some of the contributing factors associated with HVAC (Heating, Ventilation and Air Conditioning) systems in a building are:

- Insufficient amount of fresh outside air in the building (ratio of fresh air to recirculated air).
- Work areas inside the building with poor air circulation patterns (out of balance).
- Location of an outdoor air intake near a pollution source.
- Blockage or closure of return vents and air intakes for proper air flow
- Improper maintenance of the ventilation systems
- The growth and spread of microbial organisms in damp areas in the air conditioning systems.

## BIOLOGICAL OR CHEMICAL CONTAMINANTS

Biological or chemical contaminants can arise from operations within the building or can enter from outside the work or living area.

**Biological contaminants** include molds, dust and plant pollen. These contaminants can originate in the ventilation system (dehumidifiers, cooling towers, air ducts); water-damaged walls, ceilings and carpets; and from person-to-person contagious diseases.

**Chemical contaminants** include tobacco smoke, emissions from products used in the building (e.g., office equipment; furniture; wall and floor coverings; and cleaning and consumer products), accidental spill of chemicals, and gases such as carbon monoxide and carbon dioxide.

## WHAT ARE THE SOLUTIONS TO INDOOR AIR QUALITY PROBLEMS?

Solutions to IAQ problems usually include combinations of the following:

### Removing or modifying the contaminant source

is the most effective approach when sources are known and the control is feasible. Examples include:

- Periodic cleaning or replacement of HVAC system filters.
- Replacing water-stained ceiling tiles and carpeting.
- Preventing accumulation of stagnant water under cooling deck coils of air handling equipment through proper disposal and continuous drainage of drain pans.
- Implementing smoking restrictions.
- Venting contaminant source emissions to the outside.
- Storage and use of paints, adhesives, solvents and pesticides in well ventilated areas.
- Allowing time for building materials in new or remodeled areas to off-gas pollutants before occupancy.
- Relocating or redirecting fresh air intakes in garages to reduce infiltration of vehicle emissions.
- Cleaning up all water spills promptly, watering and maintaining office plants properly and repairing water leaks right away.
- Disposing garbage in appropriate containers that are emptied daily to prevent odors and contamination.
- Applying pesticides during non-working hours and weekends and ventilating before re-entry of building occupants; repairing, maintaining and/or exhausting all machines and office equipment that diffuse chemical by-products into the environment.

**Increasing ventilation rates and air distribution** often can be a cost-effective means of improving indoor quality levels. Examples of measures that can be taken include:

- Providing enough fresh outdoor air to building occupants. The HVAC system should be operated to meet or exceed the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Standard 62-2016.
- Operating the ventilation system at least a half-hour prior to arrival of occupants to flush contaminants from the building.
- In older buildings, opening windows, and installing ceiling fans to help circulate outside air.
- Keeping humidity levels between 30 and 60 percent.
- Keeping supply vents or return air grilles unblocked.

**Education and communication** are important parts of an indoor air quality management program. When building managers, occupants and maintenance personnel fully understand the causes and consequences of indoor air quality problems, they can solve and prevent problems.

## SUMMARY

While relatively few buildings have severe indoor air quality problems, even well run buildings can sometimes experience episodes of poor indoor air quality.

Provision of good air quality requires conscientious effort by building owners, managers and occupants. By understanding the sources of indoor air quality problems and how to control them, all parties can work together to provide and maintain a healthy indoor environment.

## ADDITIONAL INDOOR AIR QUALITY INFORMATION

A variety of resources are available to assist you with your indoor air quality management endeavors. Some include:

### U.S. ENVIRONMENTAL PROTECTION AGENCY

<https://www.epa.gov/indoor-air-quality-iaq>

### NATIONAL INSTITUTE OF OCCUPATIONAL SAFETY AND HEALTH

<https://search.cdc.gov/search/?query=indoor+air+quality&sitelimit=NIOSH&utf8=%E2%9C%93&affiliate=cdc-main>

### AMERICAN SOCIETY OF HEATING, REFRIGERATING, AIR-CONDITIONING ENGINEERS (ASHRAE)

<http://www.ashrae.org>

### BUILDING OWNERS AND MANAGERS ASSOCIATION INTERNATIONAL

<http://www.boma.org>

### AMERICAN INDUSTRIAL HYGIENE ASSOCIATION

On-line IAQ publications, including how to select an IAQ consultant:

<http://www.aiha.org>

### AMERICAN LUNG ASSOCIATION

On-line IAQ publications: <https://www.lung.org/clean-air>

### CALIFORNIA INDOOR AIR QUALITY PROGRAM

<https://www.cdph.ca.gov/Programs/CCDC/PHP/DEODC/EHLB/IAQ/Pages/Main-Page.aspx>

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