Combined Hazards Booklet

Residential Environmental Hazards(2011)

Protect Your Family From Lead in Your Home (2020)

Homeowner's Guide to Earthquake Safety (2020)

Home Energy Rating System Booklet (2011)

Home Buyer's & Seller's Guide to Radon (2018)

Wood Burning Handbook (2005)

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(2021)

CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

RESIDENTIAL ENVIRONMENTAL HAZARDS:

A Guide For Homeowners, Homebuyers, Landlords and Tenants

2011

This guide 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 2005 edition was prepared by the California Department of Toxic Substances Control, in cooperation with the California Air Resources Board and the California Department of Health Services, and meets all State and Federal guidelines and lead disclosure requirements pursuant to the Residential Lead-Based Paint Hazard Reduction Act of 1992. The 2005 edition incorporates the Federal "Protect Your Family from Lead" pamphlet. The 2011 update was developed by the California Department of Toxic Substances Control. This booklet is offered for information purposes only, not as a reflection of the position of the administration of the State of California.

Table of Contents

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 2005 edition was prepared by the California Department of Toxic Substances Control, in cooperation with the California Air Resources Board and 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 some environmental hazards which may be found on or in residential property and which may affect residential real estate. Since this booklet is not meant to be all inclusive, it 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.

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.

Because of the contribution of household hazardous wastes to the problem of hazardous waste disposal, a section on proper storage and disposal of 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. Sources of additional information and a list of government agencies are provided for further information.

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.

CHAPTER I ASBESTOS

What is Asbestos?

Asbestos is the name given to a number of naturally occurring fibrous silicate minerals that have been mined for their useful properties such as thermal insulation, chemical and thermal stability, and high tensile strength. The three common types of asbestos are chrysotile, amosite, and crocidolite. Chrysotile, also known as white asbestos and a member of the serpentine mineral group, is the most common. Asbestos can only be identified under a microscope.

Where is asbestos found in the home?

Asbestos has been used in many products found in the home that 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. However, in 1991, the U.S. Fifth Circuit Court of Appeals overturned and remanded the asbestos ban and phase-out rule to EPA. Today, most asbestos products can still be legally manufactured, although production of asbestos containing materials has decreased dramatically since the late 1970s. 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
- Some roofing shingles, and siding
- Vermiculite attic insulation
- Ceiling and wall insulation
- 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. Vermiculite attic insulation, found both in the attic between trusses and in-between walls, also has the potential to contain asbestos. Vermiculite attic insulation is a pebble-like, pour-in product and is usually light-brown or gold in color.

Manufacturers can provide information on the asbestos content of home products. A certified asbestos consultant can be hired to test building material and determine whether or not asbestos is present and to give advice about how to take care of it safely. Current asbestos bulk testing methods may be insufficient to determine the presence of asbestos in vermiculite attic insulation. For more information on vermiculite, see U.S. EPA’s Protect Your Family from Asbestos-Contaminated Vermiculite at www.epa.gov/asbestos/pubs/verm_questions.html.

How is asbestos harmful?

Intact or sealed (painted or taped over) asbestos is not harmful unless it becomes damaged and 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: risk of asbestosis (lung scarring); and increased risk of cancer.

The U.S. EPA classifies asbestos as a known human carcinogen. If asbestos fibers are inhaled, the chance of contracting lung cancer or mesothelioma (cancer of the lining of the chest or abdomen) increases. The more asbestos is inhaled, the greater risk of developing cancer. 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 to asbestos.

Is there a safe level of asbestos?

There is no safe level of asbestos exposure. The more asbestos fibers you inhale, the greater your risk of developing lung cancer and asbestos-related disease. Exposure to asbestos should always be avoided.

How can asbestos content in materials be determined?

When you suspect asbestos is 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. It is recommended that you contact a certified asbestos consultant to take samples of potential asbestos containing materials and have them tested by a qualified laboratory. A list of asbestos consultants who have been 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/Databases/doshacru/acruList.asp or by calling 510-286-7362 .

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. 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 contractor's work is satisfactory.
- Require the contractor to specify his safety procedures in writing.

The homeowner can expect to pay three times as much for a small removal job than a large one as it is expensive for a contractor to set up all the necessary safety equipment. You should consider hiring a certified asbestos consultant to review safety procedures and oversee the performance of the contractor.

Does the law require asbestos mitigation?

Asbestos mitigation is at the discretion of the homeowner. Even if material contains asbestos, the homeowner may choose to leave it alone or, if necessary, repair it. If the home owner chooses to do his or her own repairs, the home owner must comply with the law. The free Department of Toxic Substances Control fact sheet "Managing Asbestos Waste" is available on the DTSC Web site at www.dtsc.ca.gov/PublicationsForms/upload/OAD_FS_Asbestos1.pdf

What about naturally occurring asbestos that is found near the home?

Naturally Occurring Asbestos (NOA) includes six regulated naturally occurring minerals (actinolite, amosite, anthophyllite, chrysotile, crocidolite, and tremolite) and is commonly found in California within serpentine and other ultramafic rocks and soils of the Coastal Ranges, Klamath Mountains, and the Sierra Nevada Mountains. The California Geological Survey has produced a map that identifies areas more likely to contain NOA in California. The map may be found online at www.consrv.ca.gov/cgs/minerals/hazardous_minerals/asbestos/index.htm.

Asbestos fibers may be released into the air as a result of activities which disturb NOA-containing rock or soils. Development construction activities in areas that contain NOA may release asbestos. Also, driving on roads or driveways surfaced with asbestos containing gravel, such as serpentine, may release asbestos. The California Air Resources Board (ARB) has established Asbestos Airborne Toxic Control Measures (ATCMs) to regulate the surfacing of roads with asbestos-containing gravels and construction and grading activities in areas potentially containing asbestos. For more information about naturally occurring asbestos, go to www.arb.ca.gov/toxics/asbestos/asbestos.htm.

Hotlines:

For information on the identification and abatement of asbestos hazards in the home, and other information about asbestos visit the U.S. EPA Asbestos Web site at www.epa.gov/asbestos .

For technical assistance and information about:

- Toxic Substances Control Act (TSCA);
- Regulations and programs administered under TSCA, including asbestos, lead-based paint, and PCB's; and
- 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) 554-560
E-mail: tsca-hotline@epa.gov

Publications:
Indoor Air Quality Infosheet - Asbestos
This free publication is available from:

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

The Inside Story - A Guide to Indoor Air Quality
Asbestos in Your Home

These free publications are available from:

U.S. EPA 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
Web: www.epa.gov/iaq

Asbestos in the Home and Workplace

This list is available on the Internet from:
California Department of Health Services
Indoor Air Quality Program

http://www.cdph.ca.gov/programs/IAQ/Documents/IAQ_Asbestos_2000-03.pdf

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

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, 10th Floor
San Francisco, CA 94102
Telephone: (415) 703-5190
Web: www.dir.ca.gov

What You Should Know Before You Hire a Contractor

This free publication is available from:
California Contractors State License Board
9835 Goethe Road
P.O. Box 26000
Sacramento, CA 95827
Telephone: (800) 321-2752 (To receive the publication, leave your 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 CARBON MONOXIDE

What is carbon monoxide?

Carbon Monoxide (CO) is an odorless, colorless and tasteless gas. It is highly toxic to humans and animals in higher quantities.

Because it is impossible to see, taste or smell, breathing CO can incapacitate or kill you before you are aware it is present in your home. At lower concentrations, CO may produce flu-like symptoms, including headache, dizziness, disorientation, nausea and fatigue.

What are the sources of carbon monoxide in the home?

CO is the result of incomplete combustion of carbon fuels and is produced from both man-made and natural sources. Typical sources of CO in the home are:

- Unvented kerosene and gas space heaters
- Gas water heaters
- Improperly adjusted or maintained furnaces or boilers
- Wood stoves and fireplaces
- Gas stoves and ovens
- Gasoline powered equipment, such as generators
- Automobile exhaust
- Tobacco smoke

How is carbon monoxide harmful?

Following inhalation, CO combines with hemoglobin in the blood producing carboxyhemoglobin, which is ineffective in delivering oxygen to the body tissues. Carbon monoxide binds to other molecules such as myoglobin and mitochondrial cytochrome oxidase and may cause significant damage to the heart and central nervous system.

At low concentrations, CO exposure may result in fatigue in healthy individuals and chest pain in people with heart disease. At higher concentrations, CO may result in headache, nausea, dizziness, confusion, impaired vision, angina and reduced brain function, depending upon the concentration in air and length of exposure. Exposure to very high concentrations of CO can be fatal.

Breathing high levels of CO during pregnancy may result in miscarriage. Breathing moderate levels of CO during pregnancy can result in slower than normal mental development of your child. In animal studies, exposure to CO during pregnancy had

effects on birth weight, the heart, the central nervous system and development. Children with asthma may be more susceptible to respiratory effects following exposure to CO.

What levels of carbon monoxide are found in the home?

Typical levels in homes with no gas appliances range from 0.5 to 5 parts per million (ppm). Levels measured near properly adjusted gas appliances were between 5 and 15 ppm, while levels near poorly adjusted appliances can be 30 ppm or higher.

Is there a safe level of carbon monoxide?

No standards for CO have been adopted for indoor air. The National Ambient Air Quality Standards for outdoor air are 9 ppm for eight hours and 35 ppm for one hour. The State of California Air Resources Board (ARB) air quality standards for CO are 9 ppm for eight hours and 20 ppm for one hour. The State of California, Office of Environmental Health Hazard Assessment (OEHHA) established an acute, one hour exposure level of 23,000 micrograms per cubic meter of air ($\mu g/m^3$) or 20 ppm for CO. This exposure level was based on heart toxicity.

Can carbon monoxide be detected and measured?

California Senate Bill 183 (SB 183) will require owners of single family homes that have a fossil-fuel burning appliance, fireplace or attached garage to install a CO alarm(s) by July 1, 2011. CO detectors trigger an alarm based on accumulation of CO over time or continuous detection of CO.

What can be done to reduce exposure to carbon monoxide?

Always make sure that gas appliances are maintained and properly installed. Here are some common tips to reduce potential CO levels in your home:

- Make sure appliances that burn natural gas, kerosene or other fuels are properly installed and vented.
- Have all appliances maintained on a regular basis.
- Always follow the manufacturer's recommendations and instructions for installation of these devices.
- Do not use portable gas heaters in enclosed indoor settings.
- Do not let your car idle for long periods of time inside the garage.
- Install and use an exhaust fan vented to the outside over gas stoves.
- Make sure the flue is open when using your fireplace.
- Use properly sized wood stoves certified to meet emission standards.
- Most importantly, install carbon monoxide detectors throughout the home.

Links to Additional Information on Carbon Monoxide:

U.S. EPA, An Introduction to Indoor Air Quality (IAQ), Basic Information on Pollutants and Sources of Indoor Air Pollution, Carbon Monoxide,
www.epa.gov/iaq/co.html

OEHHA, Impacts of Criteria Air Pollutants on the Respiratory Health of Children
www.oehha.ca.gov/public_info/public/kids/pdf/balmes.pdf

USFA, DHS, Exposing an Invisible Killer: The Dangers of Carbon Monoxide
www.usfa.dhs.gov/citizens/co/fswy17.shtm

Centers for Disease Control and Prevention (CDC), Carbon Monoxide Poisoning Fact Sheet
www.cdc.gov/co/faqs.htm

Agency for Toxic Substances Disease Registry, CDC,ToxFAQs for Carbon Monoxide
www.atsdr.cdc.gov/toxfaqs/tf.asp?id=1163&tid=25

American Lung Association, Carbon Monoxide Indoors
www.lungusa.org/healthy-air/home/resources/carbon-monoxide-indoors.html

US Consumer Product Safety Commission (CPSC), Carbon Monoxide Questions and Answers
www.cpsc.gov/cpscpub/pubs/466.html

CHAPTER III 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 building materials, many consumer products, and some fabrics. Formaldehyde is found in the outdoor air at an average concentration of approximately 3 parts per billion (ppb) or 3.7 micrograms per cubic meter of air ($\mu g/m^3$).

How is formaldehyde harmful?

The Office of Environmental Health Hazard Assessment (OEHHA) has concluded that exposures to formaldehyde can cause cancer in humans. In 2004, the International Agency for Cancer Research upgraded formaldehyde to a Group I (known human) carcinogen, based on human epidemiology studies of nasopharyngeal cancer. Exposure to airborne formaldehyde may also cause other illnesses, such as irritation to the eyes, skin, and respiratory tract; coughing; sore or burning throat; nausea; and headaches. Formaldehyde may also worsen asthma or allergy symptoms in those with such pre-existing sensitivities. Reducing exposures to formaldehyde will reduce these health risks.

What levels of formaldehyde are found in the home?

The average formaldehyde concentration inside California homes is about 14 ppb (17 $\mu g/m^3$) in conventional homes and 37 ppb (45 $\mu g/m^3$)in manufactured homes. Formaldehyde concentrations have been measured at levels greater than 200 ppb (246 $\mu g/m^3$) in both manufactured and new conventional homes. However, concentrations inside manufactured homes are generally higher than those in conventional homes due to the increased use of composite wood products.

What are the sources of formaldehyde in the home?

Indoor sources are the major cause of exposures to formaldehyde because people spend most of their time indoors, and there are many indoor sources of formaldehyde that typically produce concentrations several times higher than outdoor levels. Composite wood products are probably the greatest source of formaldehyde in the home. Other sources include other building materials such as some paints, coatings, and wallpaper; some consumer products such as fingernail products; permanent pressed fabric such as clothing and draperies; and combustion sources such as cigarettes and gas appliances.

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 cabinetry, subflooring, shelving, and furniture Hardwood plywood - used in paneling, furniture, and as a wall covering
- Medium density fiberboard - used in cabinets, doors, table tops, furniture, and shelving
- Oriented strandboard and softwood plywood - used for exterior use and subflooring, which are manufactured using low-emitting phenol-formaldehyde resins

Why is formaldehyde emitted from these products?

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

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 1970s 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 a Federal Court subsequently removed this ban for procedural reasons, UFFI is not currently being installed in homes in California because it does not meet the insulation standards of the California Energy Commission. In homes where UFFI was installed prior to 1982, formaldehyde concentrations have declined with time to levels that are generally comparable to those in homes without UFFI.

How can formaldehyde be detected and measured?

Levels of formaldehyde can be measured by chemical analysis of air samples collected indoors. In general, ambient air monitoring of formaldehyde is done on a 24-hour or several day 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 or emissions of products. This information can usually be obtained from the manufacturer. In general, you do not need to measure formaldehyde levels if there are few or no materials in the building known to emit high levels of formaldehyde, because levels would then be expected to approach the lower outdoor levels. However, if known or suspected sources are extensively present and cannot be readily removed, it is wise to measure the levels of formaldehyde, to assure that levels are no greater than 7 ppb (9 $\mu g/m^3$).

Is there a safe level of formaldehyde?

Most people experience eye and throat irritation when exposed to formaldehyde at levels above 100 ppb (123 µg/m^3). 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 outdoor air may be considered as the lowest levels that can practicably be achieved in the home. OEHHA has established acute (55 ug/m3, or 44 ppb, one-hour average) and chronic (9 ug/m^3, or 7 ppb, long-term average) exposure levels to identify the levels at which sensitive individuals might experience adverse non-cancer health effects. For indoor environments, OEHHA has also identified 7 ppb as the eight hour average level that is protective against non-cancer effects for sensitive individuals. Because formaldehyde may cause cancer, and there is no known level that is absolutely risk free, the California Air Resources Board (ARB) recommends that indoor formaldehyde levels be reduced as much as possible.

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 such as bookcases 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 extensive cabinetry, these measures may not be adequate. In those cases, removal of the paneling or coating, or replacement of cabinets may be necessary. Local trade organizations and builders' associations may be helpful in finding a contractor to do this work. You can find additional suggestions for reducing indoor formaldehyde levels in the publications listed below.

Publications:

Formaldehyde in the Home-Indoor Air Quality Guideline #1, updated August 2004, www.arb.ca.gov/research/indoor/guidelines.htm

OEHHA, Appendix D. Individual Acute, 8-Hour, and Chronic Reference Exposure Level Summaries, December 2008, www.oehha.ca.gov/air/hot_spots/2008/AppendixD1_final.pdf#page=128

Determination of Formaldehyde and Toluene Diisocyanate Emissions from Indoor Residential Sources**,** www.arb.ca.gov/research/apr/past/indoor.htm **,** click on Toxic Air Contaminants, scroll down.

Final Report on the Identification of Formaldehyde as a Toxic Air Contaminant *- 1992.*

These free publications are available from:
California Air Resources Board, Research Division, Indoor Exposure Assessment Section
P.O. Box 2815
Sacramento, CA 95812
Telephone: (916) 322-8282 (For first two publications listed)
Telephone: (916) 322-7072 (For third publication listed)
Web: www.arb.ca.gov

The Inside Story - A Guide to Indoor Air Quality
An Update on Formaldehyde
These free publications are available 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
Web: www.epa.gov/iaq/

A Consumers Guide to Manufactured Housing
Manufactured Housing for Families
These free publications are available 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

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

CHAPTER IV HAZARDOUS WASTE

What is hazardous waste?

Hazardous waste is anything left over from a manufacturing process, chemical laboratory, or a commercial product that is dangerous and could hurt people, animals, or the environment. Many industries, such as oil and gas, petrochemical, electronics, dry cleaners, and print shops, generate hazardous waste.

When hazardous waste is properly managed it is shipped to special facilities for treatment, storage, disposal, or recycling. Hazardous waste that is not properly managed may escape into the environment and contaminate the soil, surface and ground water, or pollute the air. Some causes of hazardous waste releases are leaking underground storage tanks, poorly contained landfills or ponds, hazardous waste spills, or illegal dumping directly on land or water.

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 under the federal Superfund Program. Almost 100 of those sites are in California. California is overseeing the cleanup of hundreds of other sites under a state Superfund administered 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 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 if a home is affected by a hazardous waste site?

State law requires certain written disclosures to be made to prospective homeowners. The 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, or contaminated soil or water. You can find additional information on real estate disclosure “Disclosures in Real Property Transactions” available from the California Department of Real Estate. See Appendix A in this document for information on how to contact them.

A prospective homeowner may also get information about hazardous waste sites near a home by consulting the “Hazardous Waste and Substances Sites List” which is maintained by the California Environmental Protection Agency (CalEPA). The list is a comprehensive inventory of hazardous waste sites in California, including contaminated wells, leaking underground storage tanks, and sanitary landfills from which there is a known migration of hazardous waste. It also lists active federal and state hazardous waste sites scheduled for cleanup as well as potential hazardous waste sites.

Information on how you can get a copy of this list is at the end of this chapter. The addresses of federal and state agencies that manage hazardous waste programs are listed in Appendix A.

