

United States
Environmental Protection
Agency

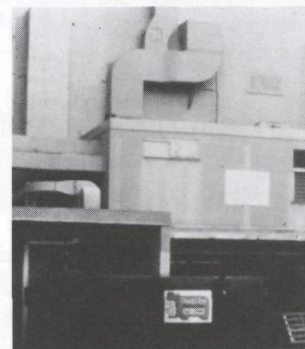
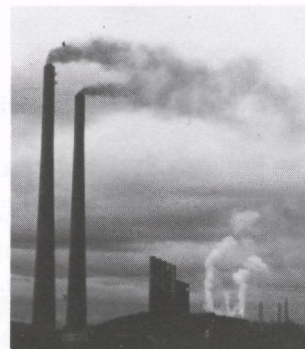
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Air And Radiation (6203J)



Targeting Indoor Air Pollution

EPA's Approach And Progress

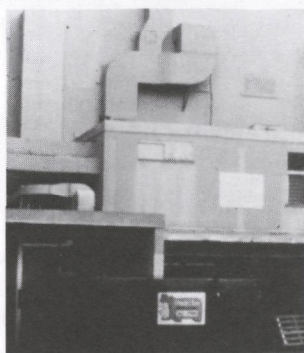
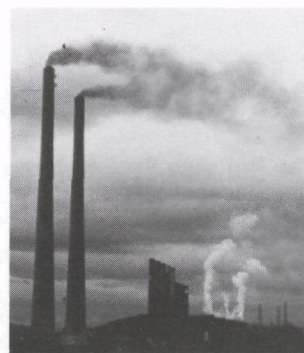


Most people are aware that outdoor air pollution can damage their

health but may not know that indoor air pollution can also have significant harmful effects. U. S. Environmental Protection Agency (EPA) studies of human exposure to air pollutants indicate that indoor levels of many pollutants may be 2-5 times, and occasionally more than 100 times, higher than outdoor levels. These levels of indoor air pollutants are of particular concern because it is estimated that most people spend as much as 90% of their time indoors.

Over the past several decades, our exposure to indoor air pollutants is believed to have increased due to a variety of factors, including the construction of more tightly sealed buildings, reduced ventilation rates to save energy, the use of synthetic building materials and furnishings, and the use of chemically-formulated personal care products, pesticides and household cleaners.

In recent years, comparative risk studies performed by EPA and its Science Advisory Board have consistently ranked indoor air pollution among the top five environmental risks to public health. EPA, in close cooperation with other Federal agencies and the private sector, has begun a concerted effort to better understand indoor air pollution and to reduce peoples' exposure to air pollutants in offices, homes, schools and other indoor environments where people live, work and play.



Indoor Air Pollution and Health

Awareness of indoor air pollution as an environmental issue is relatively new. Indoor air pollutants can cause long and short term health effects, especially when concentrations build up. One challenge for researchers today is to increase our understanding of the possible health impacts of being exposed to mixtures of indoor air pollutants at low levels for long periods of time.

Long-Term Health Effects

Some health effects may show up years after exposure has occurred or only after long or repeated periods of exposure and thus can be characterized as long-term health effects. These effects, which include respiratory diseases and cancer, can be severely debilitating or fatal. Long-term health effects are associated with indoor air pollutants such as radon, asbestos, and environmental tobacco smoke.

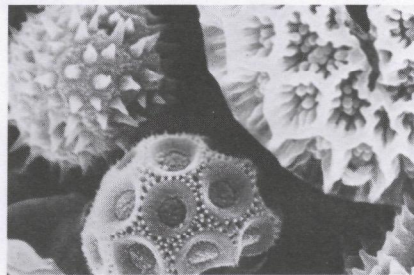
Immediate Health Effects

Immediate effects, which may appear after a single, high-dose exposure or repeated exposures, include irritation of the eyes, nose, and throat, headaches, dizziness, and fatigue. These immediate effects are usually short-term and treatable. Sometimes the treatment is simply eliminating the person's exposure to the source of the pollution, if it can be identified. Symptoms of certain diseases, including asthma, hypersensitivity pneumonitis, and humidifier fever, can appear soon after exposure to some indoor air pollutants. When symptoms of diagnosable illness can be attributed directly to airborne building contaminants, they are referred to as *building-related illness*.

