

# RESIDENTIAL ENVIRONMENTAL HAZARDS: A GUIDE FOR HOMEOWNERS, HOMEBUYERS, LANDLORDS AND TENANTS

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CALIFORNIA ENVIRONMENTAL  
PROTECTION AGENCY



This independent research report was originally developed by M. B. Gilbert Associates, under contract with the California Department of Real Estate in cooperation with the California Department of Health Services. The 2002 edition was prepared by the California Environmental Protection Agency, Department of Toxic Substances Control, in cooperation with the U.S. Environmental Protection Agency and the California Department of Real Estate, and meets all State and Federal guidelines and lead disclosure requirements pursuant to the Residential Lead-Based Paint Hazard Reduction Act of 1992. The 2002 edition incorporates the Federal "Protect Your Family from Lead" pamphlet. This booklet is offered for information purposes only, not as a reflection of the position of the administration of the State of California.

# Introduction

The California Departments of Real Estate and Health Services originally prepared this booklet in response to the California legislative mandate (Chapter 969, Statutes of 1989, AB 983, Bane) to inform the homeowner and prospective homeowner about environmental hazards located on and affecting residential property.

The 2002 edition was prepared by the California Department of Toxic Substances Control, in cooperation with the California Department of Health Services' Childhood Lead Poisoning Prevention Program, Radon Program, and Division of Drinking Water and Environmental Management, in response to a 1994 legislative mandate (Chapter 264, Statutes of 1994, AB 2753, Sher). The 1994 legislation also requires this booklet to consolidate the California disclosure requirements (Ch. 969, Statutes of 1989) and the federal disclosure requirements (The Residential Lead-Based Paint Hazard Reduction Act of 1992).

The information contained in this booklet is an overview of environmental hazards which may be found on residential property and which may affect residential real estate. This booklet should be used only for general guidance. Although law requires the disclosure of known hazards, an environmental survey may be conducted to obtain further information. Homeowners, tenants and prospective homeowners may wish to obtain other literature for additional information on hazards of concern.

Disposal of hazardous wastes is an issue of concern to us all. In the interest of reducing the use of, and encouraging the proper disposal of, household hazardous wastes, a section on their storage and disposal is included. Sources of additional information and a list of government agencies are provided for further information.

This publication is designed to provide information about some environmental hazards that may be found on or in residential property. In California, sellers are required to disclose the presence of any known environmental hazard. A statement that the homeowner is unaware of environmental hazards is not a guarantee that the property is free of such hazards. It is in the homeowner's and prospective homeowner's interest to know what hazards are common, where they are found, and how they might be mitigated. This booklet will provide homeowners and prospective homeowners with the information and additional resources needed to make an informed decision about environmental hazards that may be present on a property.

This publication is not meant to be all-inclusive. It deals only with environmental hazards that frequently affect residential property. Because of the contribution of household hazardous wastes to the problem of hazardous waste disposal, a section on household hazardous products is included. In discussing health impacts of hazardous substances, lifetime exposure to low levels is emphasized because the resident is more likely to encounter this type of exposure than exposure to high levels of hazards for a short time.

Pursuant to AB 983, if this environmental hazards booklet is made available to homeowners or prospective homeowners, real estate licensees and home sellers are not required to provide additional information on such hazards. However, delivery of this publication to homeowners or prospective homeowners does not relieve home sellers and real estate licensees of the responsibility to disclose the existence of environmental hazards when such hazards are known to them.

The material is presented with the understanding that the publisher is not engaged in offering legal or other professional advice. If legal or other expert assistance is required, the services of a skilled professional should be obtained.

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# CHAPTER I

## ASBESTOS

### *What is Asbestos?*

Asbestos is a generic term which describes a group of diverse, naturally occurring, fibrous minerals. These minerals occur as bundles of strong, flexible fibers that are chemically inert, do not burn, and have good insulating properties.

### *Where is asbestos found in the home?*

Asbestos has been used in many products found in the home to provide insulation, strength, and fire protection. In 1989, the U.S. Environmental Protection Agency (U.S. EPA) announced a phased ban of asbestos products to be completed by 1996. The most common items in the home that may contain asbestos are:

- vinyl flooring;
- duct wrapping on heating and air conditioning systems;
- insulation on hot water pipes and boilers, especially in
- homes built from 1920 to 1972;
- some roofing, shingles, and siding;
- ceiling and wall insulation in some homes built or remodeled between 1945 and 1978, and;
- in sheet rock taping compounds and some ceiling materials.

Asbestos that has been sprayed on ceilings often has a spongy, “cottage cheese” appearance with irregular soft surfaces. Asbestos troweled on walls has a textured, firm appearance. The manufacturers can provide information on the asbestos content of home products. A Certified Asbestos Consultant can be hired to determine whether or not asbestos is present and to give advice about how to take care of it safely.

### *How is asbestos harmful?*

Intact or sealed (painted or taped over) asbestos is not harmful unless it becomes friable. Friable means the material can be easily crushed or pulverized to a powder by hand pressure. Friable materials have a higher potential to release fibers. Asbestos fibers that are released into the air and inhaled can accumulate in the lungs and pose a health risk. This risk can be divided into two general categories: 1) risk of asbestosis; and 2) increased risk of cancer. Most persons diagnosed with asbestosis have been exposed to asbestos in the work place. Therefore, this booklet focuses on the increased risk of cancer associated with asbestos exposure.

The U.S. EPA classifies asbestos as a known human carcinogen. If asbestos fibers are inhaled, the likelihood of contracting lung cancer or mesothelioma (cancer of the lining of the chest or abdomen) increases. As more asbestos is inhaled, the risk of developing cancer further increases. Smokers who are exposed to high levels of asbestos have a much greater risk of developing lung cancer than nonsmokers exposed to the same level. Symptoms of cancer may not develop until 10-40 years after the first exposure.

### *Is there a safe level of asbestos?*

In theory, inhalation of one fiber of asbestos can increase the risk of developing cancer. However, from a practical standpoint this statement is misleading since breathing ambient air in an urban area results in the inhalation of about 20,000 asbestos fibers per day. As a result of this exposure to asbestos in ambient air for a lifetime, it is estimated that

3-30 cases of lung cancer and 4-24 cases of mesothelioma will occur for every one million Americans. Those cancer cases are in addition to the numerous lung cancer cases due to other causes, particularly smoking. Obviously, inhalation of additional asbestos fibers increases the risk of developing lung cancer and unnecessary exposure should be avoided.

### *How can asbestos content in materials be determined?*

When asbestos is suspected to be present in building materials, it is important to have the materials tested by a qualified laboratory. Visual inspection alone is not enough to identify the presence of asbestos. However, such testing may not be warranted if the material is in good condition, in which case it is best to leave it in place. If the material is damaged, or will be disturbed during normal household activities or remodeling, it should be tested. A list of asbestos consultants certified by the California Department of Industrial Relations, Division of Occupational Safety and Health (Cal/OSHA), for evaluating building materials and recommending a course of action may be obtained on the Internet at [www.dir.ca.gov](http://www.dir.ca.gov) or by calling (916) 574-2993. The Certified Asbestos Consultant's role is to care for the interests of the homeowner. The Consultant is prohibited from any financial tie to a contractor if one is needed to perform removal. A list of asbestos contractors registered with Cal/OSHA for doing asbestos related work may be obtained by calling (415) 703-5190.

### *How should the homeowner repair or remove asbestos?*

Repair or removal of asbestos by the homeowner may be unwise if the damage is severe, since it may result in unnecessary exposure to airborne fibers. However, small repairs of pipe or duct insulation can be made with paint or duct tape. Other materials such as sprayed-on acoustical ceilings are not easily repaired by the homeowner. In cases where planned remodeling projects are expected to damage asbestos-containing materials, it is wise to hire a qualified contractor to remove the material. The homeowner should use the following guidelines in choosing a qualified contractor:

- Check to see if the contractor is licensed by the California Contractors State License Board and registered with the California Department of Industrial Relations, Division of Occupational Safety and Health (Cal/OSHA) for doing asbestos work.
- Be aware that some contractors may remove material incorrectly and still charge a substantial fee.
- Require references from the contractor and check them to see if the contractors work is satisfactory.
- Require the contractor to specify his safety procedures in writing.

The homeowner may expect to pay three times as much for the removal than if asbestos were not present. For a small job, the cost may be more than three times the normal cost, since it is expensive for a contractor to set up all the necessary safety equipment. Consider hiring a certified asbestos consultant to review safety procedures and oversee the performance of the contractor.

### *Does the law require mitigation?*

Asbestos mitigation is at the discretion of the homeowner. Even if the material contains asbestos, the homeowner may choose to leave it alone or, if necessary, repair it.