A homeowner or prospective homeowner may choose to hire a registered environmental assessor to investigate a known or suspected environmental hazard at a property. To obtain a list of registered environmental assessors, contact the Registered Environmental Assessor Program at:
P.O. Box 806
Sacramento, CA 95812-0806
Telephone: (916) 324-6881
FAX (916) 324-1379
Web: www.dtsc.ca.gov/rea/

Internet Resources:
You can learn more about the role of the Department of Toxic Substances Control in protecting Californians from hazardous waste by visiting its Web site at www.dtsc.ca.gov .
Department of Toxic Substances Control Envirostor Database can be accessed at http://www.envirostor.dtsc.ca.gov/public/.
The Federal database of potentially contaminated sites is available at www.epa.gov/superfund/sites/index.htm.
The Hazardous Waste and Substances Sites List (Cortese List) on the locations of hazardous materials release sites is at www.dtsc.ca.gov/database/Calsites/Cortese_List.cfm .
The List of Leaking Underground Storage Tanks is available on the Web at www.geotracker.waterboards.ca.gov.

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
P.O. Box 187006
Sacramento, CA 95818-7006 (Mail orders only; a self-addressed envelope is required.)
Web: http://www.dre.ca.gov/pdf_docs/re6.pdf

List of Registered Environmental Assessors

This list is free if you are hiring a registered environmental assessor. If you wish to use it as a mailing list, it is available on CD for $6.25 and as a hard-copy printout for $35.00. It's also available free on our Web site at:
www.dtsc.ca.gov/rea

Department of Toxic Substances Control
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 l015
North Highlands, CA 95660
(Send written request with your name and street address. Make your check out to *Procurement Publications*.)

Ensuring Safe Drinking Water (600M91012)
This free publication is available from:
U.S. Environmental Protection Agency
Public Information Center
1200 Pennsylvania Ave, N.W.
Washington, D.C. 20460
Telephone: (800) 490-9198

Consumer's Guide to California Drinking Water
This publication is available for $4.00 (plus 5% shipping charge and tax) from:
Local Government Commission
1414 K Street, Suite #600
Sacramento, CA 95814
Telephone: (916) 448-1198 x307
Web: 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.gov

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

CHAPTER V HOUSEHOLD HAZARDOUS WASTE

What is household hazardous waste?

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

- Is it poisonous when swallowed, touched, or inhaled?
- Does it catch fire easily?
- Is it corrosive? Can it eat through certain containers?
- Is it reactive? Could it explode if it is improperly stored, spilled, or mixed with other products?

If you answer yes to any these questions, then the product is hazardous. Information about whether a product is hazardous usually can be found on the container label. The words “caustic,” “flammable,” “toxic,” and “ignitable” mean that the product is hazardous.

Some products are hazardous on their own, but can become even more dangerous when they are mixed with other household products. For example, most people know that bleach is poisonous, but when it is mixed with ammonia-based cleaners it releases chlorine and hydrazine gases, both of which are extremely poisonous.

Some other hazardous household products are:

- Cleaning products containing ammonia
- Chlorine bleach and cleaning products containing it
- Drain cleaners
- Carpet cleaning products
- Oven cleaners
- Metal polishes
- Garden supplies such as weed and insect killers, rat poison, and fertilizer
- Charcoal lighter fluid, and kerosene
- Automotive supplies such as antifreeze, motor oil, gasoline, batteries and brake fluid
- Paint, varnish, paint removers, glues, and waxes
- Electronic products such as cathode ray tubes, televisions, computers, cell phones
- Universal wastes such as fluorescent lights, small batteries, and products containing mercury

How should hazardous household products be stored?

Hazardous products should be stored in a cool, dry, secure location. They should be stored in locked cupboards, locked drawers, or on a high shelf out of the reach of children and pets. To prevent hazardous products from spilling during an earthquake, shelves should be firmly secured to the wall and have a restraining bar along the side.

The following guidelines will help you properly store household hazardous products:

- Store poisonous products apart from other products.
- Sort products into hazardous waste categories of poisonous, flammable, corrosive, and reactive and store them separately. 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 a separate location.
- Store bleach and ammonia-based cleaners in separate cupboards, so that if there is a spill the products won't get mixed and release poisonous gas.
- Store products in their original containers.
- Make sure labels can be read and won't come off the container.
- Tightly seal containers and check them often to make sure they are not breaking down. If you notice a container is rusting or leaking, put it inside a larger container and label it clearly.

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

The best way to dispose of household hazardous waste is to take it to a community household hazardous waste collection center in your area.
You should never pour unused hazardous household products down the drain. That is illegal in California. It is also illegal to pour used oil and paints on land, down drains, including the storm drains, or to burn them. Waste motor oil, oil filters, antifreeze, and used batteries can be recycled. You should take them to a recycling center or a household hazardous waste collection center. For information about recycling specific products or about household hazardous waste collection programs in your community, call 1-800-CLEANUP or visit the
Department of Resources Recycling and Recovery (CalRecycle) Web site at http://www.calrecycle.ca.gov/. You can get additional information on household hazardous waste at www.earth911.org .

Hotlines:
For information on household hazardous waste and used oil collection and recycling centers, information on buying recycled products, the 3 R's - Reduce, Reuse and Recycle, and other environmental tips and events, contact the California Environmental Hotline at:

Telephone: 1-800-CLEANUP (1-800-253-2687)
Web Site: 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 at:
Telephone: (800) 61TOXIC [(800) 618-6942]

Publications:
Household Products Management Wheel
This product is available for $4.95 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 VI LEAD

How is lead harmful?

Lead is a common environmental toxin that has been used extensively in consumer products such as paint and gasoline. Much of that lead remains in the California environment where people may be exposed to it. Children under the age of six years are particularly at risk. They typically are exposed to lead through the normal hand-to mouth behavior that occurs as they explore their environment. Crawling or playing on the floor, and putting their fingers, toys, and other items in their mouths can expose a child to lead. Lead poisoning, which is often unrecognized, can result in health effects that are often irreversible, including brain damage, mental retardation, convulsions, and even death. If lead poisoning goes undetected, it may result in behavior problems, reduced intelligence, anemia, and serious liver or kidney damage.

Lead is also harmful to adults. Lead poisoning can cause reproductive problems in both men and women, high blood pressure, kidney disease, 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. If a pregnant woman is lead poisoned, the lead can pass into her baby's blood and poison the baby.

How can I find out if my family has lead poisoning?

The most important step you can take to protect your children is to prevent them from being exposed to lead. Most lead poisoning does not cause acute symptoms, so the only way to know if a person is lead poisoned is by testing the level of lead in his or her blood.

There are many ways a child can be exposed to lead. The law assumes that, at minimum, children are at risk if they are on publicly funded programs for low-income children or if they live in, or spend a lot of time in, a place built before 1978 that has peeling or chipped paint, or that has been recently renovated. These children must be tested for lead at age one and two years. Children below the age of six years, who were not tested at ages one or two, should receive make-up testing as soon as possible. If you have a job or a hobby where you may be exposed to lead, you should be tested regularly. If you are pregnant, ask your doctor about a lead test.

A physician can order this simple test. Some doctors and healthcare centers can perform the test in their offices. Under California law, it must be covered by health insurance plans. Children from families with modest incomes can be tested at no cost through the Child Health and Disability Prevention Program (CHDP). The test is a required part of well-child checkups. For more information on CHDP and to locate an office in your area visit their Web site at www.dhs.ca.gov/pcfh/cms/chdp.

Because lead poisoning is the result of contact with lead, the primary treatment is to identify the source of lead, and remove or isolate it. Further medical management may be necessary, depending on factors such as the severity and duration of exposure. Adults and children who become lead poisoned will 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, windowsills, doors and doorframes, 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 large amounts of lead dust. This dust can poison your family.

Soil may be contaminated with lead from leaded gasoline emissions and from deteriorating exterior paint. Lead in soil can be a hazard to children who play in the bare soil. It can also contaminate the home and floor dust when people track 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, and lead smelting. 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 also use lead. These include ceramics, stained glass, fishing weights, and bullet casting or firing. Lead can leach into food cooked, stored, or served in some imported dishes or handmade pottery. Some traditional remedies
such as Azarcon, Greta, Pay-loo-ah, Surma, Kohl, and Kandu contain large amounts of lead and present a serious danger. Imported candy, especially chili or tamarind candy or its packaging, is frequently lead contaminated. Lead has been found in painted toys and inexpensive costume jewelry, particularly imported items. Older water systems may have pipes containing lead or pipes with lead solder.

How can I check my home for lead hazards?

To inspect your home for lead hazards, hire an individual who has been certified by the California Department of Public Health (CDPH). CDPH certification is now required for all those doing lead hazard evaluations, lead abatement plan preparation, lead abatement work and lead clearance inspections for residential and public buildings in California (Title 17, CCR § 35001-35050 and § 36000-36100). A CDPH-certified

inspector/assessor can determine the lead content of painted surfaces in your home and identify sources of lead exposure such as peeling paint, lead contaminated soil, or lead-contaminated dust. The assessment should outline the actions to take to address these hazards.

A CDPH-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, dust and soil samples; and a portable x-ray fluorescence lead testing (XRF) machine.

You may have seen home lead test kits in your local hardware store. Recent studies suggest, however, that they are not accurate for testing paint, soil, or dust. They may be used, however, to test pottery and ceramics for the presence of lead.

How can I reduce lead hazards safely?

If your house has lead hazards, you can take action to reduce your family's risk. Most importantly, if you have young children, be sure they receive a blood lead test. This is particularly critical if you live in a unit that has been recently renovated or have remodeled your home.

Second, keep your home as clean and free of dust and deteriorated paint chips as possible. Clean floors, window frames, windowsills, and other horizontal surfaces weekly. Use a mop, sponge, or disposable cloths with a solution of water and an all-purpose cleaner. Rinse out mops and sponges thoroughly after use. Use doormats or remove shoes before entering your home to avoid tracking in lead from bare soil. Have children play in grassy or landscaped areas instead of bare soil.

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 that include 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 regular cleaning and good nutrition, you can **temporarily** reduce lead hazards by repairing damaged painted surfaces and planting grass or using landscaping materials 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 a permanent solution. Hire an individual who has been certified by the CDPH as a Supervisor. CDPH-certified Supervisors and Workers have the proper training to do this

work safely. They have the proper equipment to clean up thoroughly. They will also follow strict safety rules set by the state and federal governments.

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. To fully protect your family from unsafe renovation hazards, hire a CDPH-certified Supervisor.

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 the 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. However, recently, new chemical agents being used in some water systems have been associated with increased corrosion and have resulted in increased levels of lead in water.

How can lead levels in water be determined?

If you suspect lead contamination in drinking water, you may submit water samples to a laboratory certified by the CDPH. For a list of certified laboratories, see Publications at the end of this chapter. Consult with the laboratory on the proper procedures for sample taking. Information on the possibility of lead contamination in your municipal water supply may be obtained from the water utility serving your area.

How can levels of lead in water be reduced?

Lead levels in water can be reduced by removing lead piping or lead solder, by installing a home treatment system certified by the CDPH, or regularly flushing each tap before consuming the water. Another alternative for homeowners is to purchase bottled water. A 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, for about 15 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 other purposes, such as washing clothes or watering plants.

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:

- Disclose known information on lead-based paint hazards.
- Give you a lead hazard pamphlet before leases take effect. Leases must also include a federal form about lead-based paint.

Sellers must:

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

Renovators must:

- 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].

Hotlines:
For more information on lead in drinking water and information on 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 CDPH-certified inspectors or abatement workers, contact the Lead-related Construction Hotline at:
Telephone: (800) 597-LEAD [(800) 597-5323] or visit the CDPH Web site at www.cdph.ca.gov

To obtain additional information on lead poisoning, or a list of local county lead programs, contact the CDPH Childhood Lead Poisoning Prevention Branch at:
Telephone: (510) 620-5600 or visit the CDPH Web site at www.cdph.ca.gov/programs/CLPPB.

Publications:
List of Certified Laboratories to Perform Hazardous Waste Analysis
This free list is available from:
California Department of Health Services
Environmental Laboratory Accreditation Program
850 Marina Bay Parkway, Ste. G365/EHL
Richmond, CA 94804
Telephone: (510) 620-2800
Web: www.cdph.ca.gov/certlic/labs/Documents/ELAPLablist.xls

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

Lead in your Drinking Water
This publication is available from:

U.S. Environmental Protection Agency
Public Information Center
1200 Pennsylvania Ave., N.W.
Washington, D.C. 20460
Telephone: (202) 272-0167

The Inside Story - A Guide to Indoor Air Quality
This free publication is available from:
Indoor Air Quality Information Clearinghouse
P.O. Box 37133
Washington, D.C. 20013-7133
Telephone: (800) 438-4318
Web: www.epa.gov/iaq/

Consumers Guide to California Drinking Water
This publication is available for $4.00 (plus 5 percent shipping charge, and tax) from:
Local Government Commission
1414 K Street, Suite #250
Sacramento, CA 95814
Telephone: (916) 448-1198 x 307
Web: 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 VII 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 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 easily through the air.

How am I exposed to indoor molds?

Everyone is exposed to some mold on a daily basis without evident harm. There are usually mold spores in the air inside homes. Most indoor mold spores come from outdoors by blowing through open windows or being tracked into homes as dust on shoes. Mold spores primarily cause health problems when they are present in large numbers and people inhale high concentrations of spores in air This can occur when there is active mold growth in a home, office, or school where people live or work. People can also be exposed to mold by touching moldy materials and by eating contaminated foods. Molds will grow and multiply whenever conditions are right, that is when sufficient moisture is available and organic material is present. The most important factor allowing mold to grow is dampness or moisture accumulation in the home. 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, showers, bathtubs, or sewers
- Damp basement or crawl space
- Steam from bathing, doing laundry, or cooking
- Humidifier use
- Wet clothes drying indoors or clothes dryers exhausting hot, humid air 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 growth 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 also 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 structure of your home.

What symptoms are commonly seen with mold exposure?

Exposure to large amounts of mold can cause health effects through inflammation, allergic response, or, rarely, infection. Allergic reactions, often referred to as hay fever, are the most common health problems reported following mold exposure. Typical symptoms that mold-exposed persons report, alone or in combination, include:

- Breathing problems, such as wheezing, difficulty breathing, and shortness of breath
- Nose or sinus congestion (stuffy feeling, sinus headache)
- Eye irritation (burning, watery, or reddened eyes)
- Dry, hacking cough
- Nose or throat irritation (runny nose, sneezing, sore throat)
- Skin rashes or red, itchy skin

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, encountering even 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 have different levels of sensitivity to molds, both as to the amount and the types that cause them to feel ill. In addition to being able to cause allergies, 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 as well as environmental conditions such as temperature, humidity, and other unknown factors. When mycotoxins are present, they occur in both living and

dead mold spores and may be present in materials into which mold has grown. While *Stachybotrys chartarum* and some other types of molds are growing, a wet slime layer covers the 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 readily available, inexpensive test to determine if a mold growing in a building is producing toxins. A limited number of specialized laboratories can test for mycotoxins in dust or building materials such as gypsum wallboard. These tests are very expensive and the results are not helpful in determining if there is an additional health risk from mycotoxins. There are also no blood or urine tests that a physician can use to determine if an individual has been exposed to the spores of a toxin-producing fungus or its mycotoxins.

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 earlier when in the house. Evidence of past or ongoing water damage should also trigger a 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 Public Health (CDPH) does not recommend testing as a first step to determine if you have a mold problem. Reliable air testing for mold can be expensive and requires experience and equipment that is not available to most people. Owners of individual private homes and apartments generally will need to pay a contractor to do such testing, 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 the homeowner or landlord, as are roof and plumbing repairs, house cleaning, and yard maintenance.

Another reason the CDPH does not recommend testing for mold is that there are few available standards for judging what is an acceptable amount of mold. In all locations, there is some level of airborne mold outdoors. If air testing is carried out in a home, an outdoor air sample also must be collected at the same time, to allow comparison of indoor and outdoor spore types and numbers. Because some people are much more sensitive to mold spores than are other people, mold testing 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 cleaning recommendations for a small mold problem – total area of visible mold growth is less than 10 square feet – and a large mold problem – more than 100 square feet. In the case of a relatively small area, the homeowner using personal protective equipment, such as a dust mask, safety goggles, and household gloves, can handle the cleanup. However, for larger areas, choose an experienced, professional contractor.

General Cleanup Procedures

- Find and remove sources of moisture
- Find and determine the extent and area of visible mold growth
- Clean and dry moldy areas – do not allow dust from the moldy areas to get into the rest of the home
- 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.cdph.ca.gov/programs/IAQ/Documents/MIMH_2006-06_2009-03rev6p.doc or by calling (510) 620-2874.

How can I prevent indoor mold problems in my home?

Inspect your home regularly for signs 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 so that wet materials can dry within 48 hours:

- Stop the source of the 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, or if it has been more than 48 hours since the 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 may increase the rate of mold growth.

- If water has soaked inside the walls, it may be necessary to open wall cavities by removing the baseboards and drilling a hole through the bottom of the wet wall, or by prying away wall paneling.

Publications:

Mold in My Home: What Do I Do?
This free document is available from:
California Department of Public Health
Indoor Air Quality Section
850 Marina Bay Parkway, G365 EHLB
Richmond, CA 94804
Telephone: (510) 620-2874
Web: www.cdph.ca.gov/programs/IAQ/Documents/MIMH_2006-06_2009-03rev6p.doc

Numerous mold-related articles and documents are available from:
California Department of Public Health
Environmental Health Investigation Branch
850 Marina Bay Parkway
Building P, 3rd floor
Richmond, CA 94804-6403
Web: www.ehib.org/search.jsp?ss=mold&google=on

Mold Remediation in Schools and Commercial Buildings
A Brief Guide to Mold, Moisture, and Your Home
These free documents are available from:
U.S. Environmental Protection Agency
IAQ Information Clearinghouse
Telephone: (800) 438-4318
Web: www.epa.gov/mold/moldresources.html

Repairing Your Flooded Home
This free publication is available from:
American Red Cross
8928 Volunteer Lane, Sacramento, CA 95826
Telephone: (916) 368-3131
Web: www.redcross.org

For local assistance, contact your county or city Department of Health, Housing, or Environmental Health. Phone numbers for these agencies are located in the blue government pages at the front of your local telephone directory.

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

CHAPTER VIII RADON

What is radon?

Radon is a naturally occurring colorless, tasteless, and odorless radioactive gas that comes from the decay of uranium found in nearly all soils. It enters buildings from the ground 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.

Once inside a building, radon can become trapped. Unless the building is properly ventilated to remove it, the gas can become a health hazard.

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 groundwater depends on the concentrations of uranium in the underlying rock. Radon can also be found in the air at very low concentrations.

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 such as granite and shales.

Why is radon harmful?

Long-term exposure to elevated levels of radon can increase your risk of getting lung cancer. Tobacco smokers are at an even greater risk. Radon levels vary throughout the country. The amount of radon entering homes varies from home to home. Because radon is colorless, odorless, and tasteless, testing is the only way to find out if you and your family are at risk from it.

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.

