

Typical symptoms of sick building syndrome

- headaches
- dizziness
- runny noses
- itchy, watery eyes
- scratchy throats
- nausea
- lethargy
- inability to concentrate
- respiratory infections

Indicators of sick building syndrome

1. Building occupants complain of headache; eye, nose or throat irritation; dry cough; dry or itchy skin; dizziness and nausea; difficulty in concentrating; fatigue; and sensitivity to odours.
2. The cause of the symptoms is not known.
3. Most of the complainants report relief soon after leaving the building.

Indicators of building related illness

1. Building occupants complain of symptoms such as cough; chest tightness; fever, chills, and muscle aches.
2. The symptoms can be clinically defined and have clearly identifiable causes.
3. Complainants may require prolonged recovery times after leaving the building.

Indoor Air Quality

Known contaminants

Particulates:

1. Respirable particulates (up to 3 micrometers)
2. Tobacco smoke
3. Asbestos fibers
4. Allergens (pollen and mould spores)
5. Pathogens (bacteria and viruses)
6. Radon (radioactive decay products)

Vapours and gases

1. Carbon Monoxide
2. carbon dioxide
3. formaldehyde and other aldehydes
4. other volatile organic compounds
5. oxide of nitrogen

Causes of sick Building Syndrome

1. Inadequate ventilation – require 15 – 20 cfm of outdoor air per person. Up to 60 cfm/person may be required in some spaces with smokers.
2. Chemical contaminants from indoor sources – adhesives, carpeting, upholstery, manufactured wood products, copy machines, pesticides, and cleaning agents which may give off formaldehyde, tobacco smoke, respirable particulate matter.
3. Chemical contaminants from outdoor sources – motor vehicle exhausts; plumbing vents, building exhausts from bathrooms and kitchens; combustion products from nearby garage.
4. Biological contaminants – bacteria, moulds, pollen, and viruses from stagnant water accumulated in ducts, humidifiers and drain pans, or where water has collected ceiling tiles, carpeting, or insulation. Birds or insect droppings can also be sources of biological contaminants.
5. Asbestos and radon - cause long term disease.

IAQ Sources of Contaminants

- paints, wall and floor coverings, and surface coatings
- paneling
- plywood or particle board
- caulks and sealants
- adhesives
- thermal insulation
- parking garages
- loading docks
- food preparation and serving areas
- photo labs, prints shops, and blueprint production areas
- laboratories – biological, chemical
- libraries and paper storage and use areas

- designated smoking areas
- mechanical rooms
- cooling tower equipment
- office equipment
- garbage disposal areas
- street traffic
- subway ventilators
- plumbing stacks, vents

Solutions of Sick Building Syndrome

1. Routine maintenance of HVAC systems including periodic cleaning or replacement of filters;
2. replacement of water-stained ceiling tile and carpeting;
3. institution of smoking restrictions;
4. venting contaminant source emissions to the outdoors;
5. storage and use of paints, adhesives, solvents, and pesticides in well-ventilated areas, and use of these pollutants during periods of non-occupancy;
6. Allowing time for building materials in new or remodeled areas to off-gas pollutants before occupancy.
7. Increasing ventilation rates and air distribution.
8. Local exhaust ventilation for rest rooms, copy rooms, printing facilities and designated smoking areas.
9. Air cleaning – can be useful. Limitations: typical furnace filter is not effective for capturing small particles; HEPA filters are expensive with high pressure drops; mechanical filters are useless against gaseous contaminants.
Adsorbent filters for gases are expensive and lack end of use indicators.
10. Education and communication with building occupants – very important. Opening windows to let fresh air in may upset the balance of the ventilation system.

HVAC Components

- air filters, electrostatic precipitator
- humidifiers
- air supply and exhaust ducts
- HVAC equipment drainage
- Controls
- Fan coil units
- Cooling towers
- Air intakes
- Refrigerant coils
- Radiators
- Induction units

HVAC Control Systems

- carbon monoxide sensors in parking garages
- thermostats
- humidity sensors
- pressure sensors
- time clocks
- dampers and valves
- carbon dioxide sensors

CARBON DIOXIDE MEASUREMENTS

CO2 READING (PPM) EFFECTS

Below 600	Adequate fresh air – No complaints
600 – 800	Occasional complaints esp. if air temperature rises
800 – 1000	Complaints more prevalent
Above 1000	Complaints are common

Note: Carbon dioxide has a TLV-TWA of 5000 ppm and a TLV/STEL of 30,000 ppm.