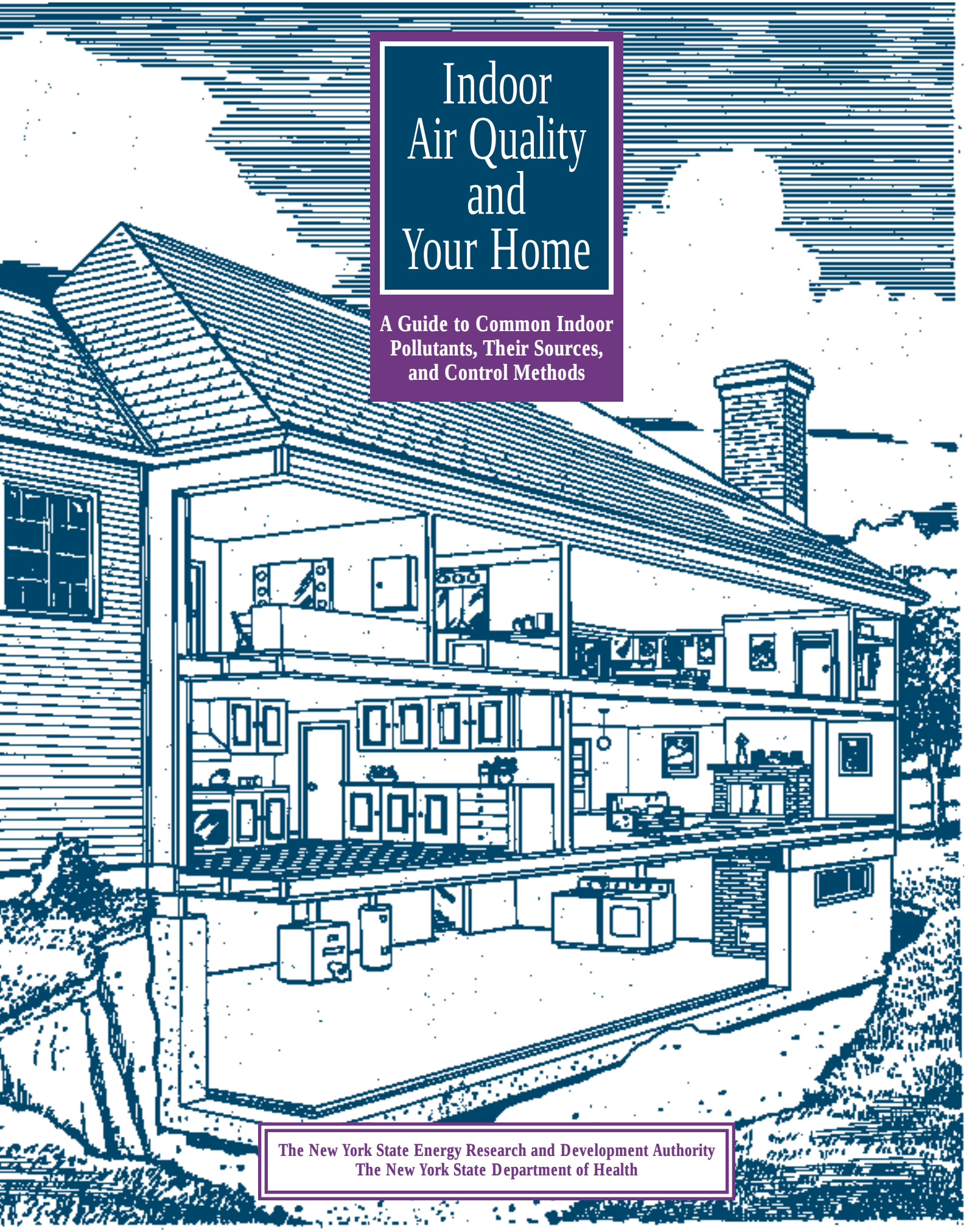
The New York State Energy Research and Development Authority
The New York State Department of Health

6/97

Indoor Air Quality and Your Home

A Guide to Common Indoor Pollutants, Their Sources, and Control Methods



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Message from the Governor

When most people hear about air pollution, they think of problems that affect outdoor air such as smog, acid rain, and diesel exhaust. However, sometimes indoor air can have higher levels of contaminants than outdoor air.

Many New Yorkers are also reducing their home heating and cooling costs by weatherizing, or tightening, their homes while newer homes are being built to be more energy-efficient. Without proper design and construction, the resulting exposure to indoor air contaminants could affect their comfort and health.

Energy-efficient homes that combine adequate ventilation while controlling sources of indoor air contaminants are the most comfortable, economical, and healthy. Because we spend most of our time indoors, it is important to address and resolve indoor air problems by limiting or removing indoor air pollutants.

This book is designed to help you learn more about the quality of air in your home and, if necessary, how to improve it. Good indoor air quality, energy efficiency, and a comfortable environment are achievable goals.

Governor George E. Pataki

Introduction

Indoor air has always contained natural and man-made impurities such as bacteria, viruses, fungi, radon gas, and combustion by-products from burning. In recent years, additional contaminants such as asbestos, formaldehyde, and other organic chemicals have been identified in indoor air. Research indicates that the air within homes and other buildings can have higher levels of these contaminants than the outdoor air, even in large cities. And, people spend most of their time indoors. Those people who may be exposed to indoor air pollutants for the longest period, such as infants, the elderly, and the ill, can be the most susceptible to adverse health effects.

Research is adding to our understanding of indoor air pollutants; but more information is needed on the sources and control of indoor air pollution. Although federal, state, and local governments are involved in controlling and regulating pollution levels in the outdoor air and in the workplace, they have only limited authority to address the quality of air in homes.

Today, homes can be made more comfortable and energy-efficient by reducing the number and size of openings in the structure and controlling air movement by mechanical means. We no longer need to rely on fans and open windows to control air flow. Instead, product manufacturers offer low-cost systems for controlling air movement into and out of new homes. Air that is stale, moist, or otherwise polluted can be removed from any area and fresh air can be brought into the places it is most needed.

This booklet describes the sources of common air pollutants in homes, the potential health effects from exposure to these pollutants, and methods to improve indoor air quality. Additional information is available from the federal, state, and private agencies listed on pages 14 and 15.

This booklet was designed to help New York State residents learn more about the quality of air in their homes and, if necessary, how to improve it.

Check Your Indoor Air Quality

		YES	NO
1	Does your home usually feel stuffy or does the air smell stale when you enter from the outside?	☐	☐
2	Do cooking odors linger for several hours?	☐	☐
3	During the winter, is there excessive condensation or ice on windows, walls, or ceilings?	☐	☐
4	Is mold growing anywhere in your home?	☐	☐
5	Is there soot around your furnace, boiler, or hot water heater?	☐	☐
6	If you heat your home with a gas or oil furnace, do you ever smell gas or oil fumes?	☐	☐
7	If you heat your home with wood, do you often smell wood smoke?	☐	☐
8	Does anyone in your household often experience any of the following symptoms when at home, but not when they are away from home?		
	a. Headaches	☐	☐
	b. Itchy, watery, or burning eyes	☐	☐
	c. Feelings of confusion or dizziness	☐	☐
	d. Breathing difficulties	☐	☐
	e. Nasal congestion	☐	☐
	f. Dry, sore throat	☐	☐
	g. Drowsiness	☐	☐

If your answer to any of these questions is "yes," the air quality in your home may be poor. This booklet can help you determine how to identify indoor air quality problems and how to improve the air quality in your home.