### *Hotlines:*

*\* For information concerning the identification and abatement of asbestos hazards in the home, and on the asbestos content of certain consumer products, call the EPA Asbestos Hotline at:*

**Telephone: (800) 368-5888**

**\* For technical assistance and information about the Toxic Substances Control Act (TSCA); regulations and programs administered under TSCA, including asbestos, lead-based paint and PCB's; and information on EPA's 33/60 voluntary pollution prevention program, contact the Toxic Substances Control Act Assistance Information Service (T.A.I.S.), Washington D.C. at:**

**Telephone: (202) 554-1404**

**Fax: (202) 554-5603**

**E-mail address: [tsca-hotline@epa.gov](mailto:tsca-hotline@epa.gov)**

**Also supplies a variety of documents, including Federal Register notices.**

### ***Publications:***

#### **\* *Asbestos in the Home***

This publication is available at no cost from:

American Lung Association  
Environmental Health Department  
909 12th Street  
Sacramento, CA 95814  
(800) LUNG-USA [(800) 586-4872]

#### **\* *The Inside Story - A Guide to Indoor Air Quality***

This publication is available at no cost from:

Indoor Air Quality Information Clearinghouse  
P.O. Box 37133  
Washington, D.C. 20013-7133  
Telephone: (800) 438-4318  
FAX: (202) 484-1510  
E-mail: [iaqinfo@aol.com](mailto:iaqinfo@aol.com)  
Web: [www.epa.gov/iaq/](http://www.epa.gov/iaq/)

#### **\* *List of Certified Asbestos Consultants***

This list is available on the Internet or by mail for \$8.00 from:

California Department of Industrial Relations  
Division of Occupational Safety and Health (Cal/OSHA)  
Asbestos Consultant Certification Unit  
2211 Park Towne Circle, Suite 1  
Sacramento, CA 95825  
Telephone: (916) 574-2993  
Web: [www.dir.ca.gov](http://www.dir.ca.gov)

**\* *List of Asbestos Abatement Contractors***

This list is available for \$25.00 from:

California Department of Industrial Relations  
Division of Occupational Safety and Health (Cal/OSHA)  
Asbestos Contractor Registration Unit  
455 Golden Gate Avenue, 10<sup>th</sup> Floor  
San Francisco, CA 94102  
Telephone: (415) 703-5190  
Web: [www.dir.ca.gov](http://www.dir.ca.gov)

**\* *What You Should Know Before You Hire a Contractor***

This publication is available at no cost from:

California Contractors State License Board  
9835 Goethe Road  
P.O. Box 26000  
Sacramento, CA 95827  
Telephone: (800) 321-2752  
(To receive publication, leave name and address on message phone.)

*Note: Telephone numbers and prices were correct at the date of publication of this booklet, but are subject to change.*

## CHAPTER II

### FORMALDEHYDE

#### *What is formaldehyde?*

Formaldehyde is a colorless, pungent gas that is soluble in water and most organic solvents. It is used as a raw material in the manufacture of paints, plastics, resins, photographic materials, and in building materials such as fiberboard and some foam insulation. Formaldehyde is found in the outdoor air at an average concentration of approximately 2.9 ppb.

#### *What levels of formaldehyde are found in the home?*

The average formaldehyde concentration inside California homes is 11 ppb for conventional homes and 45 ppb for manufactured homes. Formaldehyde concentrations have been measured as high as 40 ppb in conventional homes and 280 ppb in manufactured homes. Concentrations inside manufactured homes are higher due to the increased use of composite wood products.

#### *What are the sources of formaldehyde in the home?*

Formaldehyde is emitted from products in which formaldehyde has been used in their manufacture. These include composite wood products, urea-formaldehyde foam used in insulation, and curtain and upholstery textiles treated with formaldehyde resins for wrinkle resistance. Formaldehyde may also be emitted from gas stoves and kerosene heaters. Composite wood products are probably the most significant source of formaldehyde in the home.

#### *What are composite wood products?*

Plywood, particleboard, and oriented strandboard are Composite wood products that are bound together with formaldehyde-containing resins. The two most commonly used resins are urea-formaldehyde and phenol-formaldehyde. Composite wood products used within the home include:

- particleboard, used for subflooring, shelving, and in furniture;
- hardwood and plywood paneling, used in furniture and as a wall covering;
- medium density fiberboard, used as cabinet doors, table tops, furniture, and shelving; and,
- oriented strandboard and softwood plywood, for exterior use and subflooring; both are manufactured using phenol-formaldehyde resins.

#### *Why is formaldehyde emitted from these products?*

In the production of the resins, not all formaldehyde is bound as urea-formaldehyde or phenol-formaldehyde. Unbound or free formaldehyde can be released later as a gas from composite wood products. Formaldehyde emissions are highest from new products and decrease as the product ages. Emissions ordinarily decrease to undetectable levels over time. If properly manufactured, composite wood products that incorporate phenol-formaldehyde resins do not release significant amounts of formaldehyde. Urea-formaldehyde resins have higher emission rates than phenol-formaldehyde resins.

#### *Is urea-formaldehyde foam a significant source of formaldehyde in homes?*

Urea-formaldehyde foam insulation (UFFI) was installed in the wall cavities of some homes during the 1970's and has been used in the manufacture of mobile homes. The Consumer Product Safety Commission banned the use of UFFI in homes and schools in 1982. Although this ban has been removed by a Federal Court for procedural reasons, UFFI is not currently being installed in homes in California because of the insulation standards of the California Energy Commission. Implementation of these standards effectively prohibited the use of UFFI in homes in California after 1982. Formaldehyde emissions from UFFI decline with time. Thus, in homes where UFFI was installed prior to 1982, formaldehyde concentrations are generally comparable to those in homes without UFFI.

### *How is formaldehyde harmful?*

The Office of Environmental Health Hazard Assessment has concluded that exposures to formaldehyde can cause cancer in humans. Exposure to airborne formaldehyde may also cause non-cancer symptoms, such as irritation to the eyes, skin and respiratory tract, coughing, sore or burning throat, nausea and headaches. Reducing exposures to formaldehyde will reduce these health risks.

### *How can formaldehyde be detected and measured?*

Levels of formaldehyde can be measured by chemical analysis of air samples. In general, ambient air monitoring of formaldehyde is done on a 24-hour basis using standard analytical techniques and methods established by federal and state agencies. A useful indicator of the presence of indoor formaldehyde is knowledge of the formaldehyde content of products. This information can be obtained from the manufacturer.

### *Is there a safe level of formaldehyde?*

Most people experience eye and throat irritation when exposed to formaldehyde at levels above 0.1 ppm. Because people differ in their sensitivity to toxic effects, it is difficult to precisely define a concentration of formaldehyde that would be harmless to all people under all circumstances. Levels in the outside air may be considered as the safest and lowest levels that can practicably be achieved in the home. There are no safe levels for carcinogenic effects. The Office of Environmental Health Hazard Assessment has established an acute (94 ug/m<sup>3</sup>) and chronic (3 ug/m<sup>3</sup>) level to address the levels at which one might experience adverse non-cancer health effects.

### *What can be done to reduce indoor formaldehyde levels?*

Immediate measures include opening windows to increase ventilation and reducing the number of new composite wood products in a home. Where possible, replace composite wood products with products made from solid wood or non-wood materials. Formaldehyde emissions increase with increasing humidity and temperature. Therefore, reducing the temperature and humidity in the home will reduce formaldehyde levels. Where the source of formaldehyde is wood paneling or subflooring, these measures may not be adequate. In this case, removal of paneling and subflooring may be necessary. Local trade organizations and builder's associations may be helpful in finding a contractor to do this work.

## ***Publications:***

\* ***The Inside Story - A Guide to Indoor Air Quality***

\* ***An Update on Formaldehyde***

These publications are available at no cost from:

Indoor Air Quality Information Clearinghouse  
P.O. Box 37133  
Washington, D.C. 20013-7133  
Telephone: (800)438-4318  
FAX: (202)484-1510  
E-mail: [iaqinfo@aol.com](mailto:iaqinfo@aol.com)  
Web: [www.epa.gov/iaq/](http://www.epa.gov/iaq/)

\* ***A Consumers Guide to Manufactured Housing***

\* ***Manufactured Housing for Families***

These publications are available at no cost from:

California Department of Housing and Community Development  
Division of Administration  
P.O. Box 31  
Sacramento, CA 95812-0031  
Telephone: (916)445-3338  
Web: [www.hcd.ca.gov](http://www.hcd.ca.gov)

\* ***Formaldehyde in the Home-Indoor Air Quality Guideline #1 and Supplement – [www.arb.ca.gov/research/indoor/formald.htm](http://www.arb.ca.gov/research/indoor/formald.htm)***

\* **Determination of Formaldehyde and Toluene Diisocyanate Emissions from Indoor Residential Sources, Final Report to ARB, November 1996, Contract No. 93-315**

\* ***Final Report on the Identification of Formaldehyde as a Toxic Air Contaminant***

These publications are available at no cost from:

California Air Resources Board  
Research Division  
Indoor Exposure Assessment Section  
P.O. Box 806  
Sacramento, CA 95812-0806  
Telephone: (916) 322-8282 (For first two publications listed)  
Telephone: (916) 322-7072 (For third publication listed)  
Web: [www.arb.ca.gov](http://www.arb.ca.gov)

***Note: Telephone numbers and prices were correct at the date of publication of this booklet, but are subject to change.***

## CHAPTER III

### HAZARDOUS WASTES

#### *What are hazardous wastes?*

Hazardous waste means a waste that has the potential to harm human health or the environment. The characteristics that make a waste hazardous are that it may be toxic, corrosive, ignitable, or reactive. Many different industries such as oil and gas, petrochemical, electronics, and smaller businesses such as dry cleaners and print shops generate hazardous waste.