In contrast, there are situations in which building occupants experience symptoms that do not fit the pattern of any particular illness and are difficult to trace to any specific source. This phenomenon, referred to by some as *sick building syndrome*, is often temporary, but some buildings have long-

term problems. Frequently, problems result when a building is operated or maintained in a manner that is inconsistent with its original design or prescribed operating procedures.

Occupants may complain of one or more of the following symptoms: dry or burning mucous membranes in the nose, eyes, and throat, sneezing, stuffy or runny nose, fatigue or lethargy, headache, dizziness, nausea, irritability, and forgetfulness. Contributing factors may include inadequate ventilation;



Biological pollutants, such as pollen (shown above) and mold and mildew, are a major cause of health complaints and illness.

chemical and biological contamination from indoor or outdoor sources; and other non-pollutant stressors such as temperature, humidity, lighting, ergonomic problems and job-related psychosocial issues.

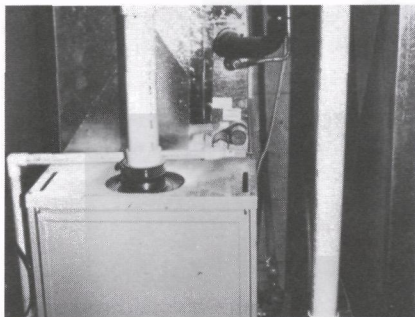
Indoor Air Pollution Costs

Initial efforts by EPA to assess the costs of indoor air pollution (see *Report to Congress on Indoor Air Quality*, August 1989) concluded that it was reasonable to estimate that the costs of indoor air pollution were in the tens of billions of dollars per year. The major types of economic costs associated with indoor air pollution are direct medical costs for people whose health is affected by poor indoor air quality and who receive treatment; lost productivity from absence due to illness; decreased efficiency on the job; and materials and equipment damages due to exposure to indoor air pollutants.

EPA's Program for Dealing with Indoor Air Pollution

Because of the potentially serious impacts on the health of individuals who may experience indoor air quality problems — as well as the dollar costs to society if indoor air pollution is not addressed — EPA has developed a comprehensive program to better understand the indoor air pollution problem and to take decisive steps to reduce people's exposures to indoor air contaminants of all types.

■ Even in the absence of complete scientific understanding of indoor air pollution, prudent public policy dictates that reasonable efforts be undertaken to reduce people's exposure to potentially harmful levels of indoor air pollutants, using the authorities available to the Federal government under current laws.



Backdrafting of pollutants from combustion appliances can result in dangerous, and even fatal, levels of carbon monoxide. A trained professional should inspect, clean, and tune-up the central heating system (furnaces, flues, and chimneys) annually.

■ Pollution prevention — and efficient resolution of indoor air quality problems of all types — must become a routine aspect of the design, construction, maintenance, and operation of public and commercial buildings, homes, health and day care facilities, educational institutions and other special use buildings.

■ An effective research and development program must be conducted to achieve a more complete understanding of the factors affecting indoor air

quality, exposure patterns, health effects, and control techniques for improving indoor air quality.

EPA is implementing this program using non-regulatory as well as regulatory tools available under a number of Federal laws to provide information and incentives for action to product manufacturers, architects, engineers, builders, building owners and managers, and building occupants.

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The primary objectives of EPA's program are to:

- Establish effective partnerships with organizations representing the range of target audiences for indoor air quality information to communicate specific guidance and information and promote timely action on indoor air quality issues;
- Forge constructive alliances with other Federal agencies to leverage resources and ensure that existing statutory authorities are used most effectively;
- Develop practical guidance on indoor air quality issues utilizing a broad-based consensus approach which includes representatives from

industry and public interest groups to ensure that information provided is accurate and practical;

- Design market-based incentives for industries to lower chemical emissions from their products and provide consumers and other decision-makers with information needed to make informed purchasing decisions;
- Sharpen the focus of the chemical screening and risk management program under the Toxic Substances Control Act (TSCA) and the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) to ensure that chemicals that pose unreasonable risks indoors are identified and addressed;



Biological pollutants can thrive on damp surfaces. Moisture on the interior surfaces of buildings can be controlled either by reducing the humidity levels indoors or by adding insulation to exterior walls (shown above).