Acknowledgements

We are grateful to the Departments of Public Health and Energy Offices in New Hampshire, Massachusetts, and Rhode Island for granting us permission to use their booklet, "Indoor Air Quality and Your Health," as the foundation for this publication. In addition, we wish to express our appreciation to Mindy Pensak of the U.S. Environmental Protection Agency; Stephen Tomasik, formerly of the American Lung Association of New York State; Robert Kelley, formerly of NY-STAR, Inc.; for their comprehensive review and comments.

The Problem

Indicators of a potential indoor air quality problem include: moisture condensation on windows or walls, signs of water leaks, areas where mold grows, stuffy or stale air, and damaged flues or chimneys.

Many things in a house release gases or particles into the air that are the primary sources of indoor air contaminants. Examples include combustion sources such as oil, gas, kerosene, or wood; furnishings or building materials such as new carpeting, new furniture, pressed wood products, and new or wet carpeting; and household items such as pesticides, paints, cleaners, and hobby products. Excessively dry or humid conditions also can result in an indoor air quality problem.

Because older homes generally were built with more air "leaks," the outdoor air that leaked into these homes diluted some indoor air pollutants. Newer homes are more tightly built, and older homes are being weatherized to reduce the cost of heating and cooling the house. If too little outdoor air enters the home, pollutants from indoor sources can build up to levels that can cause discomfort or health effects. To prevent this buildup, the sources and pollutants must be controlled or more fresh air must be provided.

Detecting Indoor Air Problems

There are some simple ways to check for poor air quality. Indicators of a potential indoor air quality problem include: moisture condensation on windows or walls, signs of water leaks, areas where mold grows, stuffy or stale air, and damaged flues or chimneys. Sometimes, health effects that occur only in the home and disappear after the person leaves the home can indicate a problem. Or, health effects may occur immediately after moving into a home, or after refurnishing or remodeling. You should consult with your physician if you have symptoms that you believe are related to indoor air. Other lifestyle choices can contribute to indoor air quality problems. Pets, tobacco smoking, household product use, hobbies, cooking habits, and parking in attached garages all can affect contaminant levels in the home.

Some air pollutants, such as radon and carbon monoxide, cannot be smelled or seen. Radon can be detected with a special monitor, and the federal government recommends that you test your home for radon. Testing for most other pollutants is expensive and the results of such testing are often difficult to interpret. For advice about monitoring pollutant levels, contact the:

New York State Department of Health
Center for Environmental Health
2 University Place
Albany, NY 12203-3399
Environmental Health Information Line: 1-800-458-1158

Finding Solutions: Improving Indoor Air Quality

Three basic approaches can be taken to lower indoor air pollutant levels: source control, ventilation, and air cleaning.

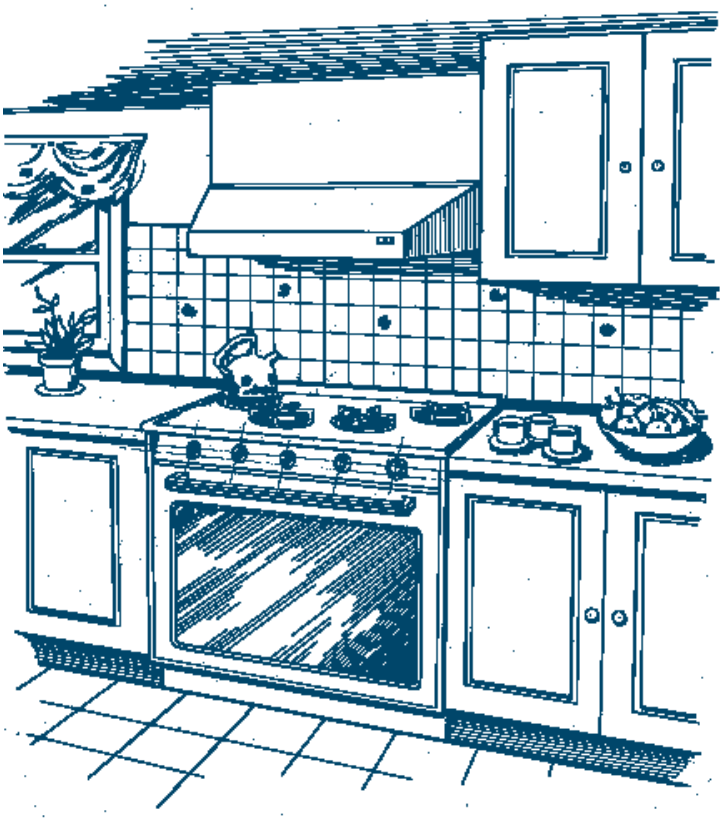
Source Control

The first step to improving indoor air quality is to eliminate individual sources of pollution or reduce their emissions (e.g., eliminating cigarette smoking and properly maintaining the furnace). Many specific methods of source control are discussed in the following sections. Obvious sources of indoor air pollutants, such as combustion sources or household products, can be controlled, but emissions from furnishings or building materials are more difficult.

Ventilation

Bringing outdoor air into the house and exhausting indoor air outside is called ventilation. Ventilation is important for reducing levels of contaminants that cannot be controlled at the source. Some outdoor air exchange is necessary in all homes to control indoor humidity and air contaminants and to keep the house from feeling stuffy. Uncontrolled ventilation, or infiltration, is unplanned airflow into and out of a house through cracks and holes, as well as open windows and doors. The rate of uncontrolled ventilation varies widely depending on the weather and the design, construction, and placement of the house. Uncontrolled airflow may not provide adequate ventilation, can make a house feel too hot or too cold, and can increase energy bills.

Mechanical ventilation and tight building construction allow you to control airflow into the house. Fans are used to bring fresh outdoor air inside, circulate the air through the house, and exhaust stale indoor air. For example, properly installed and operated exhaust fans can remove stale, moist air from bathrooms and kitchens. More sophisticated mechanical ventilation systems include air-to-air heat exchangers and heat-pump ventilators. These allow outdoor air to be brought into the house while conserving energy.



Air Cleaning

Some indoor air pollutants can be removed with an air cleaner. While air cleaning can be useful, it is never a substitute for source control and ventilation. Some air cleaners are effective at removing dust and particles from the air. However, most air cleaners have no effect on gases or vapors and should not be expected to provide total air purification. Air cleaners should always be used and maintained according to the manufacturer's instructions.

In homes with forced-air heating or cooling, air filters should be maintained and replaced on a regular basis. Typical furnace filters are designed to protect mechanical equipment and are not effective at capturing small particles capable of entering the lungs. People with allergies or asthma may want to upgrade standard furnace filters to higher-efficiency filters or electronic air cleaners. Before upgrading furnace filters, check the furnace to ensure it has the capability to handle any increased airflow resistance.

Should Houses Be Tightly Built?