Following the generation of hazardous waste, most of it is treated where it was generated. The remainder is shipped to off-site facilities for treatment or storage. Disposal must be in a special type of landfill designed only for hazardous waste. Hazardous waste that is not properly managed may escape into the environment and contaminate soil or ground or surface water, or pollute the air. These hazardous waste releases can occur through leaking underground storage tanks, poorly contained landfills or ponds, hazardous waste spills, or illegal dumping directly on land.

#### *What is California doing to locate and clean up hazardous waste sites?*

The U.S. EPA has targeted about 1,200 sites nationwide for federal cleanup, with almost 100 identified in California. The federal “Superfund” law authorized U.S. EPA to supervise cleanup of the sites proposed under the Superfund program. California is investigating and overseeing the cleanup of hundreds of other sites under a state Superfund implemented by the California Department of Toxic Substances Control (DTSC). DTSC works jointly with U.S. EPA and other state agencies; such as the California Regional Water Quality Control Boards and local health departments, to effectively manage hazardous waste problems. The primary purpose of site cleanup and mitigation activities at hazardous waste sites is to reduce or eliminate the risks the sites pose to public health or the environment.

#### *How can the prospective homeowner determine whether a home is affected by a hazardous waste site?*

State law requires certain written disclosures to be made to prospective homeowners of real property. Under state law, a seller is required to disclose whether he or she is aware that the property has any environmental hazards such as asbestos, formaldehyde, radon, lead-based paint, fuel or chemical storage tanks, and/or contaminated soil or water. Additional information on real estate disclosure is described in the booklet “Disclosures in Real Property Transactions” available from the California Department of Real Estate (see Publications).

A prospective homeowner may also obtain information about hazardous waste sites in the vicinity of a home. There are several sources of information on the status and location of hazardous waste sites in California. The California Environmental Protection Agency (Cal EPA) Hazardous Material Data Management Program maintains the “Hazardous Waste and Substances Sites List”, popularly known as the “Cortese” list (see Publications). This list consolidates most of the lists of hazardous waste problem sites in California, including hazardous waste sites, contaminated wells, leaking underground storage tanks, and sanitary landfills from which there is a known migration of hazardous waste. The purpose of this list is to inform local agencies of these hazardous sites identified by the state. State law requires an applicant for a development project to consult the list and to submit a signed statement indicating whether the project is listed.

DTSC maintains a list of state and federal hazardous waste sites that are currently scheduled for mitigation called “The List of Active Sites”. The DTSC database of potential hazardous waste sites (Cal-Sites) contains information about 4,500 suspected and confirmed sites. A portion of these sites has been classified as needing no further action. All of the active sites on the Cortese list are reported pursuant to Govt. Code Section 65962.5. The addresses of many federal, state, and local agencies that manage hazardous waste programs are listed in Appendix A.

In addition to the information contained in this booklet, a homeowner or prospective homeowner may hire a registered environmental assessor to further investigate a known environmental hazard at a property. To obtain a list of registered environmental assessors, contact Cal-EPA, Office of Environmental Health Hazard Assessment (OEHHA), Registered Environmental Assessors Program, at (916) 324-6881.

### ***Hotlines:***

***\* For information on the federal Superfund program and the National Priorities List (NPL), contact the U.S. EPA RCRA, Superfund,-EPCRA hotline at:***

***Telephone: (800) 424-9346***

### ***Publications:***

***\* Disclosures in Real Property Transactions***

This publication is available for \$2.00 plus tax from:

California Department of Real Estate  
Book Orders  
Box 187006  
Sacramento, CA 95818-7006  
(Mail orders only; a self-addressed envelope is required.)

***\* Hazardous Waste and Substances Sites List (“Cortese” List)***

This list is available for \$50.00 from (below):

***\* List of Leaking Underground Storage Tanks***

This list is available for \$75.00 from:

California Department of Toxic Substances Control  
Office of Environmental Information Management (OEIM)  
P.O. Box 806  
Sacramento, CA 95812-0806  
Telephone: (916) 445-6532  
Web: [www.dtsc.ca.gov](http://www.dtsc.ca.gov)

**\* *List of Registered Environmental Assessors***

If hiring a Registered Environmental Assessor, this list is available at no cost. If using as a mailing list, this list is available in diskette form for \$6.25, and as a hard-copy printout for \$35.00 from:

California Environmental Protection Agency  
Office of Environmental Health Hazard Assessment  
Registered Environmental Assessor Program  
P.O. Box 806  
Sacramento, CA 95812-0806  
Telephone: (916) 324-6881

**\* *The Toxics Directory: References and Resources on the Health Effects of Toxic Substances***

This publication is available for \$9.90 from:

California Department of General Services  
Documents and Publications  
P.O. Box 1015  
North Highlands, CA 95660  
(Send written request with your name and street address. Make check out to Procurement Publications.)

**\* *Ensuring Safe Drinking Water (600M91012)***

This publication is available at no cost from:

U.S. Environmental Protection Agency  
Public Information Center  
401 M Street, SW  
Washington, D.C. 20468  
Telephone: (800) 490-9198

**\* *Consumer's Guide to California Drinking Water***

This publication is available for \$4.00 (plus 5% shipping charge, plus tax) from:

Local Government Commission  
1414 K Street, Suite #600  
Sacramento, CA 95814  
Telephone: (916) 448-1198 x307  
Web: [www.lgc.org](http://www.lgc.org)

**\* *Is Your Drinking Water Safe? (PB94-203387)***

This publication is available for \$19.50 plus \$4.00 shipping from:

National Technical Information Service  
5285 Port Royal Road  
Springfield, VA 22161  
Telephone: (800) 553-6847  
Web: [www.ntis.go](http://www.ntis.go)

# CHAPTER IV

## HOUSEHOLD HAZARDOUS WASTE

### *What is household hazardous waste?*

Although generation of hazardous wastes is associated with industrial processes, each year Californians discard tons of hazardous wastes in trash cans or down the drain. To determine whether a product is hazardous, ask these questions.

- Is it poisonous when ingested, touched, or inhaled?
- Does it ignite easily?
- Is it corrosive?
- Could it explode if it is improperly stored, spilled, or mixed with other products?

If the answer is “yes” to any question, then the product is hazardous. Generally, information about a product’s hazardous properties can be found on the container label. The words “caustic”, “flammable”, “toxic”, and “ignitable” indicate that the product is hazardous. Some products are hazardous in more than one way. For example, bleach is poisonous, and when mixed with ammonia-based cleaners releases hydrazine, a poisonous gas. Other examples of household products that are hazardous are listed below. In many cases, nonhazardous materials can be used instead.

Examples of household hazardous products are:

- cleaning products: ammonia, drain cleaners, rug cleaners, oven cleaners, metal polishes, and bleaches;
- garden supplies: weed and insect killers, rat poison, fertilizer, charcoal lighters, kerosene, and gasoline;
- automotive supplies: antifreeze, motor oil, gasoline, batteries and brake fluid, and
- paint supplies: paint, varnish, paint removers, glues, and waxes.

### *How should hazardous household products be stored?*

Safe storage of hazardous products requires a cool, dry and secure location. Places to store hazardous products include locked cupboards, locked drawers, or a high shelf out of the reach of children and pets. To prevent spillage during an earthquake, shelves should be firmly secured to the wall and have a restraining bar along the side. The following guidelines will help in the proper storage of household hazardous products.

- Sort the products into hazardous waste categories (i.e., poisonous, flammable, corrosive, and reactive) and store them as separate categories. For example, flammable products such as charcoal lighter and waste oil should be stored apart from corrosive products such as drain cleaner and acid batteries. It is important to store reactive products in separate locations.
- Thus, bleach and ammonia-based cleaners should be stored in separate cupboards so that, if a spill does occur, mixing and release of poisonous gas is avoided.
- Poisonous products should always be stored apart from other products.
- Where possible, products should be stored in the original container. Household hazardous products should not be transferred to a previously used container, in order to avoid reaction with incompatible products.
- Labels should be legible and securely affixed to the container.
- Containers should be tightly sealed and regularly inspected for deterioration. Where rust or leaking is observed, the deteriorating container should be placed inside a larger container and clearly labeled.

### *What is the best way to dispose of household hazardous waste?*

The best way to dispose of household hazardous wastes is to sort them into categories according to their hazardous properties and take them to the community household hazardous waste collection center. Unused supplies of hazardous products should not be disposed of by pouring them down the drain. In California, it is illegal to dispose of used oil and paints by pouring them down the drain, including the storm drain, onto land, or by burning. Waste motor oil, oil filters, antifreeze and used batteries can be recycled and should be taken to a recycling center. For information on recycling specific products or about household hazardous waste collection programs in your community, call 1-800-CLEANUP or visit the California Integrated Waste Management Board's web site at [www.ciwmb.ca.gov](http://www.ciwmb.ca.gov). Guidelines on developing a similar program are presented in the publication "Recommendations for Developing Household Hazardous Waste Collection Facilities." This publication can be obtained from CIWMB.