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 the amount of uranium and radium in the soil varies, and because houses are constructed and used in different ways, houses in the same neighborhood will have different radon levels.

Is there a safe level of radon?

We know that the greater the exposure to radon, the greater the risk of developing lung cancer. But we do not know if there is a radon level that is harmless. Both the duration of exposure and the level of radon in the air are important in determining the risk of developing lung cancer. Smoking may be a large contributing factor to lung disease associated with radon exposure. Currently, the California Department of Public Health (CDPH) recommends that you take action to reduce radon levels in your house if the annual average indoor air concentration exceeds 4 picocuries per liter (pCi/L).

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 I get a radon detector?

The CDPH Radon Program is now offering short term test kits for $7.00 for California residents. CDPH has contracted with Alpha Energy Laboratories (DrHomeAir) to provide this service. The test kit can be ordered on-line at www.drhomeair.com/ . The CDPH Radon Program maintains lists of currently certified testers, mitigators and laboratories at www.cdph.ca.gov/HealthInfo/environhealth/Pages/RadonServiceProviders.aspx This list of certified radon providers can also be obtained by calling the CDPH Radon Program Hotline at (800) 745-7236.

What must be done to reduce indoor radon levels?

The U.S. EPA and CDPH recommend that homeowners 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, we recommend that radon levels be monitored at regular intervals to make sure the mitigation is working.

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 a test shows that indoor levels of radon are at or above 4 picocures per liter, homeowners should also 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 company supplying the water. For information or assistance with interpreting test results, contact the CDPH Division of Drinking Water and Environmental Management (see Appendix A) at . www.cdph.ca.gov/programs/Pages/DDWEM.aspx .

The radon concentration of water from a private well can be measured by having a sample analyzed at a laboratory certified to test for radon in water. Homeowners should consult the CDPH radon program at (916) 449-5674 for guidance on the type of water analysis appropriate to the area and well type. The method of sample collection is critical. To get a list of certified laboratories, call the CDPH at (800) 745-7236 or visit their website at www.cdph.ca.gov/HealthInfo/environhealth/Pages/RadonServiceProviders.aspx .

How can levels of radon in water be reduced?

Radon levels in water can be reduced by 99 percent by the installation of a granular activated carbon unit (GAC) on the water line entering the house. GAC units should be certified by the CDPH. As radon accumulates and decays in the GAC unit, the unit itself becomes radioactive. Therefore, these units must be shielded or located away 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, how to find someone to test your home, or for informational publications on radon, call the CDPH Radon Program Hotline at: (800) 745-7236 or visit their website at
www.cdph.ca.gov/HealthInfo/environhealth/Pages/Radon.aspx

For specific assistance, call the CDPH Radon Program at: (916) 449-5674
Publications:
List of Certified Providers of Radon Services
This publication is available by calling CDPH Radon Program Hotline at (800) 745-745-7236 or at
www.cdph.ca.gov/HealthInfo/environhealth/Pages/RadonServiceProviders.aspx

California Department of Public Health
Indoor Radon Program
1616 Capitol Avenue, 2nd Floor
P.O. Box 997413
Sacramento, CA 95899-7413
Telephone: (800) 745-7236
Web: www.cdph.ca.gov/HealthInfo/environhealth/Pages/Radon.aspx

Radon in California
A Citizen's Guide to Radon
Homebuyers and Sellers Guide to Radon
The Inside Story - A Guide to Indoor Air Quality
How to Reduce Radon Levels in your Home
Model Standards for Radon in New Residential Buildings
These free publications are available from:
U.S. EPA Indoor Air Quality Information Clearinghouse
P.O. Box 37133
Washington, D.C. 20013-7133
Telephone: (800) 438-4318
Fax: (202) 484-1510
Email: iaqinfo@aol.com
Web: www.epa.gov/iaq/

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

Federal Agencies
U.S. Department of Housing and Urban Development (HUD)

Office of Lead Hazard Control
451 7th Street S.W., Room B133
Washington, D.C. 20410
Telephone: (202) 755-1785
Web: www.hud.gov
HUD helps people build and maintain communities of opportunity.

U.S. Environmental Protection Agency (U.S. EPA)
Public Information Center
1200 Pennsylvania Ave., N.W.
Washington, D.C. 20460
Telephone: (202) 272-0167
Web: www.epa.gov
The 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.
State Agencies
California Air Resources Board
Research Division
Indoor Exposure Assessment Section
1001 I Street
P.O. Box 2815
Sacramento, CA 95814
Telephone: (916) 322-8282
Web: www.arb.ca.gov

California Contractor's State License Board
9821 Business Park Drive
P.O. Box 26000
Sacramento, CA 95827
Telephone: (800) 321-2752
Web: 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.dir.ca.gov
Cal/OSHA is the state equivalent to the Federal Occupational

Safety and Health Administration (OSHA) and regulates protection of workers.

California Department of Public Health
Call your local county health department listed in the front of the white pages or, on the Internet, visit www.cdph.ca.gov

California Department of Public Health
Environmental Management Branch, Radon Program
1616 Capital Avenue, 2nd Floor, MS 7405
P.O. Box 997413
Sacramento, CA 95899-7413
Telephone: (800) 745-7236
Web: www.cdph.ca.gov/HealthInfo/environhealth/Pages/Radon.aspx
This branch provides publications and information about radon hazards.

California Department of Public Health
Environmental Lab Accreditation Program
850 Marina Bay Parkway
Building P, Third Floor
Richmond, CA 94804-6403
Telephone: (510) 620-5600

APPENDIX A List of Federal and State Agencies

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

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

California Department of Public Health
Division of Drinking Water and Environmental Management
Drinking Water Technical Program Branch
Sacramento Headquarters
1616 Capital Avenue, MS 7400
P.O. Box 997413
Sacramento, CA 95899-7413
Telephone: (916) 449-5600

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

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

Southern California Section
Los Angeles District & Metropolitan Districts
1449 W. Temple Street, Room 202
Los Angeles, CA 90026
Telephone: (213) 580-5723

Santa Barbara District
1180 Eugenia Place, Suite 200
Carpinteria, CA 93013
Telephone: (805) 566-1326

South Coastal Section
San Bernardino District
464 West 4th Street, #437
San Bernardino, CA 92401
Telephone: (909) 383-4328

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) 558-4410California

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
DTSC issues permits for treatment, storage, and disposal of hazardous wastes; inspects facilities; maintains a Superfund list; and has a site cleanup 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
Chatsworth Office
9211 Oakdale Avenue
Chatsworth, CA 91311-6505
Phone: (818) 717-6500
Cypress Office
5796 Corporate Avenue
Cypress, CA 90630-4732
Telephone: (714) 484-5300
San Diego Office
9174 Skypark Court, Suite 150
San Diego, CA 92123
Telephone: (858) 637-5531

California Department of Housing and Community Development
Division of Administration - Manufactured Housing
1800 Third Street, Room 260

P.O. Box 31
Sacramento, CA 95814
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.

California Department of Real Estate (DRE)
Fresno District Office
Department of Real Estate
2550 Mariposa, Room 3070
Fresno, CA 93721-2273
Telephone: (559) 445-6153

Oakland District Office
Department of Real Estate
1515 Clay Street, Room 702
Oakland, CA 94612-1462
Telephone: (510) 622-2552

Los Angeles Executive Office
Department of Real Estate
320 W. 4th Street, Suite 350
Los Angeles, CA 90013-1150
Telephone: (213) 620-2072

San Diego District Office
Department of Real Estate
1350 Front Street, Room 3064
San Diego, CA 92101-3687
Telephone: (619) 525-4375

Sacramento Principal Office
Department of Real Estate
2201 Broadway
P.O. Box 187000
Sacramento, CA 95818-7000
Telephone: (916) 227-0864
This unit provides information on lead toxicity and treatment of lead toxicity in children.

APPENDIX B Glossary

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.

CATHODE RAY TUBE: The cathode ray tube, or CRT, is the display device used in most computer displays, video monitors, and televisions.

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.

FRIABLE: Easily crumbled, pulverized, or reduced to a powder by hand.

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 four liters.

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

MITIGATION: Mitigation means any action taken to reduce or eliminate the risk to human health and the environment from hazardous waste.

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.

REACTIVE: A solid waste that is normally unstable, reacts violently with water, or generates toxic gases when exposed to water or other materials.

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.

Protect Your Family From Lead in Your Home

United States Environmental Protection Agency

United States Consumer Product Safety Commission

United States Department of Housing and Urban Development

January 2020

Are You Planning to Buy or Rent a Home Built Before 1978?

Did you know that many homes built before 1978 have **lead-based paint**? Lead from paint, chips, and dust can pose serious health hazards.

Read this entire brochure to learn:

- How lead gets into the body
- How lead affects health
- What you can do to protect your family
- Where to go for more information

Before renting or buying a pre-1978 home or apartment, federal law requires:

- Sellers must disclose known information on lead-based paint or lead-based paint hazards before selling a house.
- Real estate sales contracts must include a specific warning statement about lead-based paint. Buyers have up to 10 days to check for lead.
- Landlords must disclose known information on lead-based paint or lead-based paint hazards before leases take effect. Leases must include a specific warning statement about lead-based paint.

If undertaking renovations, repairs, or painting (RRP) projects in your pre-1978 home or apartment:

- Read EPA's pamphlet, *The Lead-Safe Certified Guide to Renovate Right,* to learn about the lead-safe work practices that contractors are required to follow when working in your home (see page 12).

Simple Steps to Protect Your Family from Lead Hazards

If you think your home has lead-based paint:

- Don't try to remove lead-based paint yourself.
- Always keep painted surfaces in good condition to minimize deterioration.
- Get your home checked for lead hazards. Find a certified inspector or risk assessor at epa.gov/lead.
- Talk to your landlord about fixing surfaces with peeling or chipping paint.
- Regularly clean floors, window sills, and other surfaces.
- Take precautions to avoid exposure to lead dust when remodeling.
- When renovating, repairing, or painting, hire only EPA- or state-approved Lead-Safe certified renovation firms.
- Before buying, renting, or renovating your home, have it checked for lead-based paint.
- Consult your health care provider about testing your children for lead. Your pediatrician can check for lead with a simple blood test.
- Wash children's hands, bottles, pacifiers, and toys often.
- Make sure children eat healthy, low-fat foods high in iron, calcium, and vitamin C.
- Remove shoes or wipe soil off shoes before entering your house.

Lead Gets into the Body in Many Ways

Adults and children can get lead into their bodies if they:

- Breathe in lead dust (especially during activities such as renovations, repairs, or painting that disturb painted surfaces).
- Swallow lead dust that has settled on food, food preparation surfaces, and other places.
- Eat paint chips or soil that contains lead.

Lead is especially dangerous to children under the age of 6.

- At this age, children's brains and nervous systems are more sensitive to the damaging effects of lead.
- Children's growing bodies absorb more lead.
- Babies and young children often put their hands and other objects in their mouths. These objects can have lead dust on them.

Women of childbearing age should know that lead is dangerous to a developing fetus.

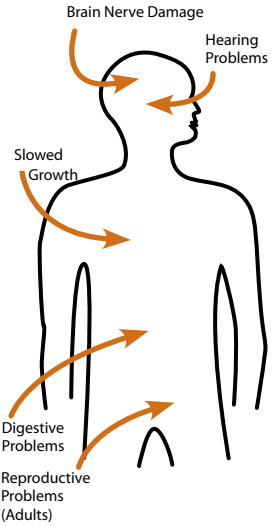
- Women with a high lead level in their system before or during pregnancy risk exposing the fetus to lead through the placenta during fetal development.

Health Effects of Lead

Lead affects the body in many ways. It is important to know that even exposure to low levels of lead can severely harm children.

In children, exposure to lead can cause:

- Nervous system and kidney damage
- Learning disabilities, attention-deficit disorder, and decreased intelligence
- Speech, language, and behavior problems
- Poor muscle coordination
- Decreased muscle and bone growth
- Hearing damage



While low-lead exposure is most common, exposure to high amounts of lead can have devastating effects on children, including seizures, unconsciousness, and in some cases, death.

Although children are especially susceptible to lead exposure, lead can be dangerous for adults, too.

In adults, exposure to lead can cause:

- Harm to a developing fetus
- Increased chance of high blood pressure during pregnancy
- Fertility problems (in men and women)
- High blood pressure
- Digestive problems
- Nerve disorders
- Memory and concentration problems
- Muscle and joint pain

Check Your Family for Lead

Get your children and home tested if you think your home has lead.

Children's blood lead levels tend to increase rapidly from 6 to 12 months of age, and tend to peak at 18 to 24 months of age.

Consult your doctor for advice on testing your children. A simple blood test can detect lead. Blood lead tests are usually recommended for:

- Children at ages 1 and 2
- Children or other family members who have been exposed to high levels of lead
- Children who should be tested under your state or local health screening plan

Your doctor can explain what the test results mean and if more testing will be needed.

Where Lead-Based Paint Is Found

In general, the older your home or childcare facility, the more likely it has lead-based paint.[1]

Many homes, including private, federally-assisted, federally-owned housing, and childcare facilities built before 1978 have lead-based paint. In 1978, the federal government banned consumer uses of lead-containing paint.[2]

Learn how to determine if paint is lead-based paint on page 7.

Lead can be found:

- In homes and childcare facilities in the city, country, or suburbs,
- In private and public single-family homes and apartments,
- On surfaces inside and outside of the house, and
- In soil around a home. (Soil can pick up lead from exterior paint or other sources, such as past use of leaded gas in cars.)

Learn more about where lead is found at epa.gov/lead.

[1] "Lead-based paint" is currently defined by the federal government as paint with lead levels greater than or equal to 1.0 milligram per square centimeter (mg/cm^2), or more than 0.5% by weight.

[2] "Lead-containing paint" is currently defined by the federal government as lead in new dried paint in excess of 90 parts per million (ppm) by weight.

Identifying Lead-Based Paint and Lead-Based Paint Hazards

Deteriorated lead-based paint (peeling, chipping, chalking, cracking, or damaged paint) is a hazard and needs immediate attention. **Lead-based paint** may also be a hazard when found on surfaces that children can chew or that get a lot of wear and tear, such as:

- On windows and window sills
- Doors and door frames
- Stairs, railings, banisters, and porches

Lead-based paint is usually not a hazard if it is in good condition and if it is not on an impact or friction surface like a window.

Lead dust can form when lead-based paint is scraped, sanded, or heated. Lead dust also forms when painted surfaces containing lead bump or rub together. Lead paint chips and dust can get on surfaces and objects that people touch. Settled lead dust can reenter the air when the home is vacuumed or swept, or when people walk through it. EPA currently defines the following levels of lead in dust as hazardous:

- 10 micrograms per square foot ($\mu g/ft^2$) and higher for floors, including carpeted floors
- 100 $\mu g/ft^2$ and higher for interior window sills

Lead in soil can be a hazard when children play in bare soil or when people bring soil into the house on their shoes. EPA currently defines the following levels of lead in soil as hazardous:

- 400 parts per million (ppm) and higher in play areas of bare soil
- 1,200 ppm (average) and higher in bare soil in the remainder of the yard

Remember, lead from paint chips—which you can see—and lead dust—which you may not be able to see—both can be hazards.

The only way to find out if paint, dust, or soil lead hazards exist is to test for them. The next page describes how to do this.

Checking Your Home for Lead

You can get your home tested for lead in several different ways:

- A lead-based paint **inspection** tells you if your home has lead-based paint and where it is located. It won't tell you whether your home currently has lead hazards. A trained and certified testing professional, called a lead-based paint inspector, will conduct a paint inspection using methods, such as:
  - Portable x-ray fluorescence (XRF) machine
  - Lab tests of paint samples

- A **risk assessment** tells you if your home currently has any lead hazards from lead in paint, dust, or soil. It also tells you what actions to take to address any hazards. A trained and certified testing professional, called a risk assessor, will:
  - Sample paint that is deteriorated on doors, windows, floors, stairs, and walls
  - Sample dust near painted surfaces and sample bare soil in the yard
  - Get lab tests of paint, dust, and soil samples
- A combination inspection and risk assessment tells you if your home has any lead-based paint and if your home has any lead hazards, and where both are located.

Be sure to read the report provided to you after your inspection or risk assessment is completed, and ask questions about anything you do not understand.

Checking Your Home for Lead, continued

In preparing for renovation, repair, or painting work in a pre-1978 home, Lead-Safe Certified renovators (see page 12) may:

- Take paint chip samples to determine if lead-based paint is present in the area planned for renovation and send them to an EPA-recognized lead lab for analysis. In housing receiving federal assistance, the person collecting these samples must be a certified lead-based paint inspector or risk assessor
- Use EPA-recognized tests kits to determine if lead-based paint is absent (but not in housing receiving federal assistance)
- Presume that lead-based paint is present and use lead-safe work practices

There are state and federal programs in place to ensure that testing is done safely, reliably, and effectively. Contact your state or local agency for more information, visit epa.gov/lead, or call **1-800-424-LEAD (5323)** for a list of contacts in your area.[3]

[3] Hearing- or speech-challenged individuals may access this number through TTY by calling the Federal Relay Service at 1-800-877-8339.

What You Can Do Now to Protect Your Family

If you suspect that your house has lead-based paint hazards, you can take some immediate steps to reduce your family's risk:

- If you rent, notify your landlord of peeling or chipping paint.
- Keep painted surfaces clean and free of dust. Clean floors, window frames, window sills, and other surfaces weekly. Use a mop or sponge with warm water and a general all-purpose cleaner. (Remember: never mix ammonia and bleach products together because they can form a dangerous gas.)
- Carefully clean up paint chips immediately without creating dust.
- Thoroughly rinse sponges and mop heads often during cleaning of dirty or dusty areas, and again afterward.
- Wash your hands and your children's hands often, especially before they eat and before nap time and bed time.
- Keep play areas clean. Wash bottles, pacifiers, toys, and stuffed animals regularly.
- Keep children from chewing window sills or other painted surfaces, or eating soil.
- When renovating, repairing, or painting, hire only EPA- or state-approved Lead-Safe Certified renovation firms (see page 12).
- Clean or remove shoes before entering your home to avoid tracking in lead from soil.
- Make sure children eat nutritious, low-fat meals high in iron, and calcium, such as spinach and dairy products. Children with good diets absorb less lead.

Reducing Lead Hazards

Disturbing lead-based paint or removing lead improperly can increase the hazard to your family by spreading even more lead dust around the house.

- In addition to day-to-day cleaning and good nutrition, you can **temporarily** reduce lead-based paint hazards by taking actions, such as repairing damaged painted surfaces and planting grass to cover lead-contaminated soil. These actions are not permanent solutions and will need ongoing attention.
- You can minimize exposure to lead when renovating, repairing, or painting by hiring an EPA- or state-certified renovator who is trained in the use of lead-safe work practices. If you are a do-it-yourselfer, learn how to use lead–safe work practices in your home.
- To remove lead hazards permanently, you should hire a certified lead abatement contractor. Abatement (or permanent hazard elimination) methods include removing, sealing, or enclosing lead-based paint with special materials. Just painting over the hazard with regular paint is not permanent control.