Many people are reducing home heating and cooling costs by weatherizing or tightening up their homes. When combined with source control and mechanical ventilation, tight homes provide the greatest opportunity for comfort, economy, and good health. However, if homes are not equipped for controlling and removing indoor air pollutants, indoor air quality problems may result. Good indoor air quality, energy efficiency, and a comfortable environment can be obtained when the practices suggested in this booklet are followed.

Three basic approaches can be taken to lower levels of indoor air pollutants: source control, ventilation, and air cleaning.

Control of Common Sources of Indoor Air Pollutants

This section provides information on common indoor air pollutants, their sources in the home, potential health effects, and ways to reduce their levels in the home.

Radon

Radon is a colorless, odorless gas that occurs naturally and is found everywhere at varying low levels. Radon is constantly produced from the breakdown of uranium and radium in soil or rock.

Sources in the home: Radon gas in the soil can enter homes through dirt floors, cracks in basement walls or floors, floor drains, or sumps. In some areas, well water contains radon. The churning of water in washers, showers, toilets, and sinks releases radon gas into the air. In some unusual situations, building materials contain radon and release it to the indoor air. The only way to know if there is a radon problem in a house is to measure the radon level with a radon detector. All homes should be tested for radon.

Health effects: Exposure to elevated levels of radon increases the risk of lung cancer. Radon is estimated to cause from 7,000 to 30,000 lung-cancer deaths each year. Only cigarette smoking is believed to cause more lung-cancer deaths in the United States. Smoking combined with exposure to elevated levels of radon increases the risk of lung cancer even further.

Guidelines for exposure: The average outdoor air concentration of radon is 0.4 picocuries per liter of air (pCi/l). Indoor air concentrations in New York State average about 1.4 pCi/l, but measurements as high as 500 pCi/l and as low as 0.1 pCi/l have been observed. The U.S. Environmental Protection Agency advises that steps be taken to reduce radon levels in the home if the levels are above 4 pCi/l. Many factors can influence radon levels in indoor air, including the weather and ventilation rate. A good measure of the annual average radon level in the home (determined by appropriate testing) should be made before deciding what, if any, remedial measures to take in your home.

Control methods: Effective measures are available to reduce the level of radon in any home. However, the approach to reducing radon exposure is specific for

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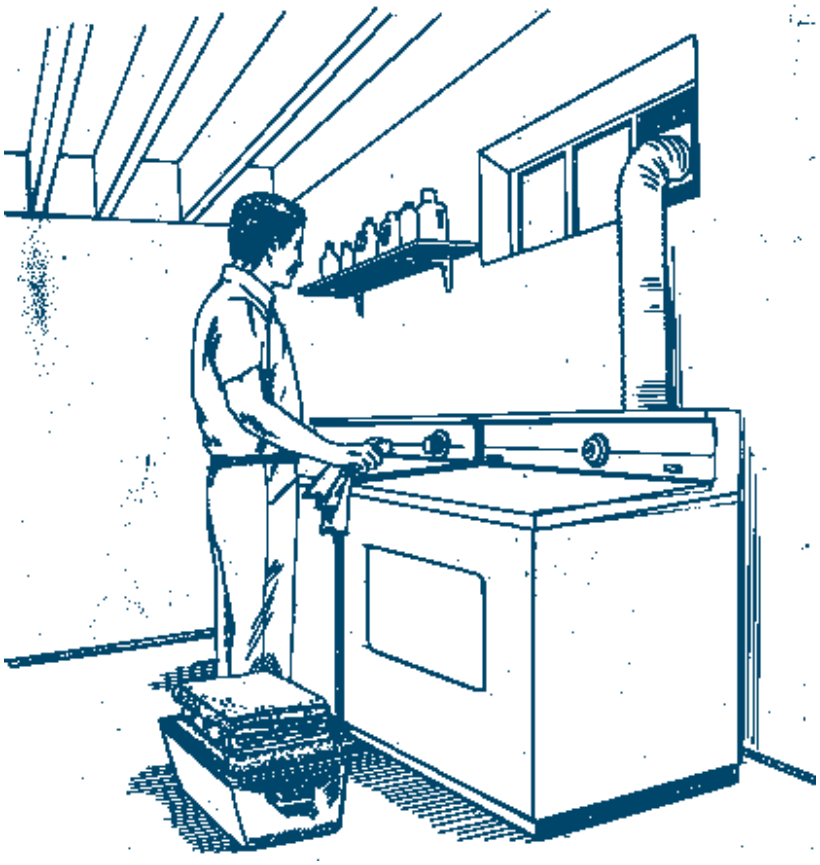

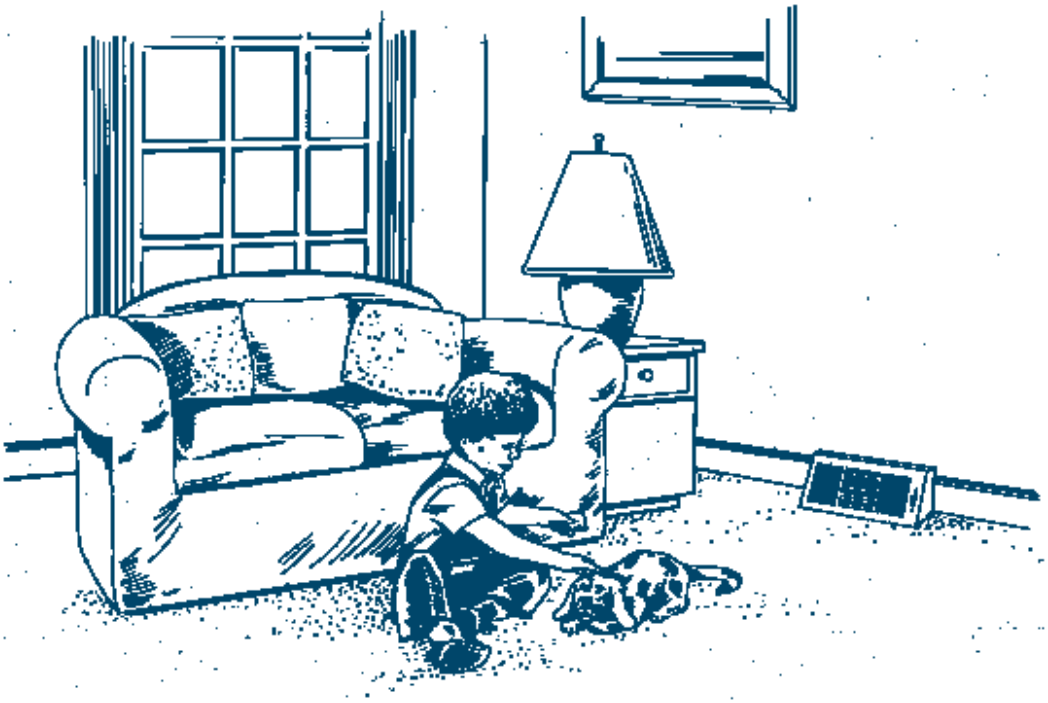

each home. Many mitigation methods require the services of an experienced contractor. The New York State Department of Health has additional information on radon, including lists of trained radon-mitigation contractors (see page 15), as well as a program to distribute radon test kits to residents. For additional information, call the toll-free number listed in the back of this booklet.