### **Hotlines:**

*\* For information on household hazardous waste and used oil collection and recycling centers, buy recycled information, the 3 R's (Reduce, Reuse and Recycle), as well as other environmental tips and events, contact the California Environmental Hotline at:*

**Telephone: 1-800-CLEANUP (1-800-253-2687)**

**Web Site: [www.1800cleanup.org](http://www.1800cleanup.org)**

*\* For information on recycling and collection centers and referrals for county and city agencies, call the California Integrated Waste Management Board at:*

**Telephone: (800) 553-2962**

*\* To report hazardous waste violations, call the California Department of Toxic Substances Control Waste Alert hotline at:*

**Telephone: (800)-69TOXIC [(800)-698-6942]**

*\* For general information on hazardous wastes, call the California Department of Toxic Substances Control (Sacramento Headquarters) at:*

**Telephone: (916) 324-1826**

### **Publications:**

*\* Household Products Management Wheel*

The above publication is available at a cost of \$4.95 each from:

Environmental Hazards Management Institute  
10 New Market Road  
P.O. Box 932  
Durham, NH 03824  
Telephone: (603) 868-1496  
FAX: (603) 868-1547

*Note: Telephone numbers and prices were correct at the date of publication of this booklet, but are subject to change.*

## **CHAPTER V**

## LEAD

### *How is lead harmful?*

Lead is a common environmental toxin that was used extensively in consumer products, such as paint and gasoline. Much of that lead remains in the California environment where people may become exposed. Children are commonly exposed to lead through normal hand-to-mouth behavior, which occurs as they explore their environment. When children crawl or play on the floor, put toys in their mouths, or suck on their fingers, they may ingest lead dust. This kind of daily, frequent exposure can result in lead poisoning. Some children eat paint chips, which can cause severe poisoning with irreversible health effects, including brain damage, mental retardation, convulsions, and even death. As lead poisoning can go undetected, it may result in behavior problems, reduced intelligence, anemia, and serious liver or kidney damage. Children under the age of six are particularly susceptible to lead poisoning.

Lead is also harmful to adults. Lead poisoning can cause reproductive problems (in both men and women), high blood pressure, digestive problems, nerve disorders, memory and concentration problems, and muscle and joint pain. Adult lead poisoning is most often the result of occupational exposure, or exposure following unsafe home renovation.

### *How can I protect my family from lead poisoning?*

The most important step you can take to protect your children is to have them tested for lead poisoning.

A simple blood test can measure levels of lead in the blood. All children age 5 and under should be tested. Family members who might have high levels of lead should also be tested.

Your doctor or health center can conduct this test. The test is covered by health insurance plans. Children from families with modest incomes can be tested at no cost through CHDP—the Child Health and Disability Prevention Program. The test is part of well-child checkups.

Poisoning is the result of contact with lead. The “treatment” begins with identifying the source of lead, and then removing or isolating it. Medical management depends on many factors, including the severity and duration of exposure. Adults and children with lead poisoning need regular testing to monitor levels of lead in the body.

### *Where is lead found in the home?*

Many houses and apartments built before 1978 have paint that contains lead. In 1978, the Consumer Product Safety Commission banned paint containing high levels of lead for residential use. If your home or apartment was built before 1978, you should assume it has lead paint.

**Lead-based paint** that is peeling, chipping, chalking, or cracking is a hazard and needs immediate attention. Lead-based paint may also pose a hazard on surfaces children can chew, or in areas with heavy wear. These areas include windows, window sills, doors and door frames, stairs, railings, banisters, porches, and fences. When painted surfaces bump or rub together they generate lead dust. Likewise, dry-scraping, sanding, or heating lead paint during repainting or remodeling also creates huge amounts of poisonous lead dust. This lead dust can poison your family.

**Soil** can become contaminated with lead from deteriorating exterior paint, and from leaded gasoline emissions. Lead in soil can be a hazard to children who play in bare soil. It can also contaminate the home when people bring soil into the house on their shoes.

**Other Sources:** Lead can be found in jobs such as battery repair or recycling, radiator repair, painting or remodeling, lead smelting, etc. Lead from the workplace poses a hazard for workers’ families. Workers can bring lead into their homes on their work clothes, shoes, and bodies without knowing it. Some hobbies use lead. These include ceramics,

stained glass, fishing weights, and bullet casting or firing. Lead can leech into food cooked, stored, or served in certain imported dishes or handmade pottery. Lead can be found in some home remedies such as Arzacon, Greta, Pay-loo-ah, Surma, Khali, and Kandou. These traditional medicines are very dangerous, and often contain large amounts of lead. Lead can be present in drinking water of older homes that have plumbing with lead or lead solder.

### *How can I check my home for lead hazards?*

To inspect your home for lead hazards, hire an individual or contractor who has been certified by the California Department of Health Services (CDHS). A CDHS-certified Inspector/Assessor will determine the lead content of every painted surface in your home and identify any sources of serious lead exposure (such as peeling paint and lead dust). The assessment should outline the actions to take to address these hazards.

A CDHS-certified Inspector/Assessor may use a variety of methods to assess lead hazards in your home. These include visual inspection of paint condition; laboratory tests of paint samples, surface dust tests, and/or a portable x-ray lead testing (fluorescence) machine.

You may have seen home lead test kits in your local hardware store. Recent studies suggest, however, that they are not always accurate. To protect your family's safety, do not rely on these kits. They are not always dependable.

### *How can I reduce lead hazards safely?*

If your house has lead hazards, you can take action to reduce your family's risk. First and foremost, if you have young children, be sure they are tested for lead. This is particularly important if you have recently renovated or remodeled your home.

Second, keep your home as clean and dust-free as possible. Clean floors, window frames, window sills and other surfaces weekly. Use a mop and regular detergent. Use paper towels to clean windows and window wells.

Wash children's hands often, especially before meals and bedtime. Keep play areas clean. Wash bottles, pacifiers, toys, and stuffed animals regularly. Feed your children nutritious meals with foods high in iron and calcium. Give children regular meals and snacks. Children with full stomachs and nutritious diets tend to absorb less lead.

### *How can I significantly reduce lead hazards?*

In addition to dust control and good nutrition, you can **temporarily** reduce lead hazards by repairing damaged painted surfaces and planting grass to cover soil with high lead levels. These actions are not permanent solutions and need ongoing attention.

To **permanently** remove lead hazards, you should hire a lead "abatement" contractor. Abatement methods include removing, sealing or enclosing lead-based paint with special materials. Simply painting over lead-based paint with regular paint is not enough. Hire an individual or contractor who has been certified by the CDHS. CDHS-certified individuals have the proper training to do this work safely. They have the proper equipment to clean up thoroughly. They will employ trained and certified workers. They will also follow strict safety rules set by the State and federal government. These safety measures will protect you and your family from lead hazards.

### *What are my responsibilities if I am selling, renting, or remodeling a home built before 1978?*

If you are planning to buy, rent, or renovate a home built before 1978, federal law requires sellers, landlords, and remodelers to disclose certain information prior to finalizing contracts.

**Landlords must:**

- 1) Disclose known information on lead-based paint hazards; and,
- 2) Give you a lead hazard pamphlet before leases take effect. Leases will also include a federal form about lead-based paint.

**Sellers must:**

- 1) Disclose known information on lead-based paint hazards; and,
- 2) Give you a lead hazard pamphlet before selling a house. Sales contracts will also include a federal form about lead-based paint. Buyers will have up to 10 days to check for lead hazards.

**Renovators must:**

- 1) Give you a lead hazard pamphlet before starting to work.

If you want more information on these requirements call the National Lead Information Clearinghouse at (800) 424-LEAD [(800) 424-5323].

### *What precautions should I take when remodeling my home?*

Before you begin any remodeling or renovations that will disturb painted surfaces (such as scraping or sanding paint, or tearing out walls) test the area for lead-based paint first. To fully protect your family from unsafe renovation hazards, hire a CDHS-certified individual or contractor.

Never use a dry scraper, belt-sander, propane torch, or heat gun to remove lead-based paint. These actions create large amounts of poisonous lead dust and fumes. This lead dust can remain in your home long after the work is done, and can make your family very sick. It is important to move your family (especially children and pregnant women) out of your home until the work is completed, and the area has been properly cleaned.

You can find out about other safety measures by calling (800) 424-LEAD [(800) 424-5323]. Ask for the brochure "Reducing Lead Hazards when Remodeling Your Home." This brochure explains what to do before, during, and after renovations.