Always use a certified contractor who is trained to address lead hazards safely.

- Hire a Lead-Safe Certified firm (see page 12) to perform renovation, repair, or painting (RRP) projects that disturb painted surfaces.
- To correct lead hazards permanently, hire a certified lead abatement contractor. This will ensure your contractor knows how to work safely and has the proper equipment to clean up thoroughly.

Certified contractors will employ qualified workers and follow strict safety rules as set by their state or by the federal government.

Reducing Lead Hazards, continued

If your home has had lead abatement work done or if the housing is receiving federal assistance, once the work is completed, dust cleanup activities must be conducted until clearance testing indicates that lead dust levels are below the following levels:

- 40 micrograms per square foot (µg/ft^2) for floors, including carpeted floors
- 250 µg/ft^2 for interior windows sills
- 400 µg/ft^2 for window troughs

For help in locating certified lead abatement professionals in your area, call your state or local agency (see pages 14 and 15), or visit epa.gov/lead, or call 1-800-424-LEAD.

Renovating, Repairing or Painting a Home with Lead-Based Paint

If you hire a contractor to conduct renovation, repair, or painting (RRP) projects in your pre-1978 home or childcare facility (such as pre-school and kindergarten), your contractor must:

- Be a Lead-Safe Certified firm approved by EPA or an EPA-authorized state program
- Use qualified trained individuals (Lead-Safe Certified renovators) who follow specific lead-safe work practices to prevent lead contamination
- Provide a copy of EPA's lead hazard information document, *The Lead-Safe Certified Guide to Renovate Right*

RRP contractors working in pre-1978 homes and childcare facilities must follow lead-safe work practices that:

- **Contain the work area.** The area must be contained so that dust and debris do not escape from the work area. Warning signs must be put up, and plastic or other impermeable material and tape must be used.
- **Avoid renovation methods that generate large amounts of lead-contaminated dust.** Some methods generate so much lead-contaminated dust that their use is prohibited. They are:
  - Open-flame burning or torching
  - Sanding, grinding, planing, needle gunning, or blasting with power tools and equipment not equipped with a shroud and HEPA vacuum attachment
  - Using a heat gun at temperatures greater than 1100°F
- **Clean up thoroughly.** The work area should be cleaned up daily. When all the work is done, the area must be cleaned up using special cleaning methods.
- **Dispose of waste properly.** Collect and seal waste in a heavy duty bag or sheeting. When transported, ensure that waste is contained to prevent release of dust and debris.

To learn more about EPA's requirements for RRP projects, visit epa.gov/getleadsafe, or read *The Lead-Safe Certified Guide to Renovate Right*.

Other Sources of Lead

Lead in Drinking Water

The most common sources of lead in drinking water are lead pipes, faucets, and fixtures.

Lead pipes are more likely to be found in older cities and homes built before 1986.

You can't smell or taste lead in drinking water.

To find out for certain if you have lead in drinking water, have your water tested.

Remember older homes with a private well can also have plumbing materials that contain lead.

Important Steps You Can Take to Reduce Lead in Drinking Water

- Use only cold water for drinking, cooking and making baby formula. Remember, boiling water does not remove lead from water.
- Before drinking, flush your home's pipes by running the tap, taking a shower, doing laundry, or doing a load of dishes.
- Regularly clean your faucet's screen (also known as an aerator).
- If you use a filter certified to remove lead, don't forget to read the directions to learn when to change the cartridge. Using a filter after it has expired can make it less effective at removing lead.

Contact your water company to determine if the pipe that connects your home to the water main (called a service line) is made from lead. Your area's water company can also provide information about the lead levels in your system's drinking water.

For more information about lead in drinking water, please contact EPA's Safe Drinking Water Hotline at 1-800-426-4791. If you have other questions about lead poisoning prevention, call 1-800 424-LEAD.*

Call your local health department or water company to find out about testing your water, or visit epa.gov/safewater for EPA's lead in drinking water information. Some states or utilities offer programs to pay for water testing for residents. Contact your state or local water company to learn more.

* Hearing- or speech-challenged individuals may access this number through TTY by calling the Federal Relay Service at 1-800-877-8339.

Other Sources of Lead, continued

- **Lead smelters** or other industries that release lead into the air.
- **Your job.** If you work with lead, you could bring it home on your body or clothes. Shower and change clothes before coming home. Launder your work clothes separately from the rest of your family's clothes.
- **Hobbies** that use lead, such as making pottery or stained glass, or refinishing furniture. Call your local health department for information about hobbies that may use lead.
- Old **toys** and **furniture** may have been painted with lead-containing paint. Older toys and other children's products may have parts that contain lead.[4]
- Food and liquids cooked or stored in **lead crystal** or **lead-glazed pottery or porcelain** may contain lead.
- Folk remedies, such as **"greta"** and **"azarcon,"** used to treat an upset stomach.

[4] In 1978, the federal government banned toys, other children's products, and furniture with lead-containing paint. In 2008, the federal government banned lead in most children's products. The federal government currently bans lead in excess of 100 ppm by weight in most children's products.

For More Information

The National Lead Information Center
Learn how to protect children from lead poisoning and get other information about lead hazards on the Web at epa.gov/lead and hud.gov/lead, or call **1-800-424-LEAD (5323).**

EPA's Safe Drinking Water Hotline
For information about lead in drinking water, call **1-800-426-4791**, or visit epa.gov/safewater for information about lead in drinking water.

Consumer Product Safety Commission (CPSC) Hotline
For information on lead in toys and other consumer products, or to report an unsafe consumer product or a product-related injury, call **1-800-638-2772,** or visit CPSC's website at cpsc.gov or saferproducts.gov.

State and Local Health and Environmental Agencies
Some states, tribes, and cities have their own rules related to lead-based paint. Check with your local agency to see which laws apply to you. Most agencies can also provide information on finding a lead abatement firm in your area, and on possible sources of financial aid for reducing lead hazards. Receive up-to-date address and phone information for your state or local contacts on the Web at epa.gov/lead, or contact the National Lead Information Center at **1-800-424-LEAD.**

Hearing- or speech-challenged individuals may access any of the phone numbers in this brochure through TTY by calling the toll-free Federal Relay Service at **1-800-877-8339**.

U. S. Environmental Protection Agency (EPA) Regional Offices

The mission of EPA is to protect human health and the environment. Your Regional EPA Office can provide further information regarding regulations and lead protection programs.

Region 1 (Connecticut, Massachusetts, Maine, New Hampshire, Rhode Island, Vermont)

Regional Lead Contact
U.S. EPA Region 1
5 Post Office Square, Suite 100, OES 05-4
Boston, MA 02109-3912
(888) 372-7341

Region 2 (New Jersey, New York, Puerto Rico, Virgin Islands)

Regional Lead Contact
U.S. EPA Region 2
2890 Woodbridge Avenue
Building 205, Mail Stop 225
Edison, NJ 08837-3679
(732) 321-6671

Region 3 (Delaware, Maryland, Pennsylvania, Virginia, DC, West Virginia)

Regional Lead Contact
U.S. EPA Region 3
1650 Arch Street
Philadelphia, PA 19103
(215) 814-2088

Region 4 (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee)

Regional Lead Contact
U.S. EPA Region 4
AFC Tower, 12th Floor, Air, Pesticides & Toxics
61 Forsyth Street, SW
Atlanta, GA 30303
(404) 562-8998

Region 5 (Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin)

Regional Lead Contact
U.S. EPA Region 5 (DT-8J)
77 West Jackson Boulevard
Chicago, IL 60604-3666
(312) 886-7836

Region 6 (Arkansas, Louisiana, New Mexico, Oklahoma, Texas, and 66 Tribes)

Regional Lead Contact
U.S. EPA Region 6
1445 Ross Avenue, 12th Floor
Dallas, TX 75202-2733
(214) 665-2704

Region 7 (Iowa, Kansas, Missouri, Nebraska)

Regional Lead Contact
U.S. EPA Region 7
11201 Renner Blvd.
WWPD/TOPE
Lenexa, KS 66219
(800) 223-0425

Region 8 (Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming)

Regional Lead Contact
U.S. EPA Region 8
1595 Wynkoop St.
Denver, CO 80202
(303) 312-6966

Region 9 (Arizona, California, Hawaii, Nevada)

Regional Lead Contact
U.S. EPA Region 9 (CMD-4-2)
75 Hawthorne Street
San Francisco, CA 94105
(415) 947-4280

Region 10 (Alaska, Idaho, Oregon, Washington)

Regional Lead Contact
U.S. EPA Region 10
Solid Waste & Toxics Unit (WCM-128)
1200 Sixth Avenue, Suite 900
Seattle, WA 98101
(206) 553-1200

Consumer Product Safety Commission (CPSC)

The CPSC protects the public against unreasonable risk of injury from consumer products through education, safety standards activities, and enforcement. Contact CPSC for further information regarding consumer product safety and regulations.

CPSC
4330 East West Highway
Bethesda, MD 20814-4421
1-800-638-2772
cpsc.gov or saferproducts.gov

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

HUD's mission is to create strong, sustainable, inclusive communities and quality affordable homes for all. Contact HUD's Office of Healthy Homes and Lead Hazard Control for further information regarding the Lead Safe Housing Rule, which protects families in pre-1978 assisted housing, and for the lead hazard control and research grant programs.

HUD
451 Seventh Street, SW, Room 8236
Washington, DC 20410-3000
(202) 402-7698
hud.gov/offices/lead/

U. S. EPA Washington DC 20460
U. S. CPSC Bethesda MD 20814
U. S. HUD Washington DC 20410

EPA-747-K-12-001
January 2020

IMPORTANT!

Lead From Paint, Dust, and Soil in and Around Your Home Can Be Dangerous if Not Managed Properly

- Children under 6 years old are most at risk for lead poisoning in your home.
- Lead exposure can harm young children and babies even before they are born.
- Homes, schools, and child care facilities built before 1978 are likely to contain lead-based paint.
- Even children who seem healthy may have dangerous levels of lead in their bodies.
- Disturbing surfaces with lead-based paint or removing lead-based paint improperly can increase the danger to your family.
- People can get lead into their bodies by breathing or swallowing lead dust, or by eating soil or paint chips containing lead.
- People have many options for reducing lead hazards. Generally, lead-based paint that is in good condition is not a hazard (see page 10).

Published by the California Seismic Safety Commission

Homeowner's Guide to Earthquake Safety

2020 EDITION

State of California
Gavin Newsom
Governor

SSC No. 20-01

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Ordering Information

Single copies of this booklet are available from the

California Seismic Safety Commission
2945 Ramco St. #195
West Sacramento, CA 95691

To order call (916) 263-5506 or download an online copy at
http://ssc.ca.gov/forms_pubs/index.html

Cover photo: Collapsed two-story home. Nigel Spiers, 2011 Shutterstock, Enhanced License

**Disclaimer: The effects, descriptions, recommendations and suggestions included in this Guide are intended to improve earthquake preparedness; however, they do not guarantee the safety of an individual or a structure. The California Seismic Safety Commission takes responsibility for the inclusion of material in this Guide. The State of California, the California Seismic Safety Commission, and all contributors to this document do not assume liability for any injury, death, property damage, loss of revenue, or any other effects of earthquakes.*

Effective July 1, 2020, the 2020 edition of the *Homeowner's Guide to Earthquake Safety* replaces the 2005 edition.

Introduction

EARTHQUAKES ARE INEVITABLE IN CALIFORNIA.

They can occur at any time and without warning. They can be extremely destructive and even deadly.

As a current or future owner of a home*, you should be aware of the risks—potentially considerable and catastrophic—that earthquakes pose to your property and to the safety of you and your family.

THIS GUIDE is designed to help you prevent injuries, save lives, and avoid costly property damage from earthquakes. It provides information on:

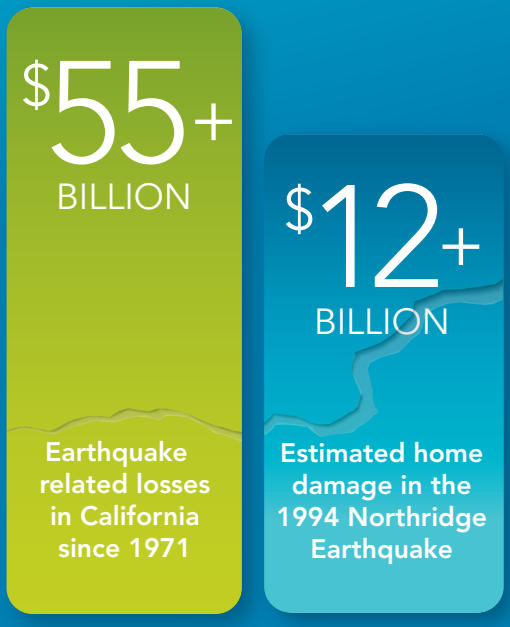
- The most common earthquake-related hazards that can damage homes
- How to find and then fix the potential structural risks in a home
- How to find more information on earthquake safety

If you sell your home, this Guide also will help you meet your requirements under California law.

There are no guarantees of safety during earthquakes, but properly constructed and strengthened homes are far less likely to collapse or be damaged during earthquakes. The California Seismic Safety Commission advises you to act on the suggestions outlined in this Guide and make yourself, your family, and your home safer.

In this Guide, "home" means single-family residences, duplexes, triplexes, and four-plexes. Under California law, a seller of a home built before 1960 must fulfill certain disclosure requirements as part of the sales process (see page 4).

USING THIS GUIDE **PAGE**



Selling or Buying A Home: Requirements & Recommendations

SELLING A HOME

If you are selling a home built before 1960, California law* requires you to:

- Properly strap the water heater.
- Provide buyers with the following documents:
  - A Residential Earthquake Risk Disclosure Statement (page 13), where you identify known home risks
  - A Natural Hazard Disclosure Statement, where you indicate if your home is in an Earthquake Fault Zone or Seismic Hazard Zone. Ask your realtor for a copy of this Disclosure Statement.
  - A copy of this Guide (Your real estate agent is required to give you the Guide.)
  - Note: If you list your home through a real estate agent or broker, you should have him or her give the documentation to the buyer.
- **Note:** Keep a copy of all documentation signed by the buyer as evidence that you complied with the requirements.

Under the law, you are NOT required to:

- Remove siding, drywall, or plaster to complete the disclosure statements.
- Hire someone to evaluate your home or to complete the disclosure statements. You may seek the assistance of a certified home inspector or a licensed contractor, architect, or engineer.
- Fix the risks before you sell your home; on the other hand, making the improvements could increase your home's value.

**A summary of the relevant California laws related to seismic safety is included at the end of this Guide (page 35).*

BUYING A HOME

Before you agree to buy a home, you should consider the following:

- Have a certified home inspector, licensed building contractor, engineer, or architect inspect the home and give an opinion on existing earthquake risks and the estimated cost to strengthen the home.
- Check the location of the home to determine if it is in an Alquist-Priolo Earthquake Fault Zone or an area susceptible to landslides, liquefaction, or tsunami. A licensed geotechnical engineer and/or engineering geologist can help you answer these questions and check the stability of the land under the home.
- Negotiate with the seller the cost of any proposed repairs or upgrades. State law does not require either the seller or buyer to strengthen a home against earthquake risks. However, the cost to repair a home after a damaging earthquake may far exceed the costs to strengthen the home and reduce the risks.

Property Tax Exclusion

Under California law (Revenue and Tax Code, Section 74.5), a homeowner can implement seismic-strengthening measures without a property tax reassessment. To receive the exclusion, you must have the work approved by the local building department and file a claim form with your county tax assessor.

Earthquake Insurance

Typically, residential property insurance does **not** include earthquake coverage. A homeowner may purchase a separate earthquake policy. Information on earthquake insurance is on page 37.

Earthquake Hazards

KNOW IF YOUR HOME IS AT RISK

Earthquakes occur in California every day. As a homeowner, you should know if your home is in an area that is more prone to earthquakes or if the geology or soil conditions of your neighborhood or community present greater risk during an earthquake. The more you know, the better able you are to take appropriate precautions to protect your home and family.

Is your home near an active earthquake fault or an area prone to severe shaking?

See the maps on pages 10 & 11.

Requirements under the law: If you are selling your home or any other type of real estate, no matter its age, you must disclose to buyers information about natural hazards that can affect the property, including flood and fire hazards and earthquake hazards. You report this information on the Natural Hazard Disclosure Statement.

The most common earthquake-related natural hazards are **ground shaking, fault ruptures, landslides, liquefaction, and tsunami.** In addition, earthquake damage to a dam can be a hazard to "downstream" homes.

Earthquake Hazards

GROUND SHAKING

Guy Morrow, 2004

In California, ground shaking causes 99% of earthquake damage to homes. Homes in areas near large active faults are more likely to feel severe shaking—and experience damage—than homes in other areas of the state.

FAULT RUPTURE

Pilar Villamor, GNS Science, 2016

A strong earthquake can cause the two sides of a fault to suddenly slide by one another. Even a relatively minor fault rupture can cause foundation and structural damage requiring expensive repairs.

Earthquake Hazards

LANDSLIDE

Al Seib, Los Angeles Times, 1994

Earthquake shaking can be strong enough to cause soil and rock on a hillside to slide down the slope. A landslide can rip apart homes at the top of the slope and also crush homes at the bottom of the slope.

LIQUEFACTION

Graeme Beattie, BRANZ, 2011

Strong ground shaking can cause liquefaction—excess pore water pressure that reduces the soil's ability to support structures. Liquefaction can cause structures to tilt or collapse.

Earthquake Hazards

TSUNAMI

National Oceanographic and Atmospheric Administration, 1964

Is your home at risk of a tsunami?

Check with your County's office of emergency services.

California's coastal areas are prone to damage from tsunami—a series of large ocean waves caused by an underwater earthquake or landslide. Tsunami waves can travel a great distance and cause flooding or wash away structures in low-lying areas along the shore, in and along harbors, and along the banks of rivers. Tsunamis generated by the 1964 Alaskan earthquake (magnitude 9.2) and the 2011 Japan earthquake (magnitude 9.0) caused property damage and loss of life in California.

DAM FAILURE

E. V. Leyendecker, United States Geological Survey, 1971

Is your home near a dam?

Check with your County's office of emergency services for a dam inundation map, which shows the location of major dams and areas that could flood in the event of a dam failure.

A very strong earthquake could damage a dam, resulting in sudden and devastating flooding of nearby homes. The 1971 San Fernando earthquake damaged the Lower San Fernando Dam, which sits less than half-mile above the neighborhoods of the San Fernando Valley in southern California. The risk of an aftershock forced the three-day evacuation of residents of an 11-square-mile area.