- Identify and fill research gaps in order to provide information to address outstanding indoor air quality policy issues;
- Select appropriate environmental indicators to measure progress in reducing population exposure to indoor air quality problems as the program matures;
- Enhance scientific understanding and public awareness of the complex factors affecting indoor air quality; and
- Bring about substantial reductions in human exposure to the entire range of indoor air pollutants.

Reducing Pollutant Levels Indoors

The Building System Approach

EPA has set a high priority on improving the way in which buildings are designed and operated, having concluded that people's exposure to indoor air pollutants can be reduced significantly by implementing current knowledge about sound building operation and maintenance practices. Some of the major actions to date include:

- Issuance, in cooperation with the National Institute for Occupational Safety and Health, of comprehensive guidance, entitled *Building Air Quality: A Guide for Building Owners and Facility Managers*, on how to prevent and resolve the full range of indoor air quality problems in public and commercial buildings.

- Publication of *The Inside Story: A Guide to Indoor Air Quality*, to help people identify and correct potential indoor air quality problems in their own homes.



A good on-site investigation of a building is often more helpful in identifying and resolving indoor air quality problems than measuring individual pollutant concentration levels.

In addition, EPA is developing guidance for school facility managers, new home builders, and architects and design engineers to acquaint them with the most current information on how to prevent indoor air quality problems from occurring or resolve them quickly if they do occur.

The Pollutant-Specific Approach

This emphasis on a "buildings approach" holds the most promise for addressing all of the factors — including those related to the ventilation system as well as sources of individual pollutants — that affect indoor air quality. However, the Agency also strongly believes that it must aggressively utilize its combined statutory authorities to identify specific pollutants that present direct health risks in the indoor environment, and to use a variety of means to reduce their levels indoors. The indoor air pollutants that are currently receiving significant Agency attention include:

Radon

The Indoor Radon Abatement Act of 1988 (Title III of TSCA) established a national goal of achieving indoor levels of radon which are no greater than outdoor levels. EPA has undertaken a range of activities directed toward this goal, including revising public information materials, providing financial and technical assistance to States, developing and encouraging the adoption of radon-resistant building practices, establishing training centers, operating industry proficiency programs, conducting studies in schools and Federal buildings, and performing mitigation research in different building types.

Environmental Tobacco Smoke

EPA has recently completed a major report on the respiratory health effects associated with environmental tobacco smoke. The report, entitled *Respiratory Health Effects of Passive Smoking: Lung Cancer and Other Disorders*, concludes that each year secondhand smoke is responsible for about 3,000 lung cancer deaths in non-smokers and causes respiratory health problems for hundreds of

thousands of young children. EPA is developing an education and outreach program to inform the public about the risks of passive smoking.

Asbestos

Title II of TSCA, the Asbestos Hazard Emergency Response Act (AHERA), passed in 1987, required EPA to establish a regulatory framework for addressing asbestos in schools. The Agency has set standards for state accreditation of personnel involved in asbestos management or abatement in



Radon and volatile organic compounds can enter buildings through cracks and openings such as the sump hole shown above. Keeping basements under positive pressure, or sump holes under negative pressure, will prevent these gases from entering buildings.

school buildings and will extend accreditation requirements to those who inspect or abate asbestos in public and commercial buildings. EPA is also involved in a range of outreach, grant, and technical assistance activities. Major recent accomplishments include publication, with the Consumer Product Safety Commission and the American Lung Association, of a homeowners' guide to *Asbestos In Your Home*; completion of a public dialogue on asbestos in buildings with industry, real estate interests, unions and the public sector; and publication of a building owner's guide, *Managing Asbestos in Place*.

Toxic Substances

TSCA grants EPA broad authority to control chemical substances and mixtures that present an unreasonable risk of injury to health and the environment. EPA has authority to require testing of chemical substances and mixtures; regulate hazardous chemical substances and mixtures by prohibiting or restricting their manufacture, processing, distribution, and



Sometimes professional assistance is needed to deal with particularly hazardous indoor air contaminants.

disposal; review new chemicals and their intended uses; and impose labeling or notification requirements. TSCA has been used to regulate asbestos, and the Agency is now evaluating groups of chemicals in selected use categories for their effect on people in indoor environments.

Pesticides

FIFRA authorizes EPA to control pesticide exposures by requiring that any pesticide be registered with EPA before it may be sold, distributed, or used in this country. EPA is evaluating the health impacts of indoor products including insecticide sprays,

termiticides, and wood preservatives. Major accomplishments include the withdrawal from the market of chlordane as a termiticide in homes and mercury used as a mildewcide in many indoor paints.

Even in the absence of complete scientific understanding of indoor air pollution, prudent public policy dictates that intensive efforts be undertaken to minimize people's exposure to the entire range of indoor air pollutants.

Lead

Exposure to dust from lead-based paint can pose a serious health threat in homes or apartments where remodeling is taking place. Toddlers and young children are at particular risk because they are more likely to swallow lead dust and the impact on their bodies is more severe. EPA, along with other key Federal agencies, is working to develop a comprehensive strategy to address lead exposures and to develop effective lead testing and abatement procedures.

Indoor Air Pollutants from Drinking Water

The Safe Drinking Water Act (SDWA) authorizes EPA to set and enforce standards for contaminants in public water systems to protect against both health and welfare effects. EPA sets standards for volatile organic compounds (VOCs) that can enter the air through volatilization from water used in a residence or other building. Eighteen such standards have been issued to date and three

more are planned. EPA is also developing a standard for radon in drinking water.

The Carpet Policy Dialogue: An Innovative Approach To Reduce Pollutant Emissions

The Agency recently completed a year long "dialogue" with carpet floor covering industries, unions, public interest groups, and other Federal agencies to explore ways of reducing the emission of VOCs from new carpet and related installation materials, such as carpet cushion and adhesives. As a result of this voluntary process, the carpet industry agreed to test new carpet floor covering materials for total VOC emissions and is exploring ways of lowering emissions of VOCs from carpet products. Most importantly, the industry has undertaken an extensive consumer education program in cooperation with other dialogue participants, designed to provide the public with information on the role that carpet products play in indoor air quality and ways that consumers can make informed purchase decisions. EPA expects to conduct similar discussions with other industry groups to determine whether additional reductions in indoor pollutant emissions can be achieved through voluntary actions.



The carpet industry has agreed to provide information on carpets and indoor air quality to consumers and is developing its own testing and certification program.

Increasing Access to Indoor Air Information

Information Dissemination

In addition to publishing a wide range of information materials on indoor air quality, EPA is also developing additional strategies for disseminating information to key audiences. To ensure that a full range of information about indoor air quality problems and solutions is readily available to both the technical and non-technical public, the Indoor Air Quality Information Clearinghouse (IAQ INFO) opened in 1992. IAQ INFO is equipped with toll-free, operator-assisted telephone access, and is able to provide written information including fact sheets and brochures, perform literature searches, and make referrals to appropriate Federal, State and Regional resources.

Training Key Indoor Air Audiences

Because concern about indoor air problems is a relatively recent phenomenon, many of the people who are in the best position to prevent problems or resolve them when they do occur are not sufficiently informed about the issue.

Many indoor air quality problems can be avoided through sound building operation practices, or resolved by knowledgeable building personnel without the need for potentially costly outside assistance. EPA has developed a training course for building owners to acquaint them with the guidance contained in *Building Air Quality: A Guide for Building Owners and Facility Managers* (December 1991). Because many indoor air quality problems are best resolved by responsible government agencies at the State and local level, EPA has developed both a live instructional course on indoor air quality issues, entitled *Orientation to Indoor Air Quality*, and a self-paced learning module entitled *Introduction to Indoor Air Quality* (April 1991) for these audiences.

Advancing the Science of Indoor Air Quality

EPA is conducting studies to assess indoor air conditions in the nation's existing building stock. Special emphasis is being given to identifying those factors that exert the greatest influence on overall indoor air quality (IAQ) and on occupant health symptoms. The information gained will be used to improve IAQ diagnostic pro-

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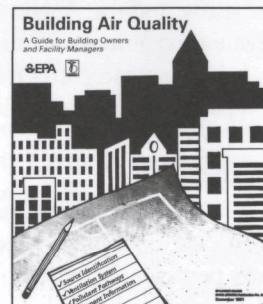
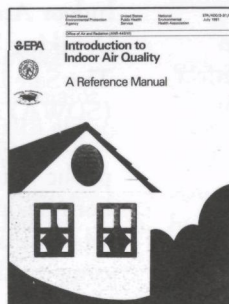
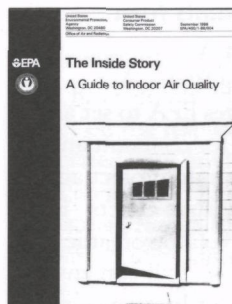
cedures as well as to provide a basis for evaluating the effectiveness of our pollution reduction strategies over time. Another set of studies now underway is designed to quantify the costs of key indoor air pollution control options for typical building structures.

EPA's Office of Research and Development conducts a multi-disciplinary research program on indoor air

quality which encompasses studies of the health effects associated with indoor air pollution exposure; assessments of indoor air pollution sources and control approaches; building studies and investigation methods; risk assessments of indoor air pollutants; and a recently initiated program on biocontaminants.

Working with Other Federal Agencies

More than 20 different Federal agencies have responsibilities associated with indoor air quality, either through their own statutory responsibilities or because they are major property managers. The activities of these agencies are coordinated through a variety of mechanisms, including an interagency Committee on Indoor Air Quality (CIAQ) which meets on a quarterly basis to exchange information on indoor air issues. Five Federal agencies — EPA, the Consumer Product Safety Commission, the Department of Energy, the National Institute for Occupational Safety and Health, and the Occupational Safety and Health Administration — are CIAQ co-chair agencies. In addition, EPA works closely with other agencies on regulatory and information development efforts and jointly sponsors many of its guidance and public information documents with these other agencies to help ensure that Federal actions are well-coordinated.



Recent EPA publications are designed to increase the awareness of key audiences about indoor air pollution problems and solutions.

Other Federal Sources of IAQ Information

U.S. Environmental Protection Agency

**Indoor Air Quality
Information Clearinghouse**
P.O. Box 37133
Washington, DC 20013-7133
1-800-438-4318
301-585-9020
Fax: 301-588-3408

**National Pesticides
Telecommunications Network**
1-800-858-7378

Provides information on pesticides.

TSCA Hotline Service
202-554-1404

Provides information on asbestos,
PCB, VOCs, and other toxic
substances.

U.S. Department of Energy

**Office of Conservation and
Renewable Energy**
1000 Independence Ave., SW, CE-43
Washington, DC 20585
202-586-9455

Quantifies the relationship among
reduced infiltration, adequate ventila-
tion, and acceptable indoor air quality.

National Institute for Occupational Safety and Health

Requests for information:
1-800-35-NIOSH

Conducts research, recommends
standards to the U.S. Department of
Labor, and conducts training on
various issues including indoor air
quality to promote safe and healthful
workplaces. Undertakes investiga-
tions at request of employees, employ-
ers, other Federal agencies, and state
and local agencies to identify and
mitigate workplace problems.

Consumer Product Safety Commission

For a copy of CPSC's booklets about
combustion appliances, asbestos,
biological pollutants, lead, methylene
chloride, humidifiers, and formalde-
hyde in your home, write to:

**U.S. Consumer Product Safety
Commission**
Washington D.C. 20207

To report an unsafe consumer product
or a product-related injury, call:
1-800-638-CPSC

Occupational Safety and Health Administration

Promulgates safety and health
standards, facilitates training and
consultation, and enforces regulations
to ensure that workers are provided
with safe and healthful working
conditions. For further information
contact OSHA Regional Offices in
Seattle, San Francisco, Denver,
Kansas City, MO, Dallas, Chicago,
Atlanta, Philadelphia, New York, and
Boston.

Cover Photos (from top to bottom)

*Levels of some pollutants are higher indoors
than outdoors in even the most heavily
industrialized cities.*

*Environmental tobacco smoke is one of the
most widespread indoor air pollutants.*

*House dust mites are a leading cause of
asthmatic episodes among children and young
adults.*

*Improperly placed outdoor air supply vents
can pull truck and automobile exhaust fumes
into buildings.*



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