Biological Agents and Allergens

Biological contaminants include bacteria, mold and mildew, viruses, mites, pollen, and animal dander.

Sources in the home: Many sources of these pollutants are commonly found in homes. Bacteria and viruses are transmitted by infected people or animals; household pets are sources of dander and other allergens. Mold and mildew growth is encouraged by damp conditions resulting from high humidity, water-pipe leaks, persistent condensation, or water-filled appliances (humidifiers, dehumidifiers, and air conditioners). Dust mites can grow in any warm, damp environment, but are commonly found in carpets and upholstery. Pollen and mold from outdoor sources can enter homes through open windows and doors.

Health effects: Biological agents can be inhaled directly or may be attached to dust particles that are inhaled. Respiratory illnesses, such as colds, flu and pneumonia, can be caused by inhaled viruses or bacteria. Allergic reactions to pollen, molds, mildew, mites, and animal allergens are also possible. Exposure to biological agents may cause or worsen asthma.

Control methods: Appliances that contain water should be cleaned and sanitized regularly according to the manufacturer's instructions. Areas that have been soaked by water leaks should be inspected for water damage. Repair any leaks in pipes or roofs. Saturated insulation, rotted wood, stained ceiling tiles, and other damaged materials should be replaced. Wet carpets should be dried promptly and may need to be replaced.

Good ventilation is necessary to control humidity. Relative humidity should be maintained between 30 and 50 percent. Properly maintained and operated exhaust fans can help control humidity. Dehumidifiers can be used in basements and other areas where humidity is difficult to control by ventilation alone.

High-efficiency air filters installed in air-handling systems can reduce the levels of some biological agents in indoor air. High-efficiency particulate air (HEPA) vacuum bags or a central vacuum system that exhausts air outside may help reduce the spread of these pollutants.

Biological contaminants include bacteria, mold and mildew, viruses, mites, pollen, and animal dander.

Pollutants from Combustion (Burning)

Carbon Monoxide, Nitrogen Oxides and Sulfur Dioxide, and Respirable Particulates

Carbon monoxide is a colorless, odorless gas produced by incomplete combustion of fuels. Nitrogen oxide, nitrogen dioxide, and sulfur dioxide are also gases formed during combustion.

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Carbon monoxide is a colorless, odorless gas produced by incomplete combustion of fuels. Nitrogen oxide, nitrogen dioxide, and sulfur dioxide are also gases formed during combustion. Respirable particulates are small particles that can be inhaled deeply and remain lodged in the lungs. They are also produced during combustion.

Sources in the home: Unvented or improperly vented kerosene or gas space heaters, unvented hot water heaters, wood or coal stoves, unvented gas ranges, improperly operating gas or oil furnaces, automobile exhaust, and tobacco smoke are potential sources of carbon monoxide in the home.

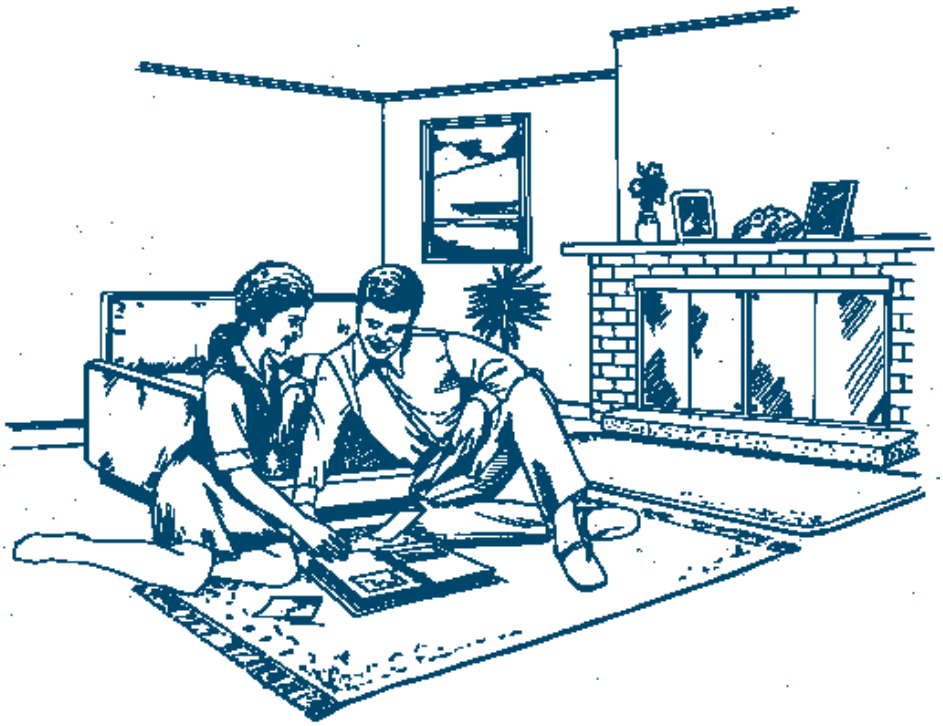
Health effects: Carbon monoxide is absorbed through the lungs into the blood, where it interferes with the blood's ability to carry oxygen. At low levels, it can cause fatigue in healthy people and chest pain in people with heart disease. At higher levels, carbon monoxide can cause headaches, dizziness, weakness, nausea, and confusion. Very high levels can cause death.

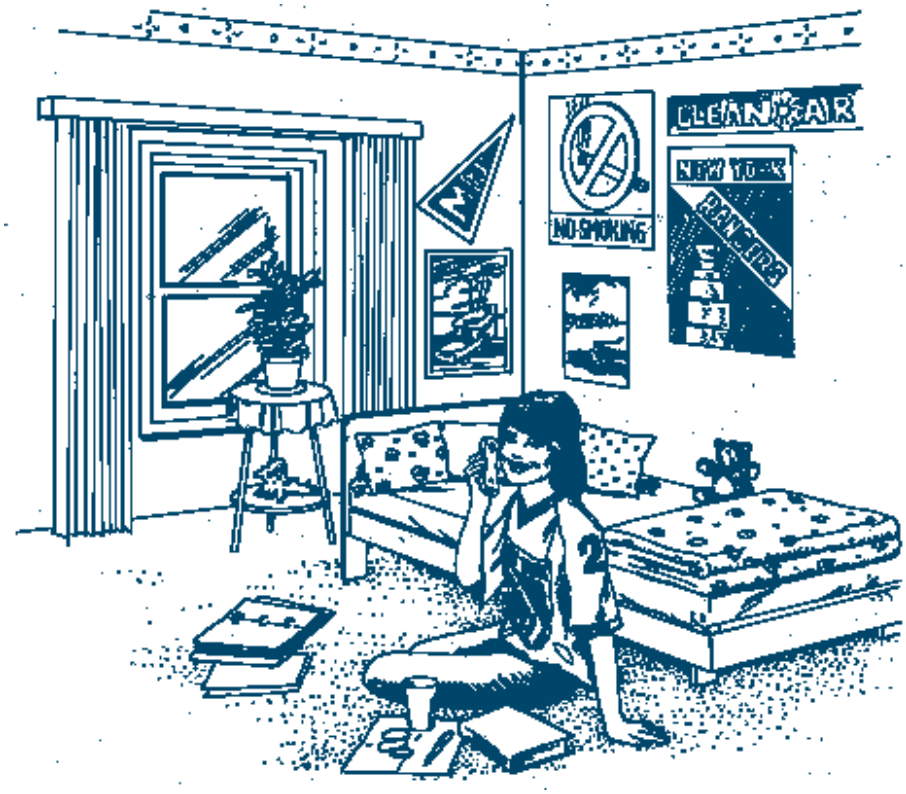
Nitrogen oxides and sulfur dioxide

Nitrogen oxides and sulfur dioxide can irritate the eyes, nose, and respiratory tract, and high levels can cause shortness of breath. Prolonged exposure to high levels of nitrogen dioxide can cause lung damage and chronic lung disease. Long-term exposure to lower levels of nitrogen dioxide may increase the frequency of respiratory illness. People with respiratory illnesses such as asthma are more susceptible to the effects of nitrogen oxides and sulfur dioxide. Children may also be more susceptible to health effects from these chemicals.

At low concentrations, respirable particulates irritate the eyes, nose, and throat. At higher levels, long-term exposure is associated with respiratory illnesses, such as bronchitis and emphysema.

Control methods: Gas and oil furnaces, gas hot water heaters, and gas dryers should be serviced before each heating season to keep them in good operating condition. Exhaust from these appliances must be vented directly to the outside. Flues and chimneys should be inspected and cleaned regularly.





Combustion appliances should be installed in an area isolated from the living area, such as a utility room. Make-up air from outside the building should be supplied to ensure adequate air for combustion and to prevent exhaust gases from blowing back into living areas. Make-up air is particularly important in tightly constructed homes. Unvented gas and kerosene heaters emit combustion gases into the indoor air. These devices are prohibited in any residence in New York City and in buildings with three or more residences in New York State. Adequate ventilation must be provided at all times and extensive use of these devices should be avoided. Gas stoves should not be used for home heating, and cars should not be idled in garages.

Some air cleaners can remove respirable particulates.

Environmental Tobacco Smoke (ETS)

ETS is a complex mixture of over 4700 chemical compounds, including gases and particles, from incompletely burned tobacco.

Sources in the home: Environmental tobacco smoke is the secondhand smoke exhaled by smokers and the sidestream smoke from the burning of cigarettes, cigars, and pipes.

Health effects: Research has shown that ETS causes lung cancer in both smokers and non-smokers. The U.S. Environmental Protection Agency estimates that ETS causes approximately 3,000 lung-cancer deaths a year in U.S. non-smokers. Short-term exposure to ETS can irritate the eyes, nose, and throat. Long-term exposure can cause respiratory problems, such as wheezing, bronchitis, pneumonia, and lung cancer. Children and asthmatics are particularly susceptible to ETS. Asthma attacks may be precipitated by respiratory irritation or infections related to ETS exposure. ETS may also contribute to heart disease.

Control methods: ETS can be totally removed from indoor air only by removing the source: cigarette, cigar, and pipe smoking. A separate smoking area, mechanical ventilation, or air cleaners may reduce, but will not eliminate, non-smokers' exposure to ETS.

Environmental tobacco smoke (ETS) is the secondhand smoke exhaled by smokers and the sidestream smoke from the burning of cigarettes, cigars, and pipes.

Pollutants from Man-Made Sources

Formaldehyde, Volatile Organic Chemicals, Lead, and Asbestos

Health effects depend on the level and specific type of chemical, the length of exposure, and other factors.

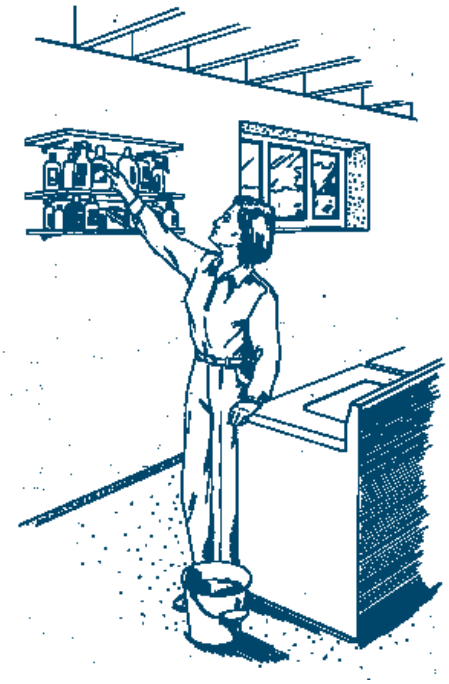
Formaldehyde

Formaldehyde is a colorless gas which has a distinctive, pungent odor at higher concentrations.

Sources in the home: Formaldehyde is released from some household products, such as plywood, particleboard, draperies, furniture fabrics, glues and adhesives, tobacco smoke, some personal care products, and urea-formaldehyde foam insulation. As these materials age, they generally stop releasing significant amounts of formaldehyde.

Health effects: Short-term, low-level exposure may cause temporary eye, nose, and throat irritation. Some people may become more sensitive to formaldehyde after an initial exposure. Long-term inhalation of formaldehyde has caused cancer in animals. Whether formaldehyde causes cancer in humans is not known.

Control methods: Formaldehyde exposure can be reduced by avoiding products that contain formaldehyde or buying low-emitting formaldehyde products. Where new formaldehyde-containing products have been installed, ventilation can be temporarily increased. High humidity and high temperatures will increase the rate at which formaldehyde escapes from



materials. Air-conditioning and dehumidification may help to reduce formaldehyde emissions.

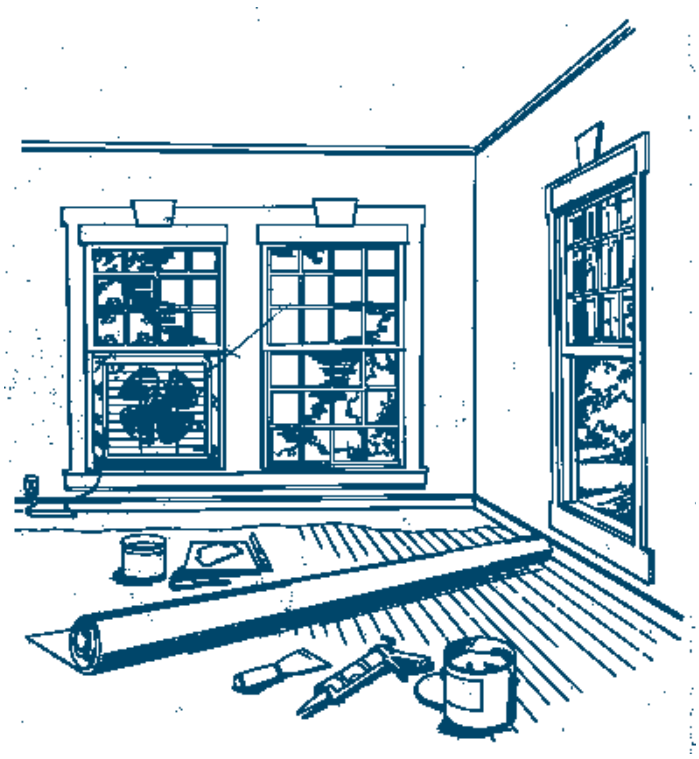
Volatile Organic Chemicals

This category includes a wide variety of liquid and solid chemicals that easily evaporate.