BETTER SAFE THAN SORRY

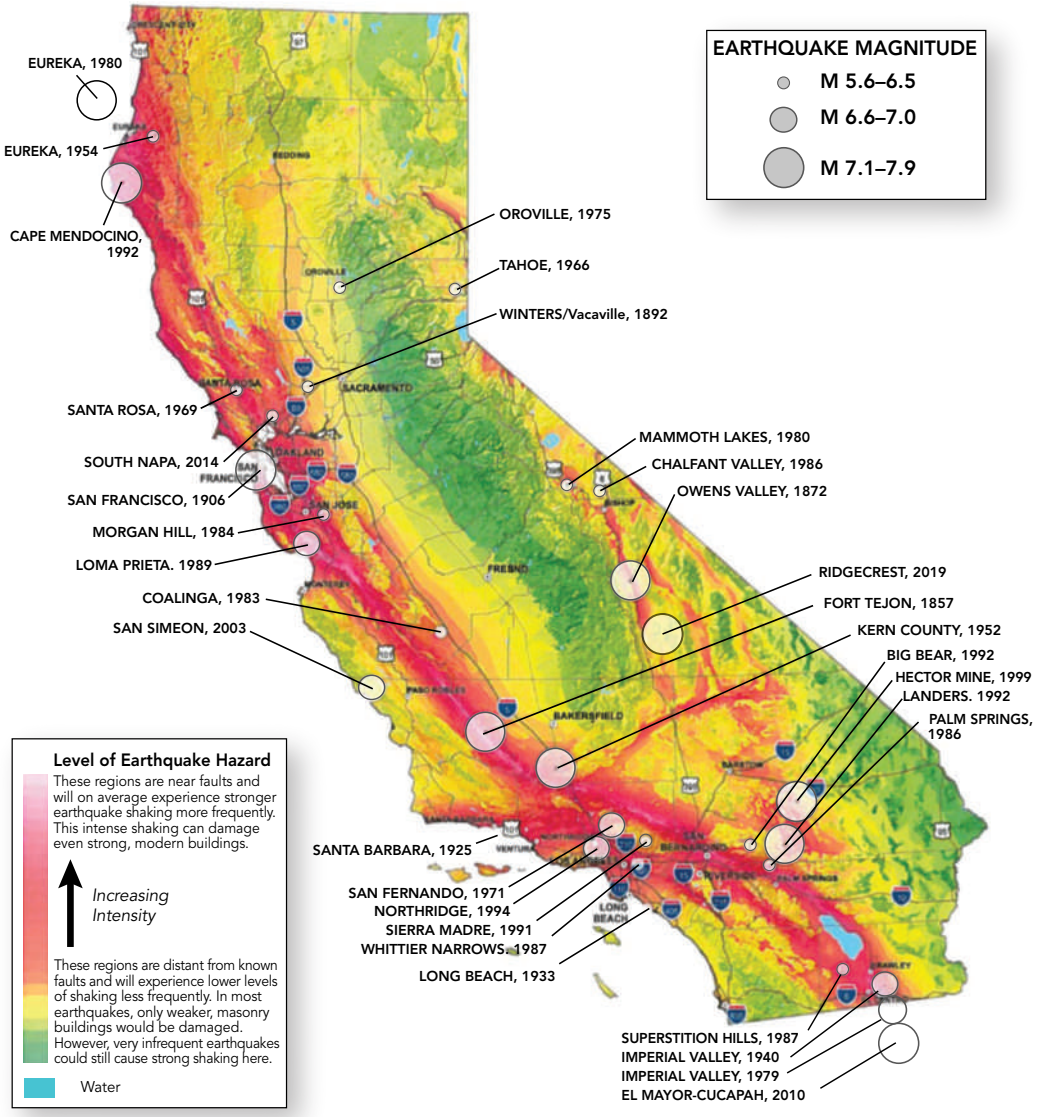
If you live in a low-lying coastal area or an area near a dam (dam inundation zone), know where to evacuate to higher ground and be prepared to evacuate immediately after an earthquake.

$3+ BILLION PER YEAR

Expected long-term average earthquake damage in California

Earthquake Shaking Potential for California

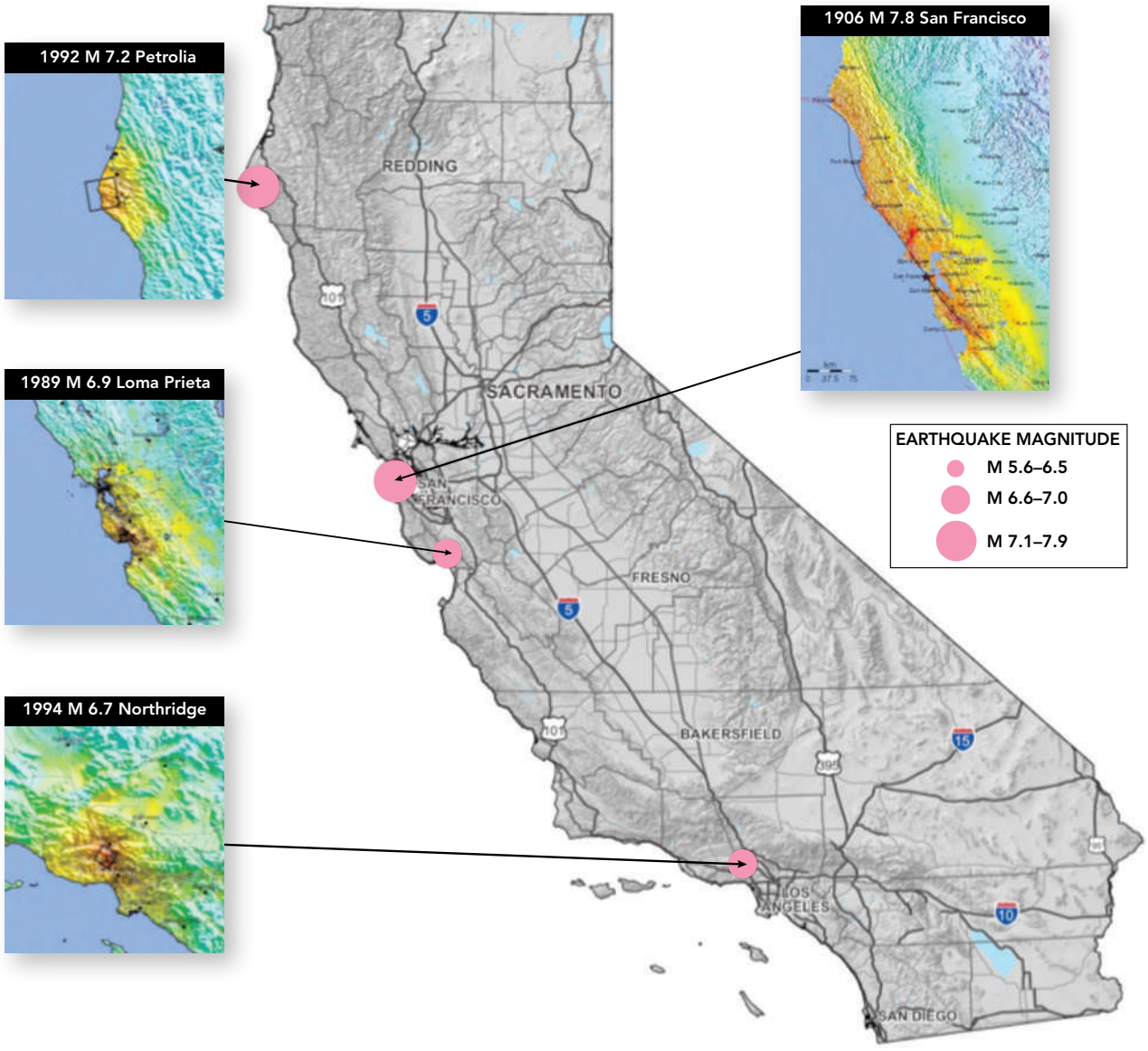
This map shows the relative intensity of ground shaking in California from anticipated future earthquakes and significant earthquakes that have occurred since the Great 1857 magnitude 7.9 Fort Tejon earthquake. Although the greatest hazard is in areas of highest intensity as shown on the map, no region is immune from potential earthquake damage.



Source: California Geological Survey Map and U.S. Geological Survey

Significant Historical Earthquakes and Their ShakeMaps

The ShakeMaps (inserts) show areas of moderate-to-heavy ground shaking in four historical earthquakes.



ShakeMap Explanation

INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+
PERCEIVED SHAKING	NOT FELT	WEAK	LIGHT	MODERATE	STRONG	VERY STRONG	SEVERE	VIOLENT	EXTREME
POTENTIAL DAMAGE	NONE	NONE	NONE	VERY LIGHT	LIGHT	MODERATE	MOD/HEAVY	HEAVY	VERY HEAVY

Source: USGS

Residential Earthquake Risks & the Disclosure Statement

IN THIS SECTION PAGE

You are not required to remove siding, drywall, or plaster or to hire an inspector to determine the answer to a question. Also, you are not required to fix or retrofit your home before you sell the property.

Earthquakes in California can occur at any time and without warning. To prevent injuries and avoid costly property damage, homeowners should determine the potential for earthquake risks in their homes and then retrofit or upgrade these conditions. If not corrected, these risks can lead to:

- Severe property damage, including foundation damage and damage to floors, walls, and windows
- Loss of personal property
- Broken utilities, which can result in fire, water damage, and spread of toxic substances
- Personal injuries

In addition, under California law, sellers of homes built before 1960 must disclose known earthquake risks to buyers as part of the property sales process.

Completing the Residential Earthquake Risk Disclosure Statement

When you sell a home built before 1960, you are required to fill out the Residential Earthquake Risk Disclosure Statement, (see next page) and give the completed statement to the buyer. You are required to answer each question to the best of your knowledge.

To complete the Disclosure Statement, answer:

- "Yes" if you know your home is protected from the risk (e.g., for Item #1, answer "Yes" if your home's water heater is properly braced)
- "No" if you know your home is at risk (e.g., for Item #6, answer "No" if your home's exterior brick walls are not strengthened)
- "Doesn't Apply" if the question is not relevant to your home (e.g., for Item #7, answer "Doesn't Apply" if your home does not have a living space over the garage)
- "Don't Know" if you do not have adequate information to answer the question

Residential Earthquake Risk Disclosure Statement (2020 Edition)

Name _____ Assessor's Parcel No. _____

Street Address _____ Year Built _____

City _____ County _____ Zip Code _____

Answer these questions to the best of your knowledge. If any of the questions are answered "No," your home is likely to have an elevated/disclosable earthquake risk. If you do not have actual knowledge as to whether these risks exist, answer "Don't Know." Questions answered "Don't Know" may indicate a need for further evaluation. If your home does not have the feature, answer "Doesn't Apply." If you corrected one or more of these risks, describe the work on a separate page. The page numbers in the right-hand column indicate where in this guide you can find information on each of these features.

	Yes	No	Doesn't Apply	Don't Know	See Page
1. Is the water heater braced to resist falling during an earthquake?	☐	☐	☐	☐	14
2. Is your home bolted to its foundation?	☐	☐	☐	☐	15
3. If your home has crawl space (cripple) walls:					
a. Are the exterior crawl space (cripple) walls braced?	☐	☐	☐	☐	17
b. If the exterior foundation consists of unconnected concrete piers and posts, have they been strengthened?	☐	☐	☐	☐	18
4. If the exterior foundation, or part of it, is made of unreinforced masonry, has it been strengthened?	☐	☐	☐	☐	19
5. If your home is on a hillside:					
a. Are the exterior tall foundation walls braced?	☐	☐	☐	☐	20
b. Are the tall posts or columns either built to resist earthquakes or have they been strengthened?	☐	☐	☐	☐	20
6. If the exterior walls of your home are made of unreinforced masonry, either completely or partially, have they been strengthened?	☐	☐	☐	☐	21
7. If your home has a room over the garage, is the wall around the garage door opening built to resist earthquakes or has it been strengthened?	☐	☐	☐	☐	22
8. Is your home outside an Alquist-Priolo Earthquake Fault Zone (an area immediately surrounding known active earthquake faults)?	*To be reported on the Natural Hazard Disclosure Statement*				
9. Is your home outside a Seismic Hazard Zone (an area identified as susceptible to liquefaction or a landslide)?	*To be reported on the Natural Hazard Disclosure Statement*				

As seller of the property described herein, I have answered the questions above to the best of my knowledge in an effort to disclose fully any potential earthquake risks it may have.

EXECUTED BY

_____ _____ _____

Seller Seller Date

I acknowledge receipt of the *Homeowner's Guide to Earthquake Safety* and this Disclosure Statement, completed and signed by the seller. I understand that if the seller has answered "No" to one or more questions, or if the seller has indicated a lack of knowledge, there may be one or more earthquake risks in this home.

_____ _____ _____

Buyer Buyer Date

This Disclosure Statement is made in addition to the standard real estate transfer disclosure statement also required by law.

Earthquake Risk Disclosure Statement Item 1

During an earthquake, an unbraced water heater can topple, which can start a fire or lead to major water damage.

Is your home's water heater braced?

If your home's water heater is not properly braced, or if it has rigid rather than flexible pipes, the water heater may move or topple during an earthquake. This movement can break gas or water lines, resulting in fire, water damage, or release of toxic gas.

Under California law, you are required to brace your home's water heater whenever you install a new water heater or if you sell the home.

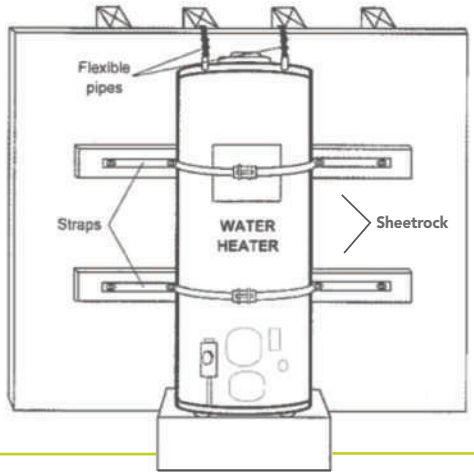
How to Check for Proper Water Heater Bracing

1. Examine your home's water heater.
2. Look for two sets of straps that wrap around the water heater and securely bolt the water heater to the wall and wall studs (see diagram).

Tankless Water Heater?

If you have a tankless water heater, be sure it is securely attached to the wall and that its pipes are installed according to the manufacturer's instructions.

PROPER WATER HEATER BRACING



WANT TO RETROFIT?
Find out more on pages 26-29.

Earthquake Risk Disclosure Statement Item 2

Is your home bolted to its foundation?

If your home is not bolted to its foundation, it could slide off the foundation during an earthquake.

- A home that has moved can cause gas, water, and sewer lines to break, resulting in fire, water damage, and release of toxic fluids.
- Lifting a home back onto its foundation is difficult and expensive.

How to Check for Foundation Bolting

1. Determine if your home has a crawl space, which will be below the first floor.
   Clue: If your home has steps leading to an exterior door, the home probably has a crawl space. If you have no steps, the home is most likely built on a concrete slab and has no crawl space. If you do not have a crawl space, see "What If"section on next page.
2. Go into the crawl space. Access will be through a small removable panel or door along an exterior wall or from inside the garage.
3. Look for areas of unfinished wood framing at base of walls (see diagram). If the crawl space has finished wood framing, see "What If"section.
4. Find sill plates (wood boards that sit directly on top of foundation) and look for anchor bolts that fasten sill plates to foundation (see diagram on next page).
   - ***Adequate bolting:*** Bolts with nuts and square washers spaced every 4 to 6 feet
   - ***Inadequate bolting:*** No visible bolts

WANT TO RETROFIT?
Find out more on pages 26-29.

WHAT IF . . .

Q My home does not have a crawl space?

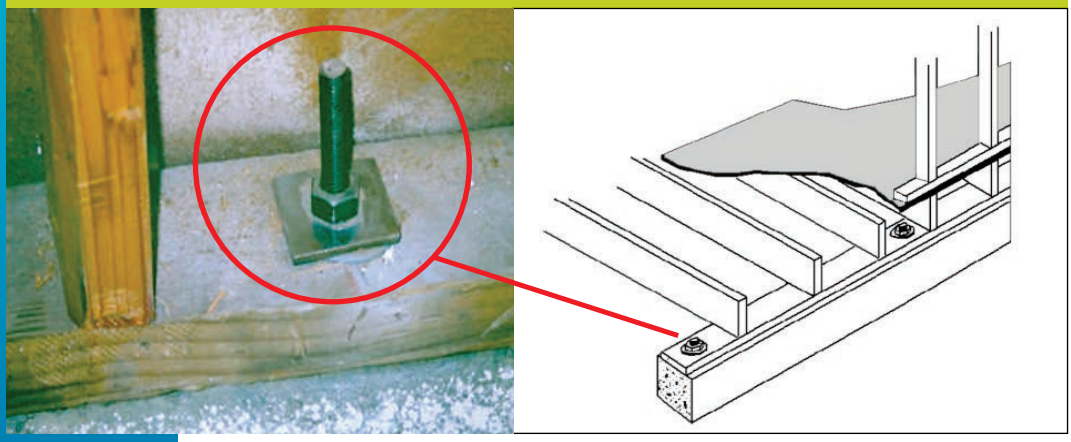
A Particularly after 1960, many California homes were built directly on concrete slabs. Fortunately, most of these homes and other post-1960 homes built to code have anchor bolts.

Q The crawl space has finished framing, so I cannot see the sill plates or anchors?

A You are not required to remove siding, drywall or plaster to determine if your home's foundation has anchor bolts.

For both situations, check "Don't Know" on the Disclosure Statement.

LOCATING FOUNDATION BOLTS



WANT TO RETROFIT?
Find out more on pages 26-29.

Earthquake Risk Disclosure Statement Item 3a

Are your crawl space (cripple) walls braced?

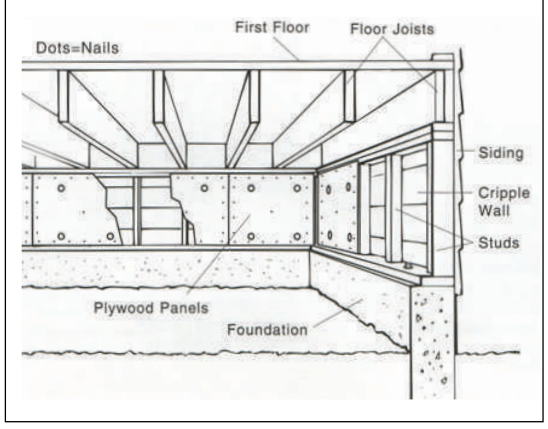
If your home has a crawl space with un-braced walls, these crawl space (cripple) walls could collapse during an earthquake, which, in turn, may cause your entire home to collapse or lead to major damage to the structure as well as possible fire, water line breaks and injuries.

This older home collapsed after earthquake shaking damaged its crawl space (cripple) walls.