### *What is the source of lead in water?*

The source of lead in water is most likely to be lead in water pipes, lead solder used on copper pipes, and some brass plumbing fixtures. Lead pipes are generally found only in homes built before 1930. The use of lead-based solder in plumbing applications in homes and buildings was banned in 1988. However, many homes built prior to 1988 may contain plumbing systems that use lead solder. The levels of lead in water from these homes are likely to be highest during the first five years after construction. After five years there can be sufficient mineral deposit, except where the water is soft, to form a coating inside the pipe; this coating prevents the lead from dissolving.

### *How can lead levels in water be determined?*

If lead contamination in drinking water is suspected, samples of water may be submitted to a laboratory certified by the CDHS. (For a list of certified laboratories, see Publications.) Consult with the laboratory on the proper procedures for sample taking.

Information on the corrosivity of household water, which may result in lead being leached from household plumbing, may be obtained from the water utility serving your area.

### *What level of lead is considered safe in drinking water?*

Historically, the standard for lead in drinking water was based on the level of lead in the source water being used by the water utility. This standard was 50 parts per billion. It was very rare for this level to be exceeded in source water since lead is only infrequently a contaminant in nature. A much more common source of lead in drinking water is the result of the lead being leached from household plumbing. Based on this fact, the U.S. EPA promulgated the federal Lead and Copper Rule that became effective on January 1, 1992. Unlike any other federal drinking water standard, this rule applies to the quality of water as it comes from the household tap rather than the quality of the water at the source. Public water systems are to take corrective action to control corrosion when it results in increases in lead (or copper) in the tap water due to the lead being leached from the household plumbing. The water system is to take such action when the concentration of lead in a first draw tap sample (collected after the water has stood unused for at least 6 hours) exceeds 15 parts per billion in a specified percentage of the homes designated as being most susceptible to corrosion of lead from household plumbing.

### *How can levels of lead in water be reduced?*

Lead levels can be reduced by removing lead piping or lead solder, by installing a home treatment system certified by the CDHS, or regularly flushing each tap before consuming the water. Another alternative for homeowners is to purchase bottled water. Home treatment methods that are effective in removing some or all lead in water include distillation and reverse osmosis. The cost for a home treatment system varies depending on the type of system and whether the system is designed for a single tap or the entire house. A more detailed discussion of home treatment systems is presented in, "Consumers Guide to California Drinking Water" (see Publications).

Where there are elevated lead levels in water, homeowners who choose not to install a treatment system or use bottled drinking water should flush each tap before the water is consumed. Water which has been standing in the water pipes for more than six hours should be flushed from the tap until the temperature changes and then about fifteen seconds more. Because lead is more soluble in hot water, the homeowner should not drink or prepare food using hot water from the tap. The flushed water should be saved and used for non-consumptive purposes such as washing clothes or watering plants.

#### ***Hotlines:***

***\* For more information on lead in drinking water and federal regulations about lead in drinking water, contact the U.S. EPA Safe Drinking Water Hotline in Washington, D.C. at:***

***Telephone: (800) 426-4791***

***\* For information on how to protect children from lead poisoning contact The National Lead Information Center at:***

***Telephone: (800) Lead-FYI [(800) 532-3394]***

***\* For other information on lead hazards, call The National Lead Information Center Clearinghouse at:***

***Telephone: (800) 424-LEAD [(800) 424-5323]***

***\* To request information on lead in consumer products, or to report an unsafe consumer product or a product-related injury, contact the Consumer Product Safety Commission at:***

**Telephone: (800) 638-2772**

**\* To request local lists of CDHS-certified inspectors or abatement workers contact the Lead-related Construction Hotline at:**

**Telephone: (800) 597-LEAD [(800) 597-5323]**

**\* To request a list of local county health department lead programs, or a list of certified labs, contact CDHS Childhood Lead Poisoning Prevention Branch at:**

**Telephone: (510) 450-2424**

### **Publications:**

**\* *List of Certified Laboratories to Perform Hazardous Waste Analysis***

This list is available at no cost from:

California Department of Health Services  
Environmental Laboratory Accreditation Program  
2151 Berkeley Way, Annex 2  
Berkeley, CA 94704  
Telephone: (510) 540-2800  
Web: [www.dhs.ca.gov/ps/ls/elap/elapindex.htm](http://www.dhs.ca.gov/ps/ls/elap/elapindex.htm)

**\* *Guidelines for the Evaluation and Control of Lead Based Paint Hazards in Housing***

This publication is available for \$45.00 from:

Department of Housing and Urban Development (HUD)  
Information Services, HUD User  
P.O. Box 6091  
Rockville, MD 20849  
Telephone: (800) 245-2691  
Web: [www.huduser.org](http://www.huduser.org)

**\* *Lead in your Drinking Water***

This publication is available at no cost from:

U.S. Environmental Protection Agency  
Public Information Center  
401 M. Street, SW  
Washington, D.C. 20460  
Telephone: (202) 260-2080

**\* *The Inside Story - A Guide to Indoor Air Quality***

This publication is available at no cost from:

Indoor Air Quality Information Clearinghouse  
P.O. Box 37133

Washington, D.C. 20013-7133  
Telephone: (800) 438-4318  
Web: [www.epa.gov/iaq/](http://www.epa.gov/iaq/)

**\* *Consumers Guide to California Drinking Water***

This publication is available for \$4.00 (plus 5% shipping charge, plus tax) from:

Local Government Commission  
1414 K Street, Suite #250  
Sacramento, CA 95814  
Telephone: (916) 448-1198 x 307  
Web: [www.lgc.org](http://www.lgc.org)

**\* *Lead Poisoning Prevention Wheel***

This publication is available for \$3.95 from:

Environmental Hazards Management Institute  
10 New Market Road  
P.O. Box 932  
Durham, NH 03824  
Telephone: (603) 868-1496

*Note: Telephone numbers and prices were correct at the date of publication of this booklet, but are subject to change.*

## CHAPTER VI

### MOLD

#### *What are molds?*

Molds are simple, microscopic organisms, present virtually everywhere, indoors and outdoors. Molds, along with mushrooms and yeasts, are fungi and are needed to break down dead material and recycle nutrients in the environment. For molds to grow and reproduce, they need only a food source – any organic material, such as leaves, wood, paper, or dirt— and moisture. Because molds grow by digesting the organic material, they gradually destroy whatever they grow on. Sometimes, new molds grow on old mold colonies. Mold growth on surfaces can often be seen in the form of discoloration, frequently green, gray, brown, or black but also white and other colors. Molds release countless tiny, lightweight spores, which travel through the air.

#### *How am I exposed to indoor molds?*

Everyone is exposed to some mold on a daily basis without evident harm. It is common to find mold spores in the air inside homes, and most of the airborne spores found indoors come from outdoor sources. Mold spores primarily cause health problems when they are present in large numbers and people inhale many of them. This occurs primarily when there is active mold growth within home, office or school where people live or work. People can also be exposed to mold by touching contaminated materials and by eating contaminated foods. Molds will grow and multiply whenever conditions are right—sufficient moisture is available and organic material is present. The following are common sources of indoor moisture that may lead to mold problems:

- Flooding
- Leaky roofs
- Sprinkler spray hitting the house
- Plumbing leaks
- Overflow from sinks or sewers
- Damp basement or crawl space
- Steam from shower or cooking
- Humidifiers
- Wet clothes drying indoors or clothes dryers exhausting indoors

Warping floors and discoloration of walls and ceilings can be indications of moisture problems. Condensation on windows or walls is also an important indication, **but it can sometimes be caused by an indoor combustion problem!** Have fuel-burning appliances routinely inspected by your local utility or a professional heating contractor.

#### *Should I be concerned about mold in my home?*

Yes, if indoor mold contamination is extensive, it can cause very high and persistent airborne spore exposures. Persons exposed to high spore levels can become sensitized and develop allergies to the mold or other health problems. Mold growth can damage your furnishings, such as carpets, sofas and cabinets. Clothes and shoes in damp closets can become soiled. In time, unchecked mold growth can cause serious damage to the structural elements in your home.

#### *What symptoms are commonly seen with mold exposure?*

Molds produce health effects through inflammation, allergy, or infection. Allergic reactions (often referred to as hay fever) are most common following mold exposure. Typical symptoms that mold-exposed persons report (alone or in

combination) include:

- Respiratory problems, such as wheezing, difficulty breathing, and shortness of breath
- Nasal and sinus congestion
- Eye irritation (burning, watery, or reddened eyes)
- Dry, hacking cough
- Nose or throat irritation
- Skin rashes or irritation

Headaches, memory problems, mood swings, nosebleeds, body aches and pains, and fevers are occasionally reported in mold cases, but their cause is not understood.

### *How much mold can make me sick?*

For some people, a relatively small number of mold spores can trigger an asthma attack or lead to other health problems. For other persons, symptoms may occur only when exposure levels are much higher. Nonetheless, indoor mold growth is unsanitary and undesirable. Basically, if you can see or smell mold inside your home, take steps to identify and eliminate the excess moisture and to cleanup and remove the mold.

