

APPENDIX I – INDOOR AIR QUALITY CONCERNS

Whatever is done to the building structure, occupant health, safety, and comfort must be maintained. Problems due to indoor air quality (IAQ) contaminants have caused occupant health problems and have acquainted us to the term "Sick Building Syndrome." Saving energy is important, but it cannot be at the expense of the productivity and health of occupants.

Indoor Air Quality Contaminants Fall Into Two Categories:

1. Respirable Particulates
 - a. Tobacco smoke (solid and liquid droplets)
 - b. Allergens (mold, pollen, fungi, spores)
 - c. Pathogens (bacteria and viruses)
 - d. Asbestos and manufactured fibers
 - e. Others

2. Gases and Vapors
 - a. Carbon monoxide (CO)
 - b. Radon
 - c. Volatile organic compounds (VOCs)
 - d. Oxides of nitrogen (NO_x)
 - e. Formaldehyde (HCHO)
 - f. Trivalent oxygen (ozone or O₃)
 - g. Polychlorinated biphenyls (PCBs)
 - h. Odors
 - i. Chordane
 - j. Others

Poor Indoor Air Quality Symptoms Include:

1. Headache
2. Fatigue
3. Burning eyes
4. Runny nose
5. Sore throat
6. Itching skin
7. Recurring sinus infection
8. Bronchitis
9. Pneumonia

Typical Causes of Sick Buildings Are:

1. Improper design including insufficient outside air quantity
2. Changes in building occupancy or use
3. Restricted ventilation due to added walls, partitions, bookshelves, etc.
4. Inadequate filtration and/or dehumidification

5. Poor outside air quality
6. Indoor pollutants including off-gassing of materials and furnishings
7. Buildup of mold and mildew, especially in air handling units and ducting
8. Poor maintenance including test, adjust and balance neglect
9. Various combinations of the above.

In a retrofit program for existing buildings, one needs to keep an eye open for asbestos, especially for buildings constructed from the 1940s through the late 1970s. Prime building components that may contain asbestos are:

1. Boiler rooms and boiler equipment
2. Pipe and duct coverings
3. Piping used in water systems
4. Cooling tower components
5. Rooftop equipment including roofing materials (felt) and penetrations (flashing) through the roof deck
6. Cement, blackboard, wallboard (or sheetrock)
7. Acoustical ceiling tiles and inside roof decking, etc.

If asbestos is found, disposal costs (hazardous wastes) will be substantially higher.

Radon gas is a naturally occurring radioactive gas that causes lung cancer. According to EPA second leading cause of lung cancer in the United States after cigarette smoking. Whenever uranium is found in rocks and in soil, radium is found. Where there is radium, radon gas and its daughters are found. Some types of rock and soil contain considerably more radon than others. Among these types are granite, phosphate, shale, and uranium.

The North Carolina Department of Environmental Health Services standard limits radon to 0.02 working level (WL), which is 4 picocuries per liter (*pCi/l*). At 4 *pCi/l*, about two people in a community of 100 may die from radon. This risk of dying from lung cancer compares to smoking 1/2-pack of cigarettes each day.

Possible sources of radon entry into a building with slab-on-grade foundations and into basements are sump-pump openings, floor cracks and joints, basement floor/wall joints, basement floors of uncracked concrete, and basement floor drains.

Source: Energy Auditor I Technical Assistance Analyst Training Manual, State Energy Office, State of Florida