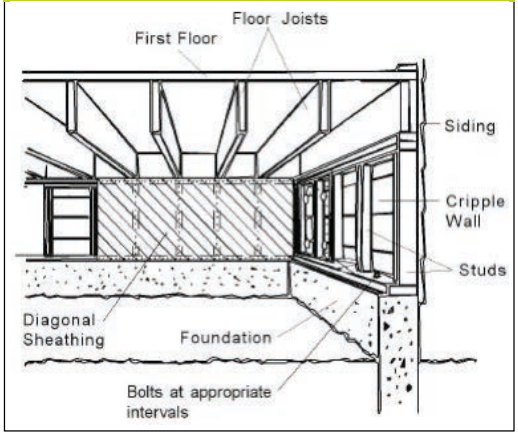
How to Check for Bracing of Crawl Space Walls

1. Determine if your home has a crawl space with cripple walls.
   Clue: If your home has three or more steps leading to an exterior door, the home has a crawl space below the first floor and, therefore, has cripple walls.
2. Go into the crawl space. Access will be through small removable panel or door along an exterior wall or from inside the garage.
3. Examine the inside surfaces of the exterior walls.
   - ***Adequate bracing:*** Plywood or diagonal sheathing on exterior walls (see diagrams)
   - ***Inadequate bracing:*** No plywood or diagonal sheathing

PLYWOOD OR ORIENTED STRAND BOARD



DIAGONAL SHEATHING



WANT TO RETROFIT?
Find out more on pages 26-29.

Earthquake Risk Disclosure Statement Item 3b

This home's pier-and-post foundation was damaged during an earthquake. The diagonal bracing was added after the earthquake to temporarily stabilize the home during repairs.

Is your home's pier-and-post foundation strengthened?

If your home sits on large wood posts that rest on unconnected concrete piers, the posts may not be braced properly. During an earthquake, the posts could fail and your home could shift or collapse.

How to Check for Pier-and-Post Foundation Strengthening

1. Go under the home and determine the type of foundation that supports the exterior walls.
   - Continuous perimeter foundation wall (check "Does Not Apply" on the statement)
   - Concrete piers and wood posts
2. For concrete piers and wood posts, look further to determine if the foundation is adequately braced or strengthened.
   - ***Adequate bracing:*** A continuous foundation around the perimeter edges of the home that consists of either reinforced concrete or reinforced masonry.
   - ***Inadequate bracing*** along the perimeter edges of the home:
     - Wood posts supported by concrete piers, or
     - Wood posts without concrete piers or continuous perimeter foundations

WANT TO RETROFIT?
Find out more on pages 26-29.

Earthquake Risk Disclosure Statement Item 4

Is your home's unreinforced masonry foundation strengthened?

If your home is supported by a brick, stone or concrete block foundation that lacks steel reinforcing, the foundation may not be able to resist earthquake shaking. Your home could slide off its foundation during an earthquake, damaging the walls and floors, rupturing utility connections, and destroying the contents of your home. This, in turn, could lead to fire, water damage, and injuries.

How to Check an Unreinforced Masonry Foundation

1. Walk around the perimeter of your home to determine the composition of the foundation. If the foundation has siding or a plaster finish, you will need to check the foundation from inside the crawl space.
   - Solid concrete foundation (check "Does Not Apply" on the statement)
   - Unreinforced brick, stone, or concrete block foundation
2. For unreinforced brick, stone, or concrete block foundation, look further to determine if the foundation is adequately braced or strengthened (e.g., steel plates attached to foundation walls). If you do not know what to look for, consult a licensed engineer or architect.

WANT TO RETROFIT?
Find out more on pages 26-29.

Earthquake Risk Disclosure Statement Item 5

The balcony of this hillside home partially collapsed and the home tilted when the stilt-type support posts and poorly braced walls shifted during an earthquake.

Does the foundation of your hillside home have adequate support?

Hillside homes require special engineering to resist earthquake shaking.

If your home is built on a hillside and the home's tall foundation walls and stilt-type support posts are not properly braced, your home could collapse during an earthquake, causing severe damage to the home and injuries.

How to Check the Foundation of a Hillside Home

1. Walk around the perimeter of your home to examine both the tall foundation walls and the tall posts or columns that support the home.
2. Examine the exterior tall foundation walls for evidence of extensive wall bracing below the home.
3. If you do not know what to look for, consult a licensed engineer or architect.

WANT TO RETROFIT?
Find out more on pages 26-29.

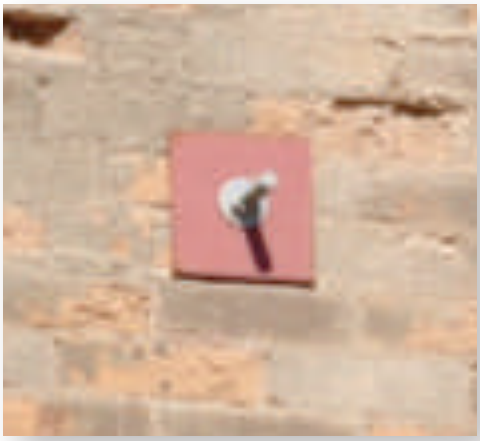
Earthquake Risk Disclosure Statement Item 6

Are your home's unreinforced masonry walls strengthened?

If your home has walls built of unreinforced masonry—brick, hollow clay tiles, stone, concrete blocks, or adobe—the walls may be too brittle to resist earthquake shaking. As a result, the walls could collapse in an earthquake.

How to Check for Unreinforced Masonry Walls

1. Walk around the perimeter of your home to examine the composition of the exterior walls. Look for evidence of unreinforced brick, clay tile, stone, adobe, or concrete-block wall construction.
   - Look closely at wall surfaces at windows and doors.
   - If the exterior walls are covered with plaster, examine the walls from inside the home (e.g., beneath light switch plates).
2. If the exterior walls are built of masonry, check further for the strength of construction or for indicators of retrofit. Steel plates and anchor bolts are common retrofits (see photo).
3. If you do not know what to look for, consult a licensed engineer or architect.



A steel plate with anchor bolts.

WANT TO RETROFIT?
Find out more on pages 26-29.

Earthquake Risk Disclosure Statement Item 7

The walls around the garage door of this home were not strong enough to withstand the shaking of the 1989 Loma Prieta Earthquake.

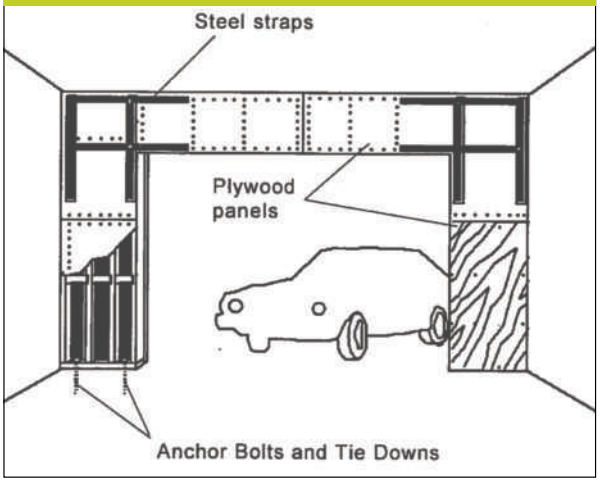
Does your home have a room above the garage?

If your home has a room above the garage, you need to ensure that the narrow walls on either side of the garage doorway are strong enough to withstand earthquake shaking. Without adequate support, these walls could collapse, causing serious damage and injuries.

How to Check the Strength of a Garage with a Room Above

1. Go into your garage and examine the walls on both sides of the garage doorway. If the garage has been built or strengthened to support a second story, you will see plywood bracing on the walls and metal straps (see diagram).
2. If you do not know what to look for, consult a licensed engineer or architect.

GARAGE WALL BRACING



Adequate bracing for a garage wall includes plywood and metal straps.

WANT TO RETROFIT?
Find out more on pages 26-29.

Other Structural Risks

Your home also may have other structural issues that could result in serious property damage or injuries during an earthquake. These risks are not included in the Residential Earthquake Risk Disclosure Statement because, typically, it is not cost effective to complete a retrofit. On the other hand, these risks should be considered if you are a homeowner or a potential home buyer.

UNREINFORCED MASONRY CHIMNEY

If your home has an unreinforced brick or stone chimney, it could collapse during an earthquake and fall on the ground beside the home or fall through the roof into your home (see photos).

How to Check Your Chimney

To determine if your chimney will withstand an earthquake:

1. Check the mortar with a screwdriver. If the mortar crumbles, it may be too weak to withstand earthquake shaking.
2. Access the attic area above the fireplace to verify that the chimney is securely attached to the home with metal straps or ties.
3. If you are unable to verify the strength of the chimney, consult a licensed engineer or architect or a general contractor.

How to Protect against Damage and Injuries (Safety Precautions)

- Avoid parking cars or locating patios or children's play areas within the falling radius of a chimney.
- Remind home occupants to stay away from chimneys and fireplaces during earthquakes.

California Earthquake Authority, 2014

Bay Area Regional Earthquake Preparedness Project, 1989

WANT TO RETROFIT?
Find out more on pages 26-29.

INADEQUATE FOUNDATION

A wood foundation or a foundation of concrete or masonry that is cracked or crumbling may not have the strength to withstand earthquake shaking.

How to Check the Condition of Your Foundation

Determining if a foundation is susceptible to earthquake damage can be a challenge, and the advice of a licensed engineer or architect or a foundation contractor may be necessary.

Wood foundation: In the past, some homes were built on wood beams laid directly on the ground without concrete or masonry supports. If you do not see concrete or masonry foundation walls along the perimeter of your home, your home may have a wood foundation.

Deteriorating masonry: Older concrete or stone foundations can deteriorate over time and become too weak to withstand earthquake shaking. Large cracks, crumbling, or rock pockets are visual signs of deterioration. You also can poke a screwdriver into a foundation wall to check its strength; if the concrete or stone crumbles easily, the foundation may be vulnerable to earthquake damage.

WANT TO RETROFIT?
Find out more on pages 26-29.

HOMES WITH UNIQUE DESIGNS

If not designed adequately and with earthquakes in mind, homes with unique designs can be prone to damage from earthquake shaking.

Unique design features include homes with:

- Large porches or overhangs
- Large windows or window walls
- Three or more stories
- Irregular shapes

Evaluation and Options

In many cases, homes with unique designs have been built to withstand earthquake shaking. Identifying if a home has been strengthened can be difficult. Consulting with a licensed engineer or architect for a seismic evaluation canbe helpful.

You can make large windows safer by applying plastic film to the glass.

WANT TO RETROFIT?
Find out more on pages 26-29.

Tips for a Successful Retrofit

MAKE A PLAN: DEFINE THE SCOPE OF WORK AND HOW TO ACCOMPLISH THE PROJECT

The first step in an earthquake retrofit or upgrade is to ensure that you, as the homeowner, understand the work that will be required for the retrofit project and the required building and performance standards. You should not rush into repairs, no matter how badly they are needed, or hire the first contractor you meet with.

Define Scope of Work

Defining the scope of a retrofit or upgrade project is a critical first step. Additional resources are listed on page 34.

Reminders:

- For any retrofit project, be sure to consult with your local building department for advice on the State's requirements, local building codes and standards.
- To determine the best solution for a retrofit, you may want to consult a licensed engineer or architect or a general contractor that specializes in this type of work.
- You or your contractor will need to obtain a building permit from your local building department.
- When evaluating the cost of a retrofit, remember to consider both the economic value of the work and the value to your "peace of mind."

Water Heater Bracing

Under California law, you are required to brace the water heater when you install a new water heater and when you sell your home.

You can brace a water heater yourself using a strap kit, available from a local hardware store. Or, you can hire a plumber or handyperson to do the work. The diagram on page 14 illustrates proper water heater bracing.

As an added safety precaution, consider having a licensed plumber replace any rigid pipes with flexible pipes, which will better withstand shaking during an earthquake.

Simple Retrofit Projects

The *California Existing Building Code, Appendix A, Chapter A3* contains how-to information for retrofitting. *FEMA P-1100, Volume 2A* is also easy to use and accepted for retrofits by local building departments. Do-it-yourself homeowners can undertake simple retrofits without hiring an engineer, architect, or contractor.

Types of Simple Retrofit Projects

- **Foundation bolting:** To add or retrofit a foundation bolting system requires drilling new holes into the foundation and installing bolts.
- **Crawl space wall bracing:** To add or retrofit the wall bracing in a crawl space requires nailing new plywood or oriented strand board to crawl space studs. ***Note:*** For crawl spaces taller than four feet, consult *FEMA P-1100, Volume 2A*.

More Complicated Retrofit Projects

By their nature, some earthquake retrofit projects are more complicated and will require the expertise of a licensed engineer or architect and/or a general contractor who specializes in this type of work.

- **Pier-and-post foundation:** You may be able to strengthen a pier-and-post foundation system adequately with bracing; alternatively, the best solution may be to install a new, continuous foundation.

- **Unreinforced masonry foundation:** You may be able to replace or supplement all or part of an existing foundation with a new reinforced concrete or masonry foundation.
- **Other inadequate foundation**: If your home's foundation is inadequate (see pages 19, 24), you may need to add a new or replace an existing foundation to reduce the risks of earthquake damage.
- **Unreinforced masonry walls:** In most cases, retrofitting unreinforced masonry walls requires 1) better connecting the walls to the roof and floors and 2) installing steel frames or reinforced concrete. In some cases, large steel plates must be attached with anchor bolts through the masonry (see photo on page 21). Engineering information is in the *California Existing Building Code, Appendix A, Chapter A1.*
- **Unreinforced masonry chimney:** Strengthening or bracing a chimney can be expensive. Retrofit options include:
  - Adding plywood panels either above ceiling joists or, when re-roofing, on roof framing
  - Removing or replacing all or a portion of the chimney with lighter-weight material (e.g., using a metal flue for the upper portion of a chimney). (see *FEMA P-1100, Volume 2C)*
- **Garage walls:** Engineering information on retrofitting garage walls is in the *California Existing Building Code* or *FEMA P-1100, Volume 2B.*
- **Hillside homes:** Retrofitting hillside homes includes strengthening foundations, walls, columns and diagonal bracing. Engineering information is in the *California Existing Building Code* or the *FEMA P-1100* publication.
- **Historical homes:** Your project will need to comply with the *California Historical Building Code.*

Keep Your Retrofit Documents

Once your project is complete, remember to keep all plans, permits, and other project records so you can provide them to a future home buyer.

Select a Licensed Contractor

A critical step is to find and hire the right contractor for your job. Be sure you:

- Discuss your project with at least two and, ideally, more licensed contractors.
- Obtain a written proposal from each contractor. Do not accept verbal promises. Be sure to compare the proposals to ensure the scope of work in each proposal (project description) meets your needs and are similar. Examine all terms of the proposal (e.g., price, project plan and timeframe, use of subcontractors). Consider each contractor's experience with residential earthquake retrofitting. The lowest-priced bid may not be the best bid.
- Ask for and then check with references.
- Before finalizing a contract, verify that your preferred contractor's state license is current and that your contractor is licensed to do business in your community.

You will find useful a number of publications from the Contractor's State License Board. Visit **www.cslb.ca.gov.**

- *What You Should Know before Hiring a Contractor:* Provides information on how to find, hire and work with a contractor
- *A Consumer Guide to Home Improvement Contracts:* Provides information on the legal obligations of home improvement contractors

Avoid Contractor Payment Pitfalls

- For any project that costs $500 or more, a licensed contractor must provide a written contract.
- Pay the contractor in installments as the work is completed.
    - Keep the down payment low. By law, a down payment on a home improvement contract cannot exceed 10% of the contract price or $1,000, whichever is less.
    - Withhold at least 10% of the total contract price until the project is completed to your satisfaction.
    - Do not make the final payment until the local building department has signed off on the work and you have conducted a final review of the work to make sure it is complete and correct.

Earthquake Safety Tips

Precautions: During an Earthquake

If you are indoors: Drop, cover and hold on.

- Get under a sturdy desk or table and hang on to it OR move into a hallway OR get against an interior wall.
- Stay clear of windows, fireplaces, and heavy furniture or appliances.
- Get out of a kitchen or any area that has numerous objects that can fall.
- Do not run downstairs or rush outside while the building is shaking. Debris may be falling and/or you might fall and sustain an injury.

If you are outdoors: Get into an open area.

Move away from buildings, power lines, chimneys, and anything else that might fall on you.

If you are driving: Prepare to stop.

- Move as far out of traffic as possible.
- Do not stop on or under a bridge or overpass or under trees, light poles, power lines, or signs.
- Remain in your car until the shaking stops.
- After you resume driving, watch for cracks or bumps in the road and fallen objects.

If you are near a steep hillside: Watch for landslides.

Earthquakes can loosen rocks, trees, and other debris.

COASTAL AREAS: SPECIAL TSUNAMI PRECAUTIONS

An earthquake or large landslide near the coast or beneath the ocean can cause a tsunami. A tsunami may occur without warning, and the first waves—which often are not the largest—may reach the coast within minutes after the initial earthquake. And, an earthquake may result in more than one set of waves; potentially deadly tsunami waves can continue to arrive for hours and at intervals of 10 minutes or more.

During the shaking: Drop, cover, and hold on.
Watch for falling objects until the shaking stops.

After the shaking: Move (evacuate) immediately either to higher ground or inland away from the shore, and do so on foot if you cannot evacuate by vehicle. Note: Authorities may have no time to issue a warning. If you do not hear an evacuation announcement but you see a drop or rise in water level or you hear a loud noise coming from the water, move immediately and quickly away from the shore.

Stay away from the shore. Wait for an official "all clear" announcement before you return to the area.

Precautions: After an Earthquake

Aftershocks may occur and you may need to continue to take precautions even after the initial earthquake.

Check for Injuries

- If a person is bleeding, put direct pressure on the wound. Use clean gauze or cloth, if available.
- If a person is not breathing, immediately call 911. If you can, perform CPR.
- Seek medical help for other serious injuries.
- Do not attempt to move a person who is seriously injured unless there is an immediate danger of further injury.
- Cover injured persons with blankets to keep them warm.

Check for Hazards

- **Fires:** If safe to do so, immediately extinguish a fire. Otherwise, call 911.
- **Gas leaks:** If you suspect a gas leak or smell natural gas (rotten eggs), shut off the main gas valve. ***Note:*** Once you turn off the gas, do not turn it back on yourself. Wait for the gas utility company to check for leaks and have the company restore your service.
- **Damaged electrical wiring:** Shut off your power at the control box.
- **Downed or damaged utility lines:** Do not touch downed power lines or any objects in contact with them. Contact the local electric utility company.
- **Spills:** If you can do so safely, clean up any spilled medications or spills of other potentially harmful materials such as bleach, lye, or gasoline.
- **Downed or damaged chimneys:** Approach chimneys with caution; they may be weakened and could topple during aftershocks. Do not use a fireplace with a damaged chimney; the damage could cause a fire or leak toxic fumes into the home.
- **Broken glass:** To avoid injuries, be sure to wear sturdy shoes.
- **Fallen objects:** Look for objects that have fallen, being careful as you check closets and cupboards for objects that still might fall.