### *Are some molds more hazardous than others?*

Allergic persons vary in their sensitivities to mold, both as to the amount and the types to which they react. In addition to their allergic properties, certain types of molds, such as *Stachybotrys chartarum*, may produce compounds that have toxic properties, which are called mycotoxins. Mycotoxins are not always produced, and whether a mold produces mycotoxins while growing in a building depends on what the mold is growing on, conditions such as temperature, pH, humidity or other unknown factors. When mycotoxins are present, they occur in both living and dead mold spores and may be present in materials that have become contaminated with molds. While *Stachybotrys* is growing, a wet slime layer covers its spores, preventing them from becoming airborne. However, when the mold dies and dries up, air currents or physical handling can cause spores to become airborne.

At present there is no environmental test to determine whether *Stachybotrys* growth found in buildings is producing toxins. There is also no blood or urine test that can establish if an individual has been exposed to *Stachybotrys chartarum* spores or its toxins.

### *How can I tell if I have mold in my house?*

You may suspect that you have mold if you see discolored patches or cottony or speckled growth on walls or furniture or if you smell an earthy or musty odor. You also may suspect mold contamination if mold-allergic individuals experience some of the symptoms listed above when in the house. Evidence of past or ongoing water damage should also trigger more thorough inspection. You may find mold growth underneath water-damaged surfaces or behind walls, floors or ceilings.

### *Should I test my home for mold?*

The California Department of Health Services does not recommend testing as a first step to determine if you have a mold problem. Reliable air sampling for mold can be expensive and requires expertise and equipment that is not available to the general public. Owners of individual private homes and apartments generally will need to pay a contractor to carry out such sampling, because insurance companies and public health agencies seldom provide this service. Mold inspection and cleanup is usually considered a housekeeping task that is the responsibility of homeowner or landlord, as are roof and plumbing repairs, house cleaning, and yard maintenance.

Another reason the health department does not recommend testing for mold contamination is that there are few available standards for judging what is an acceptable quantity of mold. In all locations, there is some level of airborne mold outdoors. If sampling is carried out in a home, an outdoor air sample also must be collected at the same time as the indoor samples, to provide a baseline measurement. Because individual susceptibility varies so greatly, sampling is at best a general guide.

The simplest way to deal with a suspicion of mold contamination is, if you can see or smell mold, you likely have a problem and should take the steps outlined below. Mold growth is likely to recur unless the source of moisture that is allowing mold to grow is removed and the contaminated area is cleaned.

### *Assessing the Size of a Mold Contamination Problem*

There will be a significant difference in the approach used for a small mold problem – total area affected is less than 10 ft<sup>2</sup> – and a large contamination problem – more than 100 ft<sup>2</sup>. In the case of a relatively small area, the homeowner using personal protective equipment can handle the cleanup. However, for much larger areas, choose an experienced, professional contractor. For medium cases, the type of containment and personal protection equipment to be used will be a matter of judgment.

### *General Cleanup Procedures*

- Identify and eliminate sources of moisture
- Identify and assess the magnitude and area of mold contamination
- Clean and dry moldy areas – use containment of affected areas
- Bag and dispose of all material that may have moldy residues, such as rags, paper, leaves, and debris.

Clean up should begin after the moisture source is fixed and excess water has been removed. Wear gloves when handling moldy materials. **Spores are more easily released when moldy materials dry out, so it is advisable to remove moldy items as soon as possible.** Detailed cleanup procedures are available in the California Department of Health Services Indoor Air Quality Section fact sheet entitled, “Mold in My Home: What Do I Do?” It is available on the Internet at [www.dhs-iaq.org](http://www.dhs-iaq.org) or by calling the (510) 540-2476.

### *How can I prevent indoor mold problems in my home?*

Inspect your home regularly for the indications and sources of indoor moisture and mold. Take steps to eliminate sources of water as quickly as possible. If a leak or flooding occurs, it is essential to act quickly:

- Stop the source of leak or flooding.
- Remove excess water with mops or wet vacuum.
- Move wet items to a dry, well ventilated area. Move rugs and pull up wet carpet as soon as possible.
- Open closet and cabinet doors and move furniture away from walls to increase circulation.
- Run portable fans to increase air circulation. Do NOT use the home’s central blower if flooding has occurred in it or in any of the ducts. Do NOT use fans if mold may have already started to grow — more than 48 hours since flooding.
- Run dehumidifiers and window air conditioners to lower humidity.
- Do NOT turn up the heat or use heaters in confined areas, as higher temperatures increase the rate of mold growth.
- If water has soaked inside the walls, it may be necessary to open wall cavities, remove baseboards, and/or pry open wall paneling.

### *Publications*

- *Mold in My Home: What Do I Do?*

This document is available on the Internet, or at no cost from:

California Department of Health Services  
Indoor Air Quality Section  
2151 Berkeley Way (EHLB), Berkeley, CA 94704  
Telephone: (510) 540-2476  
Web: [www.dhs-iaq.ca.gov](http://www.dhs-iaq.ca.gov)

- ***Health Effects of Toxin-Producing Molds in California***
- ***Stachybotrys chartarum (atra) — a mold that may be found in water-damaged homes***
- ***Fungi and Indoor Air Quality***
- ***Misinterpretation of Stachybotrys Serology***

These documents are available on the Internet, or at no cost from:

California Department of Health Services  
Environmental Health Investigation Branch  
1515 Clay Street, Suite 1700  
Oakland, CA 94612  
Telephone: (510) 622-4500  
Web: [www.dhs.ca.gov/ehib/](http://www.dhs.ca.gov/ehib/)

- ***General Information Molds, Toxic Molds, and Indoor Air Quality***  
*This document is available on the Internet at [www.cal-iaq.org/MOLD](http://www.cal-iaq.org/MOLD)*
- ***Biological Pollutants in Your Home***  
This document is available at no cost from:

U.S. Environmental Protection Agency  
IAQ Information Clearinghouse  
Telephone: (800) 438-4318  
Web: [www.epa.gov](http://www.epa.gov)

- ***Repairing Your Flooded Home***  
This publication is available on the Internet or at no cost from:

American Red Cross  
8928 Volunteer Lane, Sacramento, CA 95826  
Telephone: (916) 368-3131  
Web: [www.redcross.org](http://www.redcross.org)

***For local assistance, contact your county or city Department of Health, Housing, or Environmental Health.***

# CHAPTER VII

## RADON

### *What is radon?*

Radon is a naturally occurring chemically inert radioactive gas that is formed from radioactive decay of radium and uranium. Since radon cannot be seen, tasted, or smelled, special instruments are necessary for its detection. The unit of measurement for radon is picocuries per liter of air (pCi/L) .

### *Where is radon found?*

Radon is typically present in rocks containing uranium such as certain granites and shales. The amount of radon that can enter soils and ground water depends on the concentrations of uranium in the underlying rock. Radon can also be found in the air at very low concentrations. In California, outdoor levels of radon range from 0.1 to 0.5 pCi/L. Radon gas can also enter and concentrate in homes and buildings. In the United States, the average level indoors is 1.3 pCi/L, but radon levels have been found to range from 0.25 to over 3,000 pCi/L. Data from radon test conducted in California indicate that a relatively small percentage of homes have annual average radon levels at or above 4 pCi/L, the U.S. Environmental Protection Agency's guideline level. The California Department of Health Services (CDHS) conducts studies to identify the geographic areas of potential concern. For further information on geographical areas of potential concern call the CDHS's Radon Program at (916) 324-2208.

### *How is radon harmful?*

The U.S. EPA classifies radon as a known human carcinogen. Long-term exposure to high levels of radon may increase a person's risk of lung cancer. It is believed that tobacco smokers who are exposed to high radon levels account for a large percentage of the lung cancer deaths believed to be associated with radon exposure in the United States. Therefore, the risk is substantially less for nonsmoker.

Exposure to radon does not result in any immediate symptoms. For example, it does not result in acute respiratory effects such as colds or allergies. Any cancer resulting from inhaling radon is not likely to arise for at least 20-30 years after exposure begins and both the level of exposure and duration of exposure are factors which determine the risk of developing lung cancer.

### *How does radon enter the home?*

Radon enters the indoor air in the home from the soil through cracks and openings in concrete slabs, crawl spaces, floor drains, sumps, and the many tiny pores in hollow-wall concrete blocks. When the pressure within a home is lowered, more radon can be drawn from the soil and enter the home. Indoor air pressure may be lower during colder months when heated air rises from the floor level to the ceiling (or second story) level in the house. Indoor pressure may also be lowered in tightly sealed houses through use of exhaust fans such as those in many kitchens and bathrooms.

If radon is present in tap water, it can be released when water is used indoors for showering, washing dishes, or washing clothes. Radon is of most concern when water is obtained directly from a well that draws water from a source exposed to uranium and radium. Most of the radon in water obtained from a surface source, such as a reservoir or well water stored in an open tank, has been released before it reaches the home. Building materials are not a significant source of radon except where they incorporate rocks rich in radium or uranium. The use of these rocks (typically granite and shales) in construction of homes in California is rare.

### *Where are the highest levels of radon in the home?*

Generally, the living area closest to the soil surface has the highest level of radon. Upper stories have lower levels of radon. Consequently, radon is rarely a concern in high rise apartment buildings, other than at ground level.

