



INDOOR AIR QUALITY

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Regulatory Perspective and Design Standards

- ***Federal Agencies and their Roles***

- *No direct authority regulating IAQ*
- *Occupational Safety and health Administration (OSHA) and National Institute of Occupational Safety and Health (NIOSH) - Limited Regulatory Authority for issues related to work places.*

- ***Federal EPA Role for IAQ***

- *Formal Research and Information Sharing/Technology Transfer Program*
- *Toxic Substance Control Act to Limit such Products as Asbestos and Formaldehyde*
- *Indoor Radon Abatement Act*
- *Federal Insecticide, Fungicide and Rodenticide Act (FIFRA)*
- *Clean Air Act Amendments (CAAA) - Ambient Air Quality*

Indoor Air Pollutants

- *Carbon Monoxide, CO*
- *Nitrogen Oxides (Nitrogen Dioxide, (NO₂))*
- *Environmental Tobacco Smoke, ETS*
- *Total Suspended Particulate Matter (TSP)*
- *Inhalable Particulate Matter ($d_p < 10 \text{ } \mu\text{m}$, PM₁₀)*
- *Respirable Particulate Matter (RP)*
- *Asbestos*
- *Formaldehyde, HCHO*
- *Radon and Radon Daughters, Rn-222*
- *Ozone, O₃*
- *Organics*
- *Viable Particulate Matter*
- *Allergens*
- *Odor Causing Chemicals*
- *Carbon Dioxide*

Indoor Sources

<i>Combustion</i>	<i>Gas Stoves Kerosene Space Heaters Wood-Burning Fire Places Unvented Gas Appliances</i>	<i>Combustion products (CO, CO₂, SO₂, particles, organics, NO_x)</i>
<i>Smoking</i>	<i>Tobacco</i>	<i>Everything</i>
<i>Building Materials</i>	<i>Soil and cement products Wood products Insulation</i>	<i>Randon (and daughters) Formaldehyde and organics Asbestos</i>
<i>Other Sources</i>	<i>People Office Machines Humidifiers Cleaning Compounds Furnishings Adhesives and paint Hair dryers Consumer products Hobbies</i>	<i>Organics and CO₂ O₃ and organics Viable particles Organics Organics, HCHO Organics Asbestos Aerosols Organics</i>

Design Standards

ASHRAE 62-1989, “Ventilation for Acceptance Air Quality”

Important features:

- *A definition of acceptable air quality*
- *A discussion of ventilation effectiveness*
- *The recommendation of the use of source control through isolation and local exhaust of contaminants*
- *Recommendations for the use of heat recovery ventilation*
- *A guideline for allowable carbon dioxide levels*
- *Appendices listing suggested possible guidelines for common indoor pollutants*

ASHRAE 52-76, “Method of Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter”

Important features:

- *Definitions of arrestance and efficiency*
- *Establishment of a uniform comparative testing procedure of air cleaning devices used in ventilation systems*
- *Establishment of uniform reporting method for performance*
- *Methods of evaluation resistance to airflow and dust-holding capacity*

ASHRAE 55-1991, “Thermal Environmental Conditions for Human Occupancy”

Important features:

- *A definition of acceptable thermal comfort*
- *A discussion of the additional environment parameters that must be considered*
- *Recommendations for summer and winter comfort zones for both temperature and relative humidity*
- *A guideline for making adjustment for activity levels*
- *Guidelines for making measurements*

Guideline 1-1989 “Guideline for the Commissioning of HVAC Systems”

Important features:

- *Definition of the commissioning process*
- *Discussion of the process involved in a proper commissioning procedure*
- *Sample specification and forms for logging information*
- *Recommendation for the implementation of corrective measures as warranted*
- *Guidelines for operator training*
- *Guidelines for periodic maintenance and recommissioning as needed*

Designing For Indoor Air Quality

- ***Site Selection Considerations***
 - ▶ *Expressway*
 - ▶ *Concentration of Trucks and Buses*
 - ▶ *Smoke Stacks*
 - ▶ *Normal Wind Flows*

- ***Site Planning Considerations***
 - ▶ *Locate Motor Vehicles on Downwind Side*
 - ▶ *Avoid Air Exhausts, Loading Areas, and Service Docks from Air Intakes*
 - ▶ *Quality Landscaping – Shade and Shelter*

- ***Design Development, Bidding, and Construction***
 - ▶ *Team Awareness for Indoor Air Quality*
 - ▶ *Well-Orchestrated effort will help in making right decisions for IAQ*

- ***Interior Design Considerations***
 - ▶ *Interior Furnishing, Fixtures and Equipment*
 - ▶ *Adhesive, Wallcoverings, Carpets*
 - ▶ *Furniture, Fabrics, Plastics, and Paints*

- ***Commissioning***
 - ▶ *Testing and Balancing of HVAC Systems*
 - ▶ *Building Bake-out*

Maintenance Criteria to Avoid Indoor Air Quality Problems

- ***HVAC Systems Maintenance***

- ▶ *Periodic Professional Cleaning of Ducts and Plenums including Grilles and Diffusers*

- ▶ *Air Handling Units, Cooling Coils, Condensate Pipes*

- ▶ *Maintenance of Humidification System*

- *Steam Humidifier*

- *Cold Water Humidifiers*

- ***Control System Maintenance***

- ▶ *Calibration of Controls*

- ▶ *Control Valves*

- ***Documentation of Maintenance Program***

Publications and Reference Material

Items marked * are available from **EPA Public Information Center** (PM-211B), 401 M Street, SW, Washington, DC 20460. 202-260-2080.

Items marked ** are available from **TSCA Assistance Hotline** (TS-799), 401 M Street, SW, Washington, DC 20460. 202-554-1404.

Items marked *** are available from **NIOSH Publications Dissemination**, 4676 Columbia Parkway, Cincinnati, OH 45202. 513-533-8287.

General Information:

Sheet Metal and Air Conditioning Contractor's National Association, Inc. (SMACNA). ***Indoor Air Quality***. 1988. 8224 Old Courthouse Road, Vienna, Virginia 22180

U.S. Environmental Protection Agency and Public Health Foundation. ***Directory of State Indoor Air Contacts***. Updated, 1991.*

U.S. Environmental Protection Agency. 1988. ***Project Summaries: Indoor Air Quality in Public Buildings***. 1988. *Contains findings of research on IAQ in 10 new public and commercial buildings and on building material emissions.* *

U.S. Environmental Protection Agency and the U.S. Consumer Product Safety Commission. ***The Inside Story: A Guide to Indoor Air Quality***. 1988. *Addresses residential indoor air quality primarily, but contains a section on offices.* *

U.S. Environmental Protection Agency. ***Sick Building Syndrome***. Indoor Air Quality Fact Sheet #4. Revised, 1991.*

U.S. Environmental Protection Agency. ***Ventilation and Air Quality in Offices***. Indoor Air Quality Fact Sheet #3. Revised, 1990.*

Asbestos:

U.S. Environmental Protection Agency. ***A Guide to Respiratory Protection for the Asbestos Abatement Industry***. 1986. EPA 560/OTS 86-001.**

Biologicals:

American Council of Governmental Industrial Hygienists. ***Guidelines for the Assessment of Bioaerosols in the Indoor Environment***. 1989. 6500 Glenway Avenue, Building D-7, Cincinnati, OH 45211.

Building Management, Investigation, and Remediation:

U.S. Department of Health and Human Services. Public Health Service. Centers for Disease Control. National Institute for Occupational Safety and Health. ***Indoor Air Quality: Selected References***. 1989.***

U.S. Department of Health and Human Services. Public Health Service. Centers for Disease Control. National Institute for Occupational Safety and Health. ***Guidance for Indoor Air Quality Investigations***. 1987.***

Environmental Tobacco Smoke:

U.S. Department of Health and Human Services. Public Health Service. Centers for Disease Control. National Institute for Occupational Safety and Health. ***Current Intelligence Bulletin 54: Environmental Tobacco Smoke in the Workplace - Lung Cancer and Other Health Effects***. DHHS (NIOSH) Publication No. 91-108. 1991.***

U.S. Environmental Protection Agency. ***Environmental Tobacco Smoke***. Indoor Air Quality Fact Sheet #5. 1989.*

Publications and Reference Material *(continued)*

PCBs:

U.S. Environmental Protection Agency.
Transformers and the Risk of Fire: A Guide for Building Owners. 1986. OPA/86-001.**

Training:

OSHA Training Institute. 155 Times Drive,
DesPlaines, Illinois 60018. 708-297-4913.
Provides courses to assist health and safety professionals in evaluating indoor air quality.