Check Food and Water Supplies

- **Lack of electricity and meal planning:** If you have no electricity, plan to first eat refrigerated and frozen foods that will spoil quickly. Refrigerated and frozen food will keep for at least two days if you do not open the doors too often.
- **Using the stove:** If you suspect a gas leak, do not turn on a stove. Even an electric stove can create a spark that could cause an explosion.
- **Outdoor cooking:** Only use barbecues or camp stoves outdoors. Do not use them indoors.

Other Information

The pages that follow provide additional information that homeowners may find useful.

Additional Resources

A number of additional resources on seismic safety and earthquake safety for homeowners are available both from the California Seismic Safety Commission and the Federal Emergency Management Administration (FEMA).

- California Seismic Safety Commission: **www.ssc.ca.gov/forms_pubs/hog.html**
- FEMA: **www.fema.gov**
- California Building Standards Commission: **www.dgs.ca.gov/BSC/Codes**

IN THIS SECTION **PAGE**

Relevant State Seismic Safety Laws

The full wording of these laws is available at
http://leginfo.legislature.ca.gov/faces/codes.xhtml

Publishing the Guide (Business and Professions Code, Section 10149)

The California Seismic Safety Commission is required to develop, adopt, publish, and update the *Homeowner's Guide to Earthquake Safety*, containing information on geologic and seismic hazards, explanations of structural and nonstructural earthquake hazards, and recommendations for mitigating these hazards.

Delivering this Guide (Government Code, Section 8897.1- 8897.5)

Sellers of homes built before 1960 with one to four units of conventional light-frame construction must deliver to the buyer "as soon as practicable before the transfer" a copy of the *Homeowner's Guide to Earthquake Safety* and disclose certain earthquake deficiencies. The seller's real estate agent must provide the seller with a copy of this Guide to give to the buyer.

Water Heater Bracing (Health and Safety Code, Section 19211)

Water heaters must be anchored or strapped to resist falling during an earthquake. The seller must certify to the potential buyer that the water heater is properly braced.

Disclosing Risks (Civil Code, Section 1102 and following sections)

Sellers of real property must disclose known defects and deficiencies in the property—including earthquake risks and hazards—to prospective buyers.

Disclosing Natural Hazards (Civil Code, Section 1103)

Sellers of real property must disclose, using the statutory Natural Hazard Disclosure Statement, whether the property is within any of the seven mapped natural hazard areas, including those areas with earthquake faults or those areas with potential for landslides or liquefaction.

Earthquake Faults (Public Resources Code, Section 2621 and following sections)

The Alquist-Priolo Earthquake Fault Zoning Act prohibits building for human occupancy astride active faults and requires sellers of existing residences to disclose to potential buyers, on a Natural Hazard Disclosure Statement, if the property is located in a designated fault zone.

Landslide and Liquefaction (Public Resources Code, Section 2694 and following sections)

The Seismic Hazard Mapping Act requires the State to prepare maps of the zones in California most susceptible to landslide and liquefaction hazards during earthquakes and requires sellers to disclose to buyers, on a Natural Hazard Disclosure Statement, if the property is in such a zone.

Earthquake Insurance

Companies that sell residential property insurance in California are required by law to offer earthquake insurance to homeowners both at the time of initial sale of the policy and then every two years at the time of policy renewal.

The cost of earthquake insurance coverage is based on a number of factors, including a home's location, age, construction type, and value.

Every home is different. In considering earthquake insurance, a homeowner should evaluate the home's individual risk factors and then weigh the cost of earthquake coverage against the benefits. In other words, a homeowner should determine a home's potential for earthquake damage and the cost of repairs and compare these costs against the cost of coverage (less the deductible that is applicable to the policy). The advice of a licensed civil or structural engineer or architect can be helpful in determining a home's potential for damage and expected costs of repairs.

The California Earthquake Authority (CEA) website has an online calculator to help estimate earthquake insurance premiums. The calculator uses ZIP code, insured value, dwelling type, and desired coverage and deductible to estimate the premiums.

The CEA is required to provide, and the insurance companies are required to disclose, the availability of discounts on earthquake insurance premiums for older homes that have been strengthened to resist earthquake damage.

Residential insurance agents can also help homeowners locate earthquake insurers and estimate annual premiums.

California Earthquake Authority
www.EarthquakeAuthority.com

California Department of Insurance
www.insurance.ca.gov

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International Code Council
San Diego Association of Governments
Southern California Association of Governments
Southern California Gas Company/SEMPRA
Structural Engineers Association of California

The California ENERGY COMMISSION

What is your Home ENERGY RATING?

know before you buy or sell

- Lower your energy bills
- Enjoy a safer, more comfortable and durable home
- Reduce your impact on the environment
- Increase your home's sales appeal and appraisal value

U P D A T E D F O R 2 0 1 1

What is your Home ENERGY RATING?

"Whether you are buying or selling a residential property, or staying in your current home, every Californian should know his or her home **energy rating.**"

Contents

The California ENERGY COMMISSION

What is your Home ENERGY RATING?

California is a national leader in promoting energy efficiency. As a result, our energy use per person has remained stable for over 30 years while the national average has steadily increased. Despite this success, we must continue to reduce energy use in our homes. The benefits are highly valuable — reducing energy use not only lowers your energy bills, but helps our electricity system remain reliable, even during high peak-load periods, while also protecting our environment.

In 2006, California established aggressive goals to reduce greenhouse gases that cause global warming. These goals will cut today's carbon emissions by 25 percent, so we can return to 1990 levels by the year 2020. Efforts to accomplish this goal represent important first steps in addressing the threat of global warming. We owe our children and grandchildren nothing less.

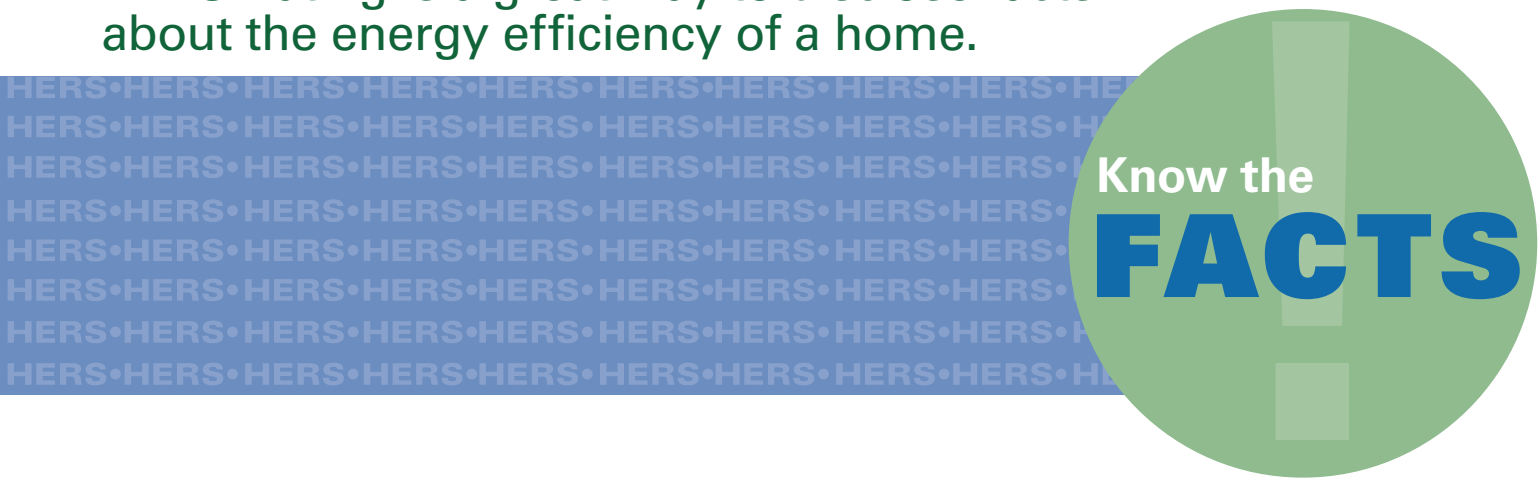
As you consider the sale or purchase of your home, this booklet asks that you recognize what energy efficiency measures have been built into the home, or ways to make further improvements to save energy and reduce peak electricity demand.

Your energy efficiency actions help make California a better, more environmentally sustainable place to raise your families.

Whether you are buying or selling a residential property, or staying in your current home, every Californian should know his or her home energy rating. Wasted energy wastes more than just your money – it changes our climate. The scientific community agrees that we must act now or risk facing an uncertain future.

The California Home Energy Rating System (HERS) Program provides a reliable way to estimate and compare the energy efficiency of California homes and identify wise energy saving improvements. This booklet explains how the HERS program works and helps you find a qualified professional to rate your own home. Once you know your home energy rating, you will be able to choose smart energy upgrades and investments that will benefit your family now… and generations to come.

During a real estate transaction, a California HERS Rating is a great way to disclose facts about the energy efficiency of a home.



Whether you are getting ready to sell your home – or preparing to buy one – knowing the energy efficiency facts about the property is a major consideration. As buyers become more aware of the benefits of an energy-efficient home, homes with a favorable home energy rating may be more attractive to buyers.

Selling?

A HERS rating will:

- Help determine facts about the energy efficiency of your home.
- Identify energy improvements that may make your home more attractive to buyers.
- Alert appraisers to add value for any energy improvements you may have made already.

Buying?

- Use a HERS rating to shop and compare the energy efficiency of homes you are considering.
- Learn about the most cost-effective options for lowering the energy bills in any home you are considering buying.
- Identify and qualify for energy efficiency financing.

Staying in your current home?

- Find out your HERS rating.
- Discover the best options for lowering your energy bills.
- Identify energy efficiency improvements that may also make your home more comfortable.
- Find resources to help finance your improvements.
- Improve your home's resale value.

Have you checked your ducts?

Heating and cooling ducts in an average California home leak almost 30 percent. That is why when heating or cooling equipment is replaced, testing the system's ducts for leaks is now required by building officials in many parts of the state.

If you are selling your home and had upgrades made without the required permits or duct testing, be sure to disclose this on your Real Estate Transfer Disclosure Statement. If you are preparing to buy a home that had duct work performed after October 2005, ask to see the duct testing report, or an explanation as to why such testing was not required.

For more information, visit:
www.energy.ca.gov/title24/changeout/

You wouldn't buy a new car without knowing its "miles per gallon" rating. So why buy a home without a "home energy rating?"

What is a HOME ENERGY RATING?

A Whole-House Home Energy Rating is a comprehensive evaluation of the efficiency of the entire home. The homeowner receives a written report that includes a numeric score or "rating" of the home, plus recommendations for improvements that will reduce energy bills and make the home more comfortable. Knowing the energy rating of your home is similar to knowing the miles per gallon rating of your car.

The California Energy Commission has developed the California Home Energy Rating System (HERS) Program to cover almost every type of residence in California. This includes new and existing single-family homes and multifamily buildings of three stories or less. Energy Commission-approved HERS Providers train, certify, and oversee a new type of service professional known as a "California Whole-House Home Energy Rater."

Each California HERS Rater must follow standardized energy auditing procedures and use energy analysis software that meets the Energy Commission's technical requirements. The HERS Rater will inspect and assess all the major energy efficiency features of your home:

- Air leaks (sealed or unsealed)
- Cooling system
- Heating system
- Water heating system
- Heating and cooling ducts and/or pipes
- Insulation (attic, walls, floor)
- Windows
- Attached lighting fixtures
- Major appliances
- Solar electricity generating systems (if any)
- Other energy uses

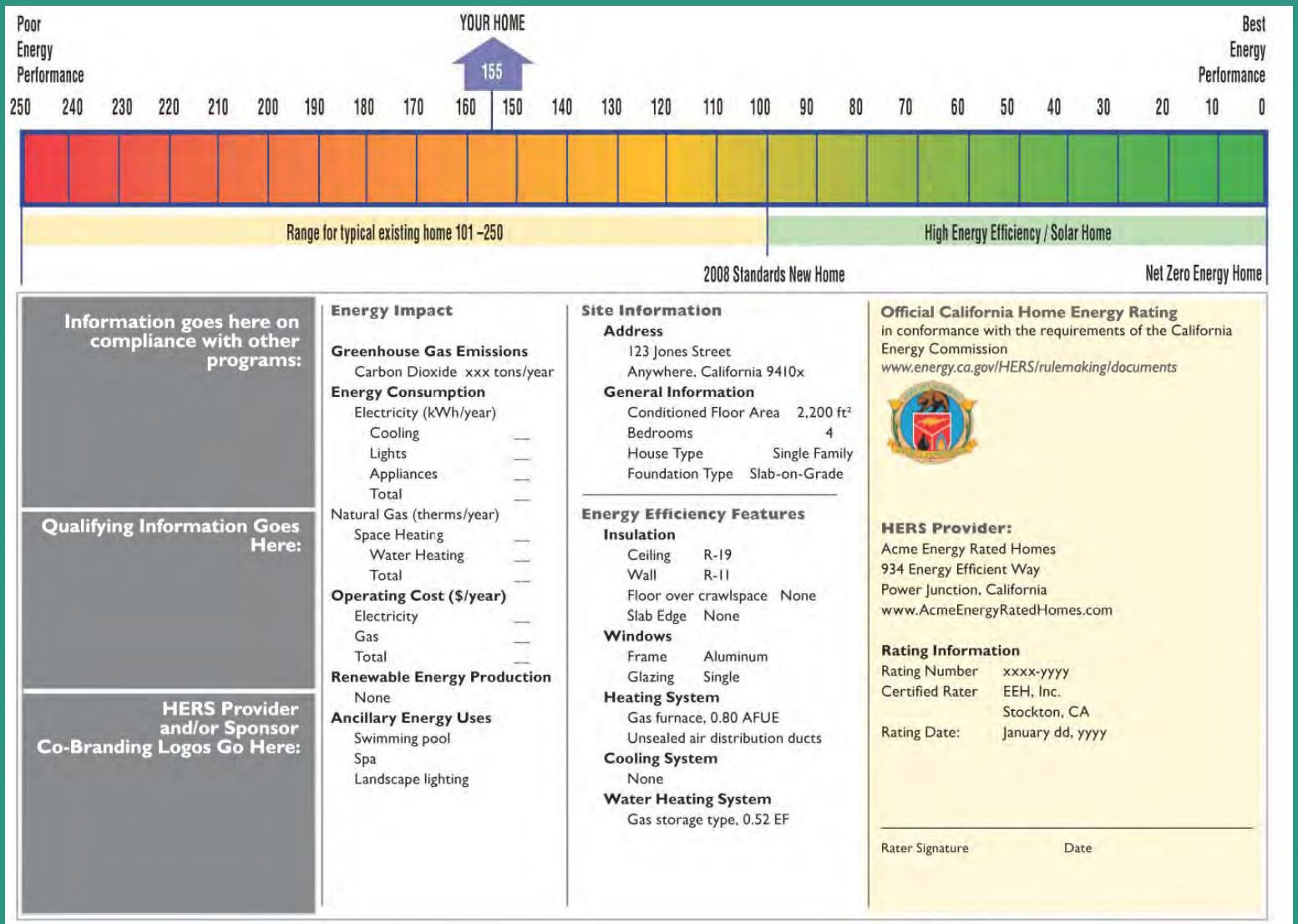
Your HERS report will identify the most cost-effective and appropriate energy efficiency improvements for your home. Only a properly prepared HERS Report will receive an official California Home Energy Rating Certificate with the California Energy Commission's seal.

Rating costs vary depending on factors such as the size and features of your home and the extent of rater services needed. Ask your real estate agent for names of certified HERS Raters in your area or find an Energy Commission-approved HERS Provider at: www.energy.ca.gov/HERS/index.html or call the Energy Hotline at (800) 772-3300.

Your HERS Rating Certificate will:

- Display an official HERS Index efficiency rating on a 0 to 250-point scale.
- Itemize the home's major energy-efficiency features as determined by the HERS Rater.
- Estimate the home's annual energy use, operating cost, and greenhouse gas emissions.
- Calculate the amount of solar or other onsite renewable energy that the home may produce.

Understanding your HERS index



What is your Home Energy Rating?
How low can it go?

A lower HERS Index indicates a more energy efficient home. A home with a HERS Index of:

- "250" or more is likely to have very high energy bills, and many opportunities for efficiency improvements.
- "100" uses the same energy as a new home that meets California's 2008 Building Energy Efficiency Standards.
- "0" is a super-efficient "Net Zero Energy Home" that consumes no more energy than it produces with solar or other onsite renewable sources.

HERS Recommendations

Your HERS report will contain detailed recommendations so that you can learn about all the improvements that are cost-effective and appropriate for your particular home. Here are a few examples:

Test and seal air leaks in building envelope
A pressure test will show where the air is leaking out so you can make your home less drafty.

Increase attic insulation to R-38
Properly installed insulation makes your home quieter and more comfortable.

Test and seal air duct leaks
Almost every home in California has leaky ducts, typically wasting 30 percent or more.

Tune-up the heating and cooling system
Proper maintenance saves energy and improves comfort and safety.

Upgrade to a correctly sized ENERGY STAR® furnace
A new ENERGY STAR® furnace will run more quietly and keep you warm all winter for less money.

Hire a Professional

Don't trust just anyone to make your improvements. Trying to save a little can sometimes cost you more in the long run. Instead, find one or more licensed specialty contractors who have the knowledge, tools, and skills to do each job right. You may want to consider a "building performance" contractor who is a licensed general contractor and is specially trained and certified to help address all of the energy and comfort improvement opportunities in your home and make them work together as an efficient system. The Contractors State License Board website www.cslb.ca.gov provides more information on how to choose a qualified contractor.

Making WISE IMPROVEMENTS

Do it Yourself

Some improvements are so easy and inexpensive, you don't need a HERS rating to know they pay back quickly:

- Replace incandescent bulbs with ENERGY STAR® compact fluorescent lamps (CFLs).
- Replace all nightlights and holiday lights with light-emitting diodes (LEDs).
- Choose ENERGY STAR® appliances, computers, and televisions.
- Install low-flow showerheads and faucet aerators.
- Insulate the first 5 feet of pipes from the cold and hot water heater.
- Add or repair weather stripping on all doors and windows.
- Use caulk and spray foam to fill all visible air gaps.
- Clean or replace furnace air filters monthly.
- Plant shade trees.

Energy Wise HABITS

These no-cost tips will help reduce the energy consumption in your home:

- Turn off lights and computers when not in use.
- Use a power strip for televisions, DVD players, VCRs, and chargers, and turn off power to the strip when not in use.
- Recycle burned-out CFL bulbs, fluorescent tubes, televisions, computer monitors, and all other electronic waste.
- Unplug and recycle any inefficient old refrigerators and freezers.
- Use appliances efficiently. Use your dishwasher and clothes washer for full loads only. Use the cold water setting on your clothes washer when possible.
- Turn down the water heater to 120 degrees Fahrenheit.
- Use your drapes properly. In the summer, close your drapes during the day. In the winter, open your drapes during the day and close your drapes at night.
- Open your windows for natural ventilation on cool summer mornings and nights.

A $100 per month reduction in your utility bills frees up enough cash to pay for a $17,000 increase in your mortgage (assuming 6 percent interest over 30 years).