### *Do adjacent houses have similar levels of radon?*

Because of the variability of the uranium and radium content of soil and differences in house construction and use, it cannot be assumed that houses in the same neighborhood have the same radon levels. In order to determine radon levels in any particular house, measurements must be made.

### *Is there a safe level of radon?*

Although there is consensus that the greater the exposure to radon the greater the risk of developing lung cancer, there is insufficient data to define a radon level which is harmless. Both the length of time during which radon is inhaled and the level of radon in the air are important in determining the risk of developing lung cancer. It is also believed that smoking may be a large contributing factor to lung disease associated with radon exposure.

### *How can radon levels be measured?*

Several types of passive radon detectors or active devices can measure the level of radon in a house. Passive detectors are devices left in place for a period of time that require no ongoing activity or power. To obtain accurate results, the homeowner should carefully follow the manufacturer's instructions. Although short-term measurements of radon levels are more convenient, health risk can be more accurately determined from measurements made over a year. Active devices require a source of power and are used by professional radon testers to monitor radon levels. These devices are usually used during real estate transactions.

### *Where can radon detectors be obtained?*

The CDHS publishes a list of those laboratories certified to provide test devices (radon services) in California. Those companies offering onsite testing or detection devices used by the homeowner are listed in the "List of Certified Providers of Radon Services" which may be obtained by calling CDHS Radon Program Hotline at (800) 745-745-7236 or at the Radon Program's website <http://www.dhs.ca.gov/ps/ddwem/environmental/radon/radon.htm>.

### *What actions are required to reduce indoor radon levels?*

The U.S. EPA and CDHS recommend that homeowners should attempt to reduce radon levels in any home that has an annual average level of radon at or above 4 pCi/L. The mitigation method chosen will depend on the construction of the house, extent of radon reduction required, and cost. After installing a mitigation system, it is recommended that radon levels be monitored at regular intervals to verify that the mitigation remains effective.

A qualified contractor should install the radon mitigation system unless the homeowner fully understands the principles of the mitigation system.

### *When should water be tested for radon?*

When indoor levels of radon are at or above 4 pCi/L, homeowners should consider a water test. If the water comes from a water system, information about the source of the water and any radon tests done on it can be obtained from the water company that supplies the water. For more information or assistance in interpreting test results, contact the

CDHS Division of Drinking Water and Environmental Management (see Appendix A).

If the water comes from a private well, the radon concentration may be measured by analyzing a water sample at a laboratory certified to test for radon in water. Homeowners should consult the CDHS radon program at (916) 324-2208 for guidance on the type of water analysis appropriate to the area and well type. It must be emphasized that the method of sample collection is critical. To obtain a list of certified laboratories, call the CDHS at (800) 745-7236.

### *How can levels of radon in water be reduced?*

Radon levels in water can be reduced by 99 percent by installation of a GAC (granular activated carbon unit) on the water line entering the house. (GAC units should be certified by the CDHS.) As radon accumulates in the GAC unit, the unit becomes radioactive as the radon decays. Thus, GAC units installed to remove radon in household water must be shielded or located in areas remote from the house to protect occupants from radiation. The GAC filters also require special handling during replacement and disposal. Aeration may also remove radon from water. This technique may be more costly but avoids the problem of radiation build up.

Selection of the proper water treatment technology depends primarily upon its removal efficiency (other contaminants in the water may adversely affect this), safety, initial costs, and operating and maintenance costs. Therefore, professional guidance is strongly advised.

### *Does the law require mitigation?*

Mitigation of radon is not required by law and is at the discretion of the homeowner.

### *Hotlines:*

***\* For information on how to purchase a radon detector (Certified Radon Measurement Laboratories), have someone test your home (California List of Certified Radon Testing and Consulting Specialists), to fix your home or for informational publications on radon, call the CDHS Radon Program Hotline at:***

***Telephone: (800) 745-7236.***

***Website: <http://www.dhs.ca.gov/ps/ddwem/environmental/radon/radon.htm>***

***\* For specific assistance, call the CDHS Radon Program at:***

***Telephone: (916) 324-2208***

### *Publications:*

***\* List of Certified Providers of Radon Services***

This publication is available by calling CDHS Radon Program Hotline at (800) 745-745-7236 or at <http://www.dhs.ca.gov/ps/ddwem/environmental/radon/radon.htm>.

***\* Radon in California***

***\* A Citizen's Guide to Radon***

***\* Homebuyers and Sellers Guide to Radon***

- \* ***How to Reduce Radon Levels in your Home***
- \* ***Model Standards for Radon in New Residential Buildings***

These publications can be downloaded at the EPA Indoor Air Quality website [www.epa.gov/iaq](http://www.epa.gov/iaq) or are available at no cost from:

California Department of Health Services  
Environmental Management Branch  
Radon Program  
601 N. 7th Street  
P.O. Box 942732  
Sacramento, CA 94234-7320  
Telephone: (800) 745-7236

- \* ***The Inside Story - A Guide to Indoor Air Quality***

This publication is available at no cost from:

Indoor Air Quality Information Clearinghouse  
P.O. Box 37133  
Washington, D.C. 20013-7133  
Telephone: (800) 438-4318  
FAX: (202) 484-1510  
E-mail: [iaqinfo@aol.com](mailto:iaqinfo@aol.com)  
Web: [www.epa.gov/iaq/](http://www.epa.gov/iaq/)

- \* ***The Radon Reference Manual (PB-88196654)***

This publication is available for \$35.00 (plus \$4.00 handling) from:

U.S. Department of Commerce  
National Technical Information Service  
5285 Port Royal Road  
Springfield, VA 22161  
Telephone: (800) 553-6847  
FAX: (703) 321-8547  
E-mail address: [orders@ntis.gov](mailto:orders@ntis.gov)  
Web: [www.htis.gov](http://www.htis.gov)

*Note: Telephone numbers and prices were correct at the date of publication of this booklet, but are subject to change.*

# APPENDIX A

## LIST OF FEDERAL AND STATE AGENCIES

*Contact information provided was correct as of the date of publication, but is subject to change.*

### FEDERAL AGENCIES

#### **U.S. Department of Housing and Urban Development (HUD)**

Office of Lead Hazard Control  
451 7th Street, Room B133, SW  
Washington, D.C. 20410  
Telephone: (202) 755-1785  
Web: [www.hud.org](http://www.hud.org)

*HUD helps people build and maintain communities of opportunity.*

#### **U.S. Environmental Protection Agency (US EPA)**

Public Information Center  
401 M Street, SW  
Washington, D.C. 20460  
Telephone: (202) 260-2080  
Web: [www.epa.gov](http://www.epa.gov)

*U.S. EPA is a regulatory agency responsible for implementing federal laws designed to protect our air, water, and land from past and future environmental hazards.*

#### **U.S. Environmental Protection Agency, Region IX**

75 Hawthorne Street  
San Francisco, CA 94105  
Telephone: (415) 744-1500

*The U.S. EPA San Francisco Regional Office (Region 9) is responsible for implementing environmental programs within the states of California, Arizona, Nevada, Hawaii and the Pacific Islands.*

### STATE AGENCIES

#### **California Air Resources Board**

Research Div. - Indoor Exposure Assessment Section  
1001 I Street  
Sacramento, CA 95814  
Telephone: (916) 323-1528  
[www.arb.ca.gov](http://www.arb.ca.gov)

*The Research Division allocates funds for research on air pollution and provides consumer publications.*

#### **California Contractor's State License Board**

9835 Goethe Road  
P.O. Box 26000  
Sacramento, CA 95827  
Telephone: (800) 321-2752  
Web Site: [www.contractorslicense.com](http://www.contractorslicense.com)

*This board is responsible for licensing contractors, including asbestos abatement.*

#### **California Department of Industrial Relations**

Division of Occupational Safety and Health (Cal/OSHA)  
Asbestos Consultant Certification Unit  
2211 Park Towne Circle, #1  
Sacramento, CA 95825  
Telephone: (916) 574-2993  
Web: [www.cdiss.ca.org](http://www.cdiss.ca.org)

*Cal/OSHA is the state equivalent to the Federal Occupational Safety and Health Administration (OSHA) and regulates protection of workers.*

#### **California Department of Health Services**

Call your local county health department listed in the front of the white pages or, on the Internet, visit [www.dhs.ca.gov](http://www.dhs.ca.gov)

#### **California Department of Health Services**

Childhood Lead Poisoning Prevention Program  
5801 Christie Avenue, Suite 600  
Emeryville, CA 94608  
Telephone: (510) 622-5000

*This unit provides information on lead toxicity and treatment of lead toxicity in children.*

#### **California Department of Health Services**

Environmental Management Branch  
Radon Program  
601 North 7th Street  
Sacramento, CA 94234-7320  
Telephone: (800) 745-7236

*This branch provides publications and information about radon hazards.*

**California Department of Health Services**

Environmental Lab Accreditation Program

1625 Shattuck Avenue

Berkeley, CA 94709

Telephone: (510) 540-2800

*This office may provide information about test procedures for analyzing environmental pollutants.*

**California Department of Health Services**

Div. of Drinking Water and Environmental Management

Drinking Water Technical Program Branch

Sacramento Headquarters

601 North 7th Street

P.O. Box 942732

Sacramento, CA 94234-7320

Telephone: (916) 323-6111

*This division collects and evaluates water quality information on drinking water in California and supervises the activities of all public water systems. It also provides assistance to local health departments, water purveyors, and the general public on issues related to water quality, water supply, and water treatment:*

**Northern California Section*****Sacramento District***

8455 Jackson Road, Room 120

Sacramento, CA 95826

Telephone: (916) 229-3126

***Lassen, Valley, Klamath & Shasta Districts***

415 Knollcrest Drive, Suite 110

Redding, CA 96002

Telephone: (916) 224-4800

**North Coastal Section*****San Francisco & Santa Clara Districts***

2151 Berkeley Way, Room 458

Berkeley, CA 94704

Telephone: (510) 540-2158

***Mendocino & Sonoma Districts***

50 D Street, Suite 200

Santa Rosa, CA 95404-4752

Telephone: (707) 576-2145

***Monterey District***

1 Lower Ragsdale, Bldg. 1, Suite 120

Monterey, CA 93940

Telephone: (831) 655-6939

**Central California Section*****Merced & Visalia Districts***

1040 East Herndon Avenue, Suite 205

Fresno, CA 93720-3158

Telephone: (559) 447-3300

***San Bernardino District***

464 West 4th Street, #437

San Bernardino, CA 92401

Telephone: (909) 383-4328

***Stockton District***

31 E. Channel Street, Room 270

Stockton, CA 95202

Telephone: (209) 948-7696

***Tehachapi District***

1200 Discovery Drive, Suite 100

Bakersfield, CA 993309

Telephone: (661) 335-7315

**South Coastal Section*****Los Angeles District & Metropolitan Districts***

1449 W. Temple Street, Room 202

Los Angeles, CA 90026

Telephone: (213) 580-5723

***San Diego & Riverside Districts***

1350 Front Street, Room 2050

San Diego, CA 92101

Telephone: (619) 525-4159

***Santa Ana District***

28 Civic Center Plaza, Room 325

Santa Ana, CA 92701

Telephone: (714) 558-4410

***Santa Barbara District***

1180 Eugenia Place, Suite 200

Carpinteria, CA 93013

Telephone: (805) 566-1326

**California Department of Toxic Substances Control**

1001 I Street

P.O. Box 806

Sacramento, CA 95812-0806

Telephone: (916) 324-1826

Web: [www.dtsc.ca.gov](http://www.dtsc.ca.gov)

*DTSC issues permits for treatment, storage, and disposal of hazardous wastes, inspects facilities, maintains a Superfund list and has a site clean-up program.*

## **Northern California Regional Offices**

### ***Sacramento Office***

8800 Cal Center Drive  
Sacramento, CA 95826-3268  
Telephone: (916) 255-3618

### ***Clovis Office***

1515 Tollhouse Road  
Clovis, CA 93611-0522  
Telephone: (559) 297-3901

### ***Berkeley Office***

700 Heinz Avenue, Suite #200  
Berkeley, CA 94710-2721  
Telephone: (510) 540-2122

## **Southern California Regional Offices**

### ***Glendale Office***

1011 North Grandview Avenue  
Glendale, CA 91201-2205  
Telephone: (818) 551-2830

### ***Cypress Office***

5796 Corporate Avenue  
Cypress, CA 90630-4732  
Telephone: (714) 484-5300

### ***San Diego Office***

2878 Camino Del Rio South, Suite 402  
San Diego, CA 92108-3847  
Telephone: (619) 278-3734

## **California Department of Housing and Community Development**

Division of Administration - Manufactured Housing  
P.O. Box 31  
Sacramento, CA 95812-0031  
Telephone: (916) 445-3338

*Administration of codes and statutes relating to mobile homes. It also allocates grants and loans for low-income housing, house rehabilitation, and disaster relief.*

## **Department of General Services**

Documents and Publications  
P.O. Box 1015  
North Highlands, CA 95660  
Telephone: (916) 928-4630

*Documents and publications are sold through this department by the various state agencies.*

## **California Department of Real Estate (DRE)**

### ***Fresno District Office***

Department of Real Estate  
2550 Mariposa, Room 3070  
Fresno, CA 93721  
Telephone: (559) 445-6153

### ***Oakland District Office***

Department of Real Estate  
1515 Clay Street, Room 702  
Oakland, CA 94612-1413  
Telephone: (510) 622-2552

### ***Los Angeles Executive Office***

Department of Real Estate  
320 W. 4th Street, Suite 350  
Los Angeles, CA 90013  
Telephone: (213) 620-2072

### ***San Diego District Office***

Department of Real Estate  
1350 Front Street, Room 3064  
San Diego, CA 92101  
Telephone: (619) 525-4356

### ***Sacramento Principal Office***

Department of Real Estate  
2201 Broadway  
P.O. Box 187000  
Sacramento, CA 95818-7000  
Telephone: (916) 227-0931

# APPENDIX B

## GLOSSARY OF TERMS

**AERATION:** A technique by which air is introduced into a liquid; bubbles and aerosols are generated and dissolved gases released. For example, water aerated by passing through a shower head will release dissolved radon gas.

**ACTIVATED CARBON:** A material made from burnt wood which is used to remove organic solutes, such as pesticides, and some inorganic solutes, such as chlorine, from water. Dissolved organic solutes are removed from the water by absorption onto the activated carbon. The activated carbon must be periodically replaced when it becomes saturated and unable to adsorb any more solute. Activated carbon is not effective in removing heavy metals, such as lead, and salts, which make water hard.

**ANNUAL AVERAGE LEVEL:** The average of measurements taken at different times over the period of one year or the level measured by a device left in place for a full year.

**CARCINOGEN:** A substance that causes cancer.

**CERTIFIED LABORATORY:** A laboratory that has demonstrated that it can meet the federal and state standards for accuracy and precision for a given analytical procedure.

**DISTILLATION:** As referenced in this booklet, distillation is a technique used to purify water by removal of inorganic contaminants such as salts through heating the solution and condensing the steam. The resultant distilled water has a reduced salt concentration. Distillation is not effective in removing pesticides and volatile organic contaminants such as chloroform and benzene.

**EXPOSURE:** Contact with an agent through inhalation, ingestion, or touching. For example, exposure to radon is primarily through inhalation; exposure to lead is primarily through ingestion.

**FILTRATION:** Purification of water by removing undissolved solids or sediment by passing the water through a filter or sieve. Filtration does not remove dissolved salts or organic contaminants.

**LEVEL:** Another term for concentration; also, the amount of a substance in a given volume of air, liquid or solid.

**LITER:** Metric unit of volume equivalent to 1.057 quarts of liquid. One gallon is equivalent to about 4 liters.

**MILLIGRAM:** A unit of weight. There are 1,000 milligrams in one gram and about 28 grams in one ounce.

**PARTS PER MILLION:** A unit of concentration. For example, air that contains 1 part per million formaldehyde contains 1.2 milligrams formaldehyde in 1 million milliliters air, i.e. 1,000 liters, air. Also water which contains 1 part per million lead contains 1 milligram lead in 1 million milligrams water, i.e., 1 kilogram, water. One part per million can be compared to one cent in ten thousand dollars.

**PASSIVE DETECTOR:** A measuring device that functions without any energy input or ongoing attention from the user. For example, use of a passive radon detector to measure radon requires only that the detector be left in place for a specified time.

**PICOCURIE:** A unit of amount used in measurement of radioactive substances. For example, five picocuries of radon are five trillionths of a curie and are equivalent to 11 radioactive radon atoms decaying every minute.

**RADIOACTIVE:** A term used to describe atoms that are unstable and break down or decay to form another kind of atom. For example, radium breaks down to form radon. In the process of decay some high-energy particles are emitted. The detection of these particles by special instruments indicates that a substance is radioactive. The high-energy particles and gamma rays are called radiation.

**REVERSE OSMOSIS:** A technology used to purify water by removing the salts from water. Osmosis involves the diffusion of water from a dilute to a concentrated solution across a semi-permeable membrane that allows only the passage of water. In reverse osmosis, water is forced through a semi-permeable membrane from a concentrated solution to a stream of purified water. For example, in the desalination of seawater, reverse osmosis is used to separate the salts from the water generating drinking water and a residue of salts.

**RISK:** In the context of this booklet, risk indicates the chance of developing a disease after exposure to an environmental hazard. Risk depends on the time period for which a person is exposed to a particular hazard and the level of the hazard.

**SOFT WATER:** Water that does not contain large amounts of dissolved minerals such as salts containing calcium or magnesium.

**SOLDER:** A metallic compound used to seal joints between pipes. Until recently, most solder contained about 50 percent lead. Lead solder is now banned for plumbing applications.

**TOXICITY:** The extent to which a material is toxic.