Sources in the home: Volatile organic chemicals (VOCs) found in indoor air come from a variety of sources, including paints, cleaners, tobacco smoke, aerosol sprays, pesticides, deodorizers, mothballs, fuels, dry-cleaned clothes, and other household products and furnishings. Chemical products used in home workshops and hobbies often contain VOCs.

Health effects: Health effects depend on the level and specific type of chemical, the length of exposure, and other factors. Some VOCs are irritants, some affect the central nervous system, and others can cause cancer with long-term, high-level exposure. Very little is known about the effects of long-term, low-level exposure to combinations of these compounds.

Control methods: Exposure to VOCs in indoor air can be reduced in several ways. Unnecessary products containing VOCs can be eliminated from the indoor environment, or such products can be bought in amounts that are used quickly. Products containing VOCs should be

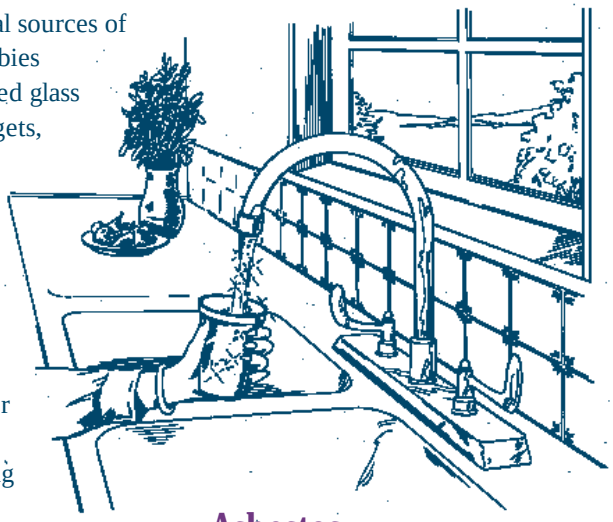


used only in well-ventilated areas or outdoors. Labels should be read carefully and directions for use should be followed. Products containing VOCs should be stored in tightly sealed containers in a secure and well-ventilated area.

Lead

Lead is a naturally occurring soft metal that once was widely used in gasoline, paint, and plumbing fixtures. Although lead paint for walls and lead solder for pipes have been banned, older homes are likely to contain lead. As lead paint ages, it can chip or crumble into dust. Exposure to lead paint dust or chips can cause serious health problems, especially for children and pregnant women.

Sources in the home: Lead can be found in paint, dust, soil, and water. Lead poisoning in homes most commonly occurs when a child eats paint chips, sucks on lead-dusted hands and toys, or chews on lead-painted window sills and stair rails. In most cases, lead-based paint in good condition is not a hazard. Any renovation or remodeling projects that disturb paint or create dust should be handled professionally, as removing lead-based paint improperly can increase the danger. Drinking water may also contain lead from old pipes or solder, particularly if the water is soft, corrosive, or acidic. The longer water stands in the pipes, the greater the possibility of lead being dissolved in it. Other potential sources of lead exposure include hobbies such as working with stained glass and shooting at indoor targets, food and liquids stored in lead crystal, lead-glazed pottery, or porcelain; and some folk medicines and cosmetics. Adults who work in occupations such as construction, plumbing, painting, or auto repair may bring lead dust home on their clothing or shoes.



Health effects: All children should be tested for lead poisoning at ages one and two. Other children up to six years old should also be tested if their doctors think they are at risk. If lead gets into a child's body, it could cause a lower IQ, kidney damage, hearing loss, headaches, slowed growth, anemia, or behavior problems. Children are at higher risk from lead exposure because they put hands and other objects in their mouths, their growing bodies absorb more lead, and their brains and nervous systems are more sensitive to the damaging effects of lead. Lead also can be harmful to adults, and pregnant women should be especially careful.

Control methods: Deteriorating paint or high levels of dust can pose a hazard in homes with lead paint. Paint chips should be cleaned up immediately. Floors, window frames, and window sills should be cleaned regularly with warm water and an all-purpose cleaner, and mops and sponges thoroughly rinsed afterwards. Children's hands should be washed often, and they should be kept from chewing painted surfaces. Children with good diets who eat low-fat meals high in iron and calcium will absorb less lead. Temporary measures such as covering a surface with wallboard or paneling may reduce hazards. Any removal of lead paint should be done by a trained professional, who will do the work safely and has the proper equipment to clean up thoroughly. Lead should not be removed by dry scraping, belt-sanding, propane torch, or heat gun; these actions generate large amounts of dust and fumes.

Asbestos

Asbestos is a mineral fiber used extensively in building products because it is fireproof, a good thermal insulator, and easily made into fabrics, pipe coverings, and other materials. When asbestos is disturbed or deteriorates, asbestos fibers can break off and get into the air.

Sources in the home: Asbestos has been banned from many products and voluntarily removed from others. Asbestos is most commonly found in older homes in pipe and furnace insulation, shingles, millboard, textured paints, and vinyl-asbestos floor tiles. Asbestos was commonly used before 1970.

Health effects: Long-term exposure to high levels of asbestos fibers in the air has led to respiratory disease and cancer in asbestos workers and their families.

Control methods: Depending on the situation, asbestos materials either can be removed or sealed in place to prevent fibers from getting into the air. However, only a trained professional should work with asbestos. An untrained individual should not dust, sweep, disturb, or vacuum materials suspected of containing asbestos because these activities can release fibers into the air.

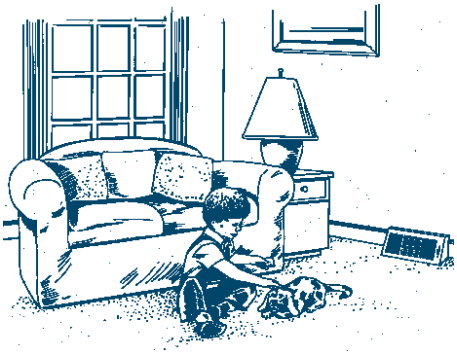
Exposure to lead paint dust or chips can cause serious health problems, especially for children and pregnant women.

Indoor Air Pollutants

	POLLUTANTS	SOURCES
Pollutants from Natural Sources	RADON A colorless, tasteless, and odorless gas that comes from the radioactive decay of uranium or radium.	■ Earth and rock under buildings ■ Some earth-derived building materials ■ Groundwater
	BIOLOGICAL AGENTS Bacteria, viruses, fungi, animal dander, mites, pollens, molds, and mildews.	■ House dust ■ Infected humans or animals ■ Bedding ■ Poorly maintained humidifiers, dehumidifiers, and air conditioners ■ Wet or moist surfaces ■ Carpets and home furnishings
Pollutants from Combustion (Burning)	CARBON MONOXIDE A colorless, odorless gas produced by incomplete combustion of all carbon fuels.	■ Unvented or malfunctioning gas appliances ■ Unvented or malfunctioning gas and oil furnaces ■ Unvented kerosene heaters ■ Wood or coal stoves ■ Tobacco smoke ■ Automobile exhaust, usually in attached garages ■ Malfunctioning chimneys used for wood, gas, or oil exhaust
	NITROGEN OXIDES and SULFUR DIOXIDE Gases formed by incomplete combustion of all carbon fuels.	■ Same as for carbon monoxide
	RESPIRABLE PARTICULATES Particles small enough to inhale that come in a variety of sizes, shapes, and levels of toxicity.	■ Environmental tobacco smoke (ETS) ■ Wood-burning stoves and fireplaces ■ Unvented kerosene space heaters ■ Gas-fired ranges, furnaces, and water heaters ■ Vacuum cleaning and house dust
	ENVIRONMENTAL TOBACCO SMOKE Secondhand smoke exhaled by smokers, also called sidestream smoke.	■ Cigarettes ■ Cigars ■ Pipes
Pollutants from Man-Made Sources	FORMALDEHYDE A colorless gas with a distinctive, pungent odor at higher concentrations.	■ Pressed wood products such as plywood, paneling, and particleboard ■ Urea-formaldehyde foam wall insulation ■ Carpets, draperies, and furniture fabrics ■ Paper products, glues, and adhesives ■ Some personal care products ■ Tobacco smoke
	VOLATILE ORGANIC CHEMICALS (VOCs) Airborne chemicals contained in many household products.	■ Aerosol sprays, hair sprays, perfumes, solvents, glues, cleaning agents, fabric softeners, pesticides, paints, moth repellents, deodorizers, and other household products ■ Dry-cleaned clothing ■ Moth balls ■ Tobacco smoke
	LEAD A natural element once used as a component in gasoline, water pipes, solder, and house paint.	■ House dust from lead paint or contaminated soil ■ Lead-based paint ■ Water from lead or lead-soldered pipes ■ Soil near highways and lead industries ■ Hobbies such as working with stained glass and target shooting ■ Lead-glazed ceramic ware ■ Some folk remedies
	ASBESTOS A natural mineral fiber used in various building materials.	■ Damaged or deteriorating ceiling, wall, and pipe insulation ■ Vinyl-asbestos floor material ■ Fireproof gaskets in heat shields, wood stoves, and furnaces ■ Acoustical materials

	HEALTH EFFECTS	CONTROL METHODS
	■ Lung cancer	■ Seal cracks and openings to the soil with caulk ■ Use sub-slab suction (active soil depressurization), drain-tile suction, or block-wall ventilation ■ Use basement pressurization ■ Cover exposed earth in basement or crawl space with heavy plastic air barrier ■ Use water filtration or aeration
	■ Allergic reactions and asthma ■ Headaches ■ Eye, nose, and throat irritation ■ Colds, flu, and pneumonia	■ Maintain relative humidity between 30 and 50 percent ■ Keep the home clean, control the source of irritants, and use air filters and cleaners ■ Empty and clean sources of standing water (humidifiers, dehumidifiers, and air conditioners) regularly with disinfectants according to manufacturers' instructions ■ Cover exposed earth in basement or crawl space with heavy plastic vapor barrier ■ Use exhaust fans that vent to the outside in bathrooms and kitchens ■ Ventilate crawl spaces and basements during warm weather
	■ Headaches ■ Shortness of breath and chest pain ■ Blurry vision ■ Nausea ■ Weakness, confusion, and fatigue ■ Death	■ Regularly inspect and maintain all fuel-burning equipment and appliances ■ Install combustion appliances in an area isolated from the home's living area ■ Use pilotless ignition on gas appliances ■ Direct-vent all combustion exhaust, including gas dryers, outside ■ Supply adequate outdoor make-up air for combustion ■ Inspect and clean flues and chimneys regularly ■ Never use a gas range for home heating ■ Never warm up a car in an attached garage
	■ Eye, nose, and throat irritation ■ Shortness of breath ■ Increased respiratory infections in children ■ Lung damage and chronic lung disease	■ Same as for carbon monoxide
	■ Eye, nose, and throat irritation ■ Increased susceptibility to respiratory infections, such as bronchitis ■ Emphysema ■ Lung cancer	■ Properly maintain, vent, and provide outdoor make-up air for combustion equipment and appliances ■ Keep the home clean ■ Control the source of irritants ■ Use air filters and cleaners ■ Use a kitchen exhaust fan vented to the outside when cooking
	■ Eye, nose, and throat irritation ■ Respiratory irritation (wheezing, coughing) ■ Bronchitis and pneumonia (particularly in children) ■ Emphysema, lung cancer, and heart disease	■ Remove the source — cigarette, cigar, and pipe smoking
	■ Allergic reactions ■ Eye, nose, and throat irritation ■ Headaches ■ Maybe cancer ■ (Note: sensitivity varies widely)	■ Remove the source ■ Avoid products that contain high levels of formaldehyde ■ Purchase low-emitting formaldehyde products ■ Coat exposed board products with vapor-barrier paints ■ Avoid high relative humidity
	■ Eye, nose, and throat irritation ■ Headaches ■ Loss of coordination ■ Confusion ■ Damage to liver, kidneys, and brain ■ Various types of cancer	■ Eliminate unnecessary chemicals from the indoor environment ■ Use less hazardous products and do not mix products ■ Buy chemicals in small quantities that will be used quickly ■ Store chemicals in a secure, well-ventilated area ■ Carefully read labels and follow directions for use ■ Use only in well-ventilated areas or outside ■ Air out freshly dry-cleaned clothes before wearing
	■ Damage to the brain, kidneys, and nervous system ■ Behavioral and learning problems ■ Slowed growth ■ Anemia ■ Hearing loss	■ Use only water from the cold water tap for drinking, cooking, or making baby formula and run tap until cold to the touch ■ Damp mop frequently ■ Wash children's hands and toys ■ Clean or remove shoes before entering to avoid tracking in lead from soil ■ Eat a healthy diet ■ Have your home inspected for lead-based paint ■ Get professional advice for renovation or remodeling activities
	■ Coughing, chest pain, and weakness ■ Asbestosis (scarring of lung tissue) ■ Cancers: lung, mesothelioma (cancer of chest lining or abdomen), and others	■ Do not use materials containing asbestos ■ If a material containing asbestos is damaged or needs repair, contact a certified asbestos abatement contractor ■ Do not dust, sweep, wrap, or vacuum materials suspected of containing asbestos

Where to go for Additional Information



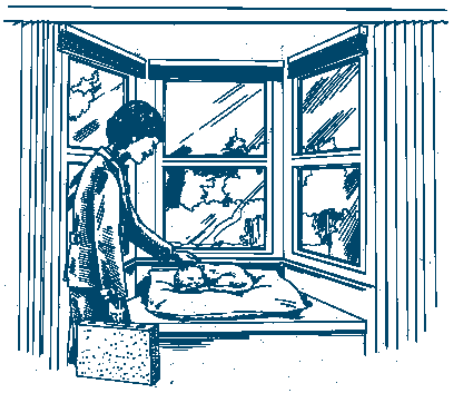
These State and federal agencies and private organizations can supply you with additional information.

New York State Department of Health (DOH)
Center for Environmental Health
2 University Place,
Albany, NY 12203-3399
1-800-458-1158

Indoor Air Quality Information Clearinghouse (IAQ INFO)
A service of the U.S. Environmental Protection Agency, Indoor Air Division
P. O. Box 37133,
Washington, DC 20013-7133
1-800-438-4318 (for general or technical indoor air quality information)

U. S. Consumer Product Safety Commission (CPSC)
Office of Hazards Analysis
4330 Eastwest Highway,
Bethesda, MD 20814
1-800-638-2772 (complaints about adverse reactions to or injuries from household chemicals)

American Lung Association of New York State (ALA)
8 Mountain View Avenue,
Albany, NY 12205
518-459-4197



General Indoor Air Quality

"Who to Contact for Help and Information about Environmental Health," January 1992, DOH.

"Glossary of Environmental Health Terms," October 1991, DOH.

"An Introduction to Toxic Substances," October 1991, DOH.

"A Guide to Reference Materials on Toxic Substances," October 1991, DOH.

"The Inside Story, A Guide to Indoor Air Quality," EPA/400/1-88/004, April 1995, IAQ INFO.

"Residential Air-Cleaning Devices - A Summary of Available Information," EPA 400/1-90-002, February 1990, IAQ INFO.

"Indoor Air Facts No. 7: Residential Air Cleaners," IAQ-0007, February 1990, IAQ INFO.

"Indoor Air Facts No. 8: Use and Care of Home Humidifiers," IAQ-0008, February 1991, IAQ INFO.

"Indoor Air Pollution Fact Sheet" on Household Products, 1986, ALA.

"Indoor Air Pollution Fact Sheet" on Ozone, 1992, ALA.

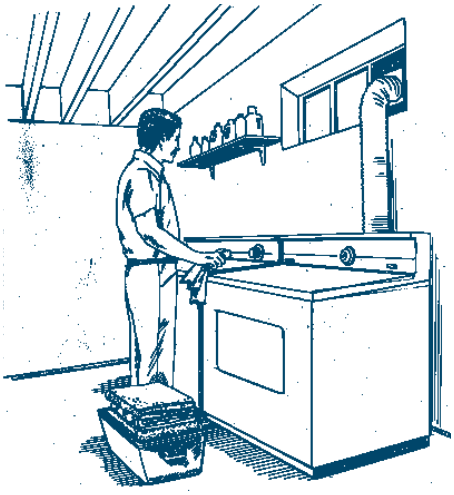
"Indoor Air Pollution Fact Sheet" on Carpets, 1992, ALA.

"Air Pollution in Your Home?" June 1990, ALA.

Book: "Household Hazards, A Guide to Detoxifying Your Home," published by the League of Women Voters of Albany County, 1988. (Available from NYS Department of Environmental Conservation, (518) 457-6072.)

Book: "Indoor Pollution," Steve Coffel and Karyn Feiden, Ballantine Books, New York, 1990.

Book: "Non-Toxic Home and Office," Debra Lynn Dadd, Jeremy P. Tarcher, Inc., Los Angeles.



Radon

"A Citizen's Guide To Radon (Second Edition), The Guide to Protecting Yourself and Your Family from Radon," 402-K92-001, May 1992, DOH.

"Consumer's Guide to Radon Reduction - How to Reduce Radon Levels in Your Home," 402-K92-003, August 1992, DOH.

"Home Buyers' and Sellers' Guide to Radon," EPA-402-R-93-003, DOH.

"Protocols for Radon and Radon Decay Product Measurements in Homes," EPA-402-R-92-003, DOH.

"National Radon Measurement Proficiency Program Report," EPA-402-R-93-006, DOH.

"National Radon Contractor Proficiency Program Report," EPA-402-R-93-005, DOH.

"Indoor Air Pollution Fact Sheet" on Radon, 1992, ALA.

Information about radon-testing equipment, radon testing, and radon-mitigation contractors is available from the New York State Department of Health (1-800-458-1158). Additional information can be obtained from EPA's Office of Radiation and Indoor Air on the Internet at http://www.epa.gov/radonpro or 1-800-962-4684.

Biological Agents

"Biological Pollutants in Your Home," January 1990, ALA.

"Indoor Air Pollution Fact Sheet" on Biological Agents, 1986, ALA.

Combustion Pollutants

"Indoor Air Pollution Fact Sheet" on Combustion Pollutants, 1986, ALA.

"CPSC Safety Alert on Carbon Monoxide Detectors," available from Carbon Monoxide Detectors, Washington, DC 20207.

The CPSC Hotline (1-800-638-2772) provides information on residential carbon monoxide detectors that meet Underwriters Laboratory Standard 2034.

Environmental Tobacco Smoke

"Respiratory Health Effects of Passive Smoking: Lung Cancer and Other Disorders," EPA/600/6-90/006F, December 1992, IAQ INFO.

"Respiratory Health Effects of Passive Smoking - Fact Sheet," January 1993, IAQ INFO.

"Reducing the Health Risks of Secondhand Smoke," 1992, ALA.

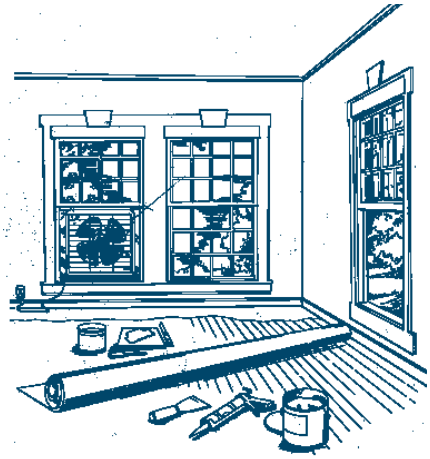
"Indoor Air Pollution Fact Sheet" on Secondhand Smoke, 1990, ALA.

Formaldehyde

"An Update on Formaldehyde," October 1990, CPSC.

"Tips for Purchasing and Installing New Carpet - Fact Sheet," October 1992, CPSC.

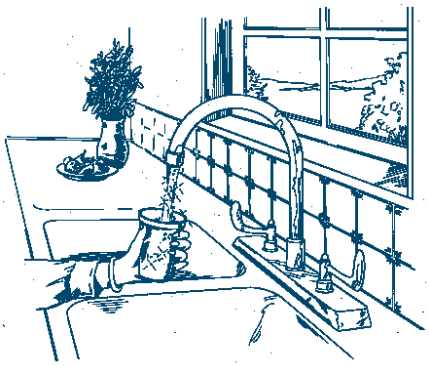
"Indoor Air Pollution Fact Sheet" on Formaldehyde, 1986, ALA.



Lead

"Get the Lead Out of Drinking Water," May 1995, DOH.

"What You Should Know About Lead-Based Paint in Your Home," September 1990, CPSC.



Asbestos

"Asbestos in Your Home," September 1990, ALA.

"Indoor Air Pollution Fact Sheet" on Asbestos, 1990, ALA.

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