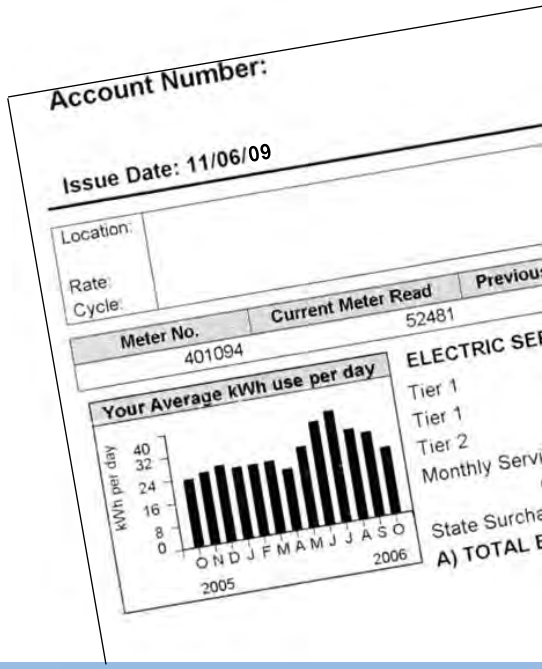
Utility Bills & RATINGS

Home energy efficiency ratings are designed to help you focus on the physical features of the house – not on other factors that can affect energy consumption like unusual weather or personal energy use habits.

Utility bills give a personal perspective: the history of how much energy the occupants of the home actually used over a period. Unless you consider a rating coupled with the utility bills, you may get only half of the story.

As a potential buyer, you should always ask to see the previous occupant's energy bills. While sellers are not obligated to share their utility bills, many will if asked.

If the old bills have not been saved, current occupants can access their records by calling the local utility or by setting up an account on the utility's website. Your HERS Rater can assist you in obtaining the bills and will consider them to establish a more complete picture of your home energy use to make the best recommendations for improvements. A Home Buyers' Energy Checklist that helps buyers ask questions related to the home's energy use is available at: www.energy.ca.gov/HERS/index.html.



Energy efficiency is different than energy consumption. Efficiency depends upon the physical features of the home and all the equipment it contains. Consumption is reduced through efficiency but also depends on the energy use behavior of the occupants. Wasteful habits, unusual weather, or malfunctioning equipment can drive up energy bills, even in the most energy-efficient house in the neighborhood.

After your mortgage payment, your energy bill is often the second largest monthly home ownership expense.

Financing your IMPROVEMENTS

Principal
+ **I**nterest
+ **T**axes
+ **I**nsurance
+ **E**nergy

True cost of owning your home

If you are buying or refinancing and looking for a way to finance your energy improvements, you should get advice from a knowledgeable real estate agent or lender about the many new options now available. The federal government, Fannie Mae/Freddie Mac, and many major lenders are introducing new products to help you fund your energy efficiency improvements. Some cities and counties also have programs that allow homeowners to finance efficiency improvements and solar installations over 20 years.

You may also be able to qualify for an Energy Efficient Mortgage (EEM). An EEM is a loan program that recognizes the importance of the energy efficiency of a home and allows for cost-effective energy upgrades to be financed in the mortgage. A HERS rating is required to qualify for an EEM. These loans provide borrowers the opportunity to make energy efficiency improvements to their homes and gain several desirable benefits including:

- Provide the ability to roll the cost of your efficiency improvements into a low mortgage rate.
- May stretch your debt-to-income qualifying ratio.
- Enjoy your improvements and energy savings right away.
- Earn a higher resale price when you sell.

Best of all, you get to enjoy all the benefits of your home improvements for the same total monthly cost (PITI+E)…or maybe even less.

EEM programs are available from:

- Federal Housing Authority (FHA)
- Veterans Administration (VA)
- Conventional lenders (Fannie Mae, Freddie Mac)
- Other home-buyer or refinancing programs

Combine an EEM with other programs and you may be able to borrow up to $40,000 or more for efficiency improvements. Ask a knowledgeable lender if an EEM is right for you.

Another way to finance energy improvements is through an equity loan or equity line of credit. If your HERS rating is low enough, some lenders may offer a "green" mortgage or equity line of credit at a discount relative to their regular interest rates or points. Shop around to see if these products make sense for you. Utilities also offer financial incentives such as re-bates, for energy smart improvements, such as:

- Added insulation
- ENERGY STAR® appliances
- Refrigerator recycling
- High-efficiency heating and air conditioning systems
- Compact fluorescent light fixtures
- Whole-house fans, cool roofs, swimming pool pump motors, and more

Contact your local utility for information on their program offerings. Manufacturers also offer discounts or rebates on efficient products so check their websites or with a retailer for possible offers.

It's no secret; energy efficiency features may make your home more valuable and sell faster.

Federal tax credits now available include:

Efficiency ADDS VALUE

10 percent of the cost, up to $500 or a specific amount from $50-$300, through 2011 (existing homes only) for:

- Windows and Doors
- Biomass Stoves
- Insulation
- Roofs
- HVAC
- Water Heaters

30 percent of the cost, with no upper limit through 2016 (existing homes and new construction) for:

- Geothermal Heat Pumps
- Small Wind Turbines (Residential)
- Solar Energy Systems

For more news on energy efficiency tax credits, visit: www.energystar.gov/taxcredits

Did You Know?

- A study of energy-efficient homes in The Appraisal Journal showed that a $1 reduction in annual energy bills resulted in more than $10 increase in resale value.
- A past president of the California Association of Real Estate Appraisers recommends that appraisals account for any efficiency improvements because they "so contribute to the habitability, enjoyability and economic stability of the home."
- FHA authorizes the cost of energy efficiency measures to be added to the mortgage.
- Home builders find that homes with efficiency and solar electricity upgrades sell faster and at higher prices than similar homes nearby.

Make sure your real estate agent knows about any efficiency improvements you have made, let buyers know your home is "Energy-Rated," and give the appraiser a copy of your HERS Report.

The energy used in the average home produces roughly twice as much greenhouse gas pollution as the average car (US EPA).

Once you have made all appropriate energy efficiency improvements, you may also want to consider solar electric generation.

If you have already decided on the size of solar electric system, investing in energy efficiency measures first will allow your solar system to power more of your home's electricity need. Plan ahead and don't oversize your new solar electric system to power an energy-inefficient house. Your HERS Rater will show you how.

California has set a goal to generate 3,000 megawatts of new, solar-produced electricity by 2017 — moving the state toward a cleaner energy future and lowering the cost of solar systems for all consumers. The California Solar Initiative offers incentives up to 30 percent off the installed cost of a solar system for a typical home. This discount may be combined with any federal tax credits or other incentives available.

Visit
www.gosolarcalifornia.ca.gov
for details.

The California Energy Commission does not endorse any product, supplier, manufacturer, builder or organization.

The text in this booklet is designed to be informational and not all-inclusive.

ACKNOWLEDGEMENTS

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San Francisco, California
Contract No. 400-05-020

Photo on page 4 courtesy of The Energy Conservatory.
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CUT HERE

The California ENERGY COMMISSION

Property Address:

I have received a copy of the **WHAT IS YOUR HOME ENERGY RATING?** booklet (CEC-400-2009-008-BR-REV1)

Buyer's Signature	Printed Name	Date
Buyer's Signature	Printed Name	Date
Buyer's Agent Signature	Printed Name	Date
	Broker's Name	
Seller's Signature	Printed Name	Date
Seller's Signature	Printed Name	Date
Listing Agent's Signature	Printed Name	Date
	Broker's Name	

ALL SIGNERS SHOULD RETAIN A COPY OF THIS PAGE FOR THEIR RECORDS

California Civil Code Section 2079.10 states that if this booklet is provided to the buyer by the seller or broker, then this booklet is deemed to be adequate to inform the home buyer about the existence of California Home Energy Rating Program.

For more information, visit: www.energy.ca.gov/HERS/index.html

EPA 402/K-13/002 | March 2018 (revised) | www.epa.gov/radon

United States Environmental Protection Agency

Home Buyer's and Seller's Guide to Radon

Indoor Air Quality (IAQ)

EPA RECOMMENDS:

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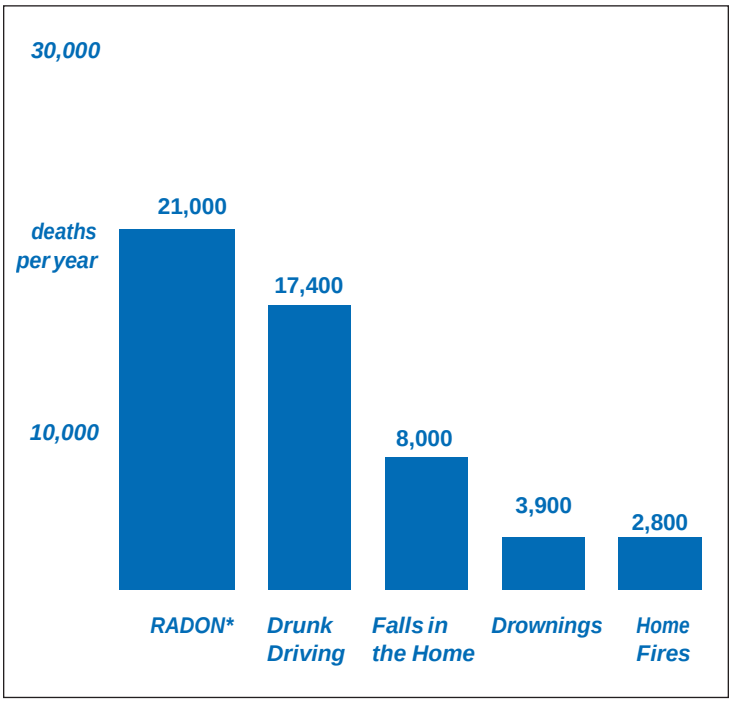
- If you are buying or selling a home, have it tested for radon.
- For a new home, ask if radon-resistant construction features were used and if the home has been tested.
- Fix the home if the radon level is 4 picocuries per liter (pCi/L) or higher.
- Radon levels less than 4 pCi/L still pose a risk and, in many cases, may be reduced.
- Take steps to prevent device interference when conducting a radon test.

EPA estimates that radon causes thousands of cancer deaths in the U.S. each year.



**Radon is estimated to cause about 21,000 lung cancer deaths per year, according to EPA's 2003 Assessment of Risks from Radon in Homes (EPA 402-R-03-003). The numbers of deaths from other causes are taken from the Centers for Disease Control and Prevention's 2005-2006 National Center for Injury Prevention and Control Report and 2006 National Safety Council Reports.*

EPA 402/K-13/002 |March 2018 (revised)

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Overview

This *Guide* answers important questions about radon and lung cancer risk. It also answers questions about testing and fixing for anyone buying or selling a home.

Radon Is a Cancer-Causing, Radioactive Gas

You cannot see, smell, or taste radon. But it still may be a problem in your home. When you breathe air containing radon, you increase your risk of getting lung cancer. In fact, the Surgeon General of the United States has warned that radon is the second leading cause of lung cancer in the United States today. *If you smoke and your home has high radon levels, your risk of lung cancer is especially high.*

See page 4

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EPA Risk Assessment for Radon in Indoor Air

EPA has updated its estimate of the lung cancer risks from exposure to radon in indoor air. The Agency's updated risk assessment, *EPA Assessment of Risks from Radon in Homes* (EPA 402-R-03-003, June 2003), is available at https://www.epa.gov/radiation/epa-assessment-risks-radon-homes as a downloadable Adobe Acrobat PDF file. EPA's reassessment was based on the National Academy of Sciences' (NAS) report on the *Health Effects of Exposure to Radon* (BEIR VI, 1999). The Agency now estimates that there are about 21,000 annual radon-related lung cancer deaths, an estimate consistent with the NAS Report's findings.

You Should Test for Radon

Testing is the only way to find out your home's radon levels. EPA and the Surgeon General recommend testing all homes below the third floor for radon.

See page 20

You Can Fix a Radon Problem

If you find that you have high radon levels, there are ways to fix a radon problem. Even very high levels can be reduced to acceptable levels.

If You Are Selling a Home...

EPA recommends that you test your home before putting it on the market and, if necessary, lower your radon levels. Save the test results and all information you have about steps that were taken to fix any problems. This could be a positive selling point.

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If You Are Buying a Home...

EPA recommends that you know what the indoor radon level is in any home you consider buying. Ask the seller for their radon test results. If the home has a radon-reduction system, ask the seller for any information they have about the system.

If the home has not yet been tested, you should have the house tested.

See page 6

If you are having a new home built, there are features that can be incorporated into your home during construction to reduce radon levels.

See page 9

The radon testing guidelines in this *Guide* have been developed specifically to deal with the time-sensitive nature of home purchases and sales, and the potential for radon device interference. These guidelines are slightly different from the guidelines in other EPA publications which provide radon testing and reduction information for *non-real estate* situations.

This *Guide* recommends three short-term testing options for real estate transactions. EPA also recommends testing a home in the lowest level that could be used regularly, since a buyer may choose to live in a lower area of the home than that used by the seller.

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1. Why Should I Test for Radon

a. Radon Has Been Found in Homes All Over the United States

Radon is a radioactive gas that has been found in homes all over the United States. It comes from the natural breakdown of uranium in soil, rock, and water and gets into the air you breathe. Radon typically moves up through the ground to the air above and into your home through cracks and other holes in the foundation. Radon can also enter your home through well water. Your home can trap radon inside.

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Any home can have a radon problem. This means new and old homes, well-sealed and drafty homes, and homes with or without basements. In fact, you and your family are most likely to get your greatest radiation exposure at home. That is where you spend most of your time.

Nearly one out of every 15 homes in the United States is estimated to have an elevated radon level (4 pCi/L or more). Elevated levels of radon gas have been found in homes in your state. Contact your state radon office for information about radon in your area.

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b. EPA and the Surgeon General Recommend that You Test Your Home

Testing is the only way to know if you and your family are at risk from radon. EPA and the Surgeon General recommend testing all homes below the third floor for radon.

U.S. SURGEON GENERAL HEALTH ADVISORY

"Indoor radon is the second-leading cause of lung cancer in the United States and breathing it over prolonged periods can present a significant health risk to families all over the country. It's important to know that this threat is completely preventable. Radon can be detected with a simple test and fixed through well-established venting techniques." January 2005

You cannot predict radon levels based on state, local, and neighborhood radon measurements. Do not rely on radon test results taken in other homes in the neighborhood to estimate the radon level in your home. Homes which are next to each other can have different indoor radon levels. Testing is the only way to find out what your home's radon level is.

In some areas, companies may offer different types of radon service agreements. Some agreements let you pay a one-time fee that covers both testing and radon mitigation, if needed. Contact your state radon office to find out if these are available in your state.

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2. I'm Selling a Home. What Should I Do?

a. If Your Home Has Already Been Tested for Radon...

If you are thinking of selling your home and you have already tested your home for radon, review the *Radon Testing Checklist* to make sure that the test was done correctly. If so, provide your test results to the buyer.

See page 20

No matter what kind of test was done, a potential buyer may ask for a new test, especially if:

- The *Radon Testing Checklist* items were not met;
- The last test is not recent, e.g., within two years;
- You have renovated or altered your home since you tested; or
- The buyer plans to use a lower level of the house than was tested, such as a basement that could be used regularly by the buyer.

A buyer may also ask for a new test if your state or local government requires disclosure of radon information to buyers.

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b. If Your Home Has *Not Yet* Been Tested for Radon...

Have a test taken as soon as possible. If you can, test your home before putting it on the market. You should test in the lowest level of the home that could be used regularly. This means testing in the lowest level that you currently live in or a lower level not currently used, but which a buyer might use as a family room or play area, etc.

The radon test result is important information about your home's radon level. Some states require radon measurement testers to follow a specific testing protocol. If you do the test yourself, you should carefully follow the testing protocol for your area or EPA's *Radon Testing Checklist*. If you hire a contractor to test your residence, protect yourself by hiring a **qualified*** individual or company.

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You can determine a service provider's qualifications to perform radon measurements or to mitigate your home in several ways. **Check with your state radon office**. Many states require radon professionals to be licensed, certified, or registered. Most states can provide you with a list of knowledgeable radon service providers doing business in the state. In states that don't regulate radon services, **ask the contractor if they hold a professional proficiency or certification credential**. Such programs usually provide members with a photo-ID card, which indicates their qualification(s) and its expiration date. If in doubt, you should check with their credentialing organization. Alternatively, **ask the contractor if they've successfully completed formal training** appropriate for testing or mitigation, e.g., a course in radon measurement or radon mitigation.

* You should first call your state radon office for information on qualified radon service providers and state-specific radon measurement or mitigation requirements. For up-to-date information on state radon program offices, visit **http://www.epa.gov/radon/whereyoulive.html**. EPA's detailed and technical guidance on radon measurement and mitigation is included in Section 8 (p. 29); however, state requirements or guidance may be more stringent. Visit **http://www.epa.gov/radon/radontest.html** for links to private sector radon credentialing programs.

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3. I'm Buying a Home. What Should I Do?

a. If the Home Has Already Been Tested for Radon...

If you are thinking of buying a home, you may decide to accept an earlier test result from the seller or ask the seller for a new test to be conducted by a qualified radon tester. Before you accept the seller's test, you should determine:

- The results of previous testing;
- Who conducted the previous test: the homeowner, a radon professional, or some other person;
- Where in the home the previous test was taken, especially if you may plan to live in a lower level of the home. For example, the test may have been taken on the first floor. However, if you want to use the basement as living space, test there; and
- What, if any, structural changes, alterations, or changes in the heating, ventilation, and air conditioning (HVAC) system have been made to the house since the test was done. Such changes might affect radon levels.

If you accept the seller's test, make sure that the test followed the *Radon Testing Checklist*.

See page 20

If you decide that a new test is needed, discuss it with the seller as soon as possible. If you decide to use a qualified radon tester, contact your state radon office to obtain a copy of their approved list of radon testing companies.

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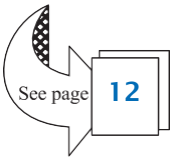
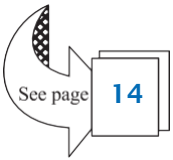
b. If the Home Has *Not Yet* Been Tested for Radon...

Make sure that a radon test is done as soon as possible. Consider including provisions in the contract specifying:



- Where the test will be located;
- Who should conduct the test;
- What type of test to do;
- When to do the test;



- How the seller and the buyer will share the test results and test costs (if necessary); and
- When radon mitigation measures will be taken, and who will pay for them.

Make sure that the test is done in the lowest level of the home that could be used regularly. This means the lowest level that you are going to use as living space whether it is finished or unfinished. A state or local radon official or qualified radon tester can help you make some of these decisions.

If you decide to finish or renovate an unfinished area of the home in the future, a radon test should be done before starting the project and after the project is finished. Generally, it is less expensive to install a radon-reduction system before (or during) renovations rather than afterwards.

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4. I'm Buying or Building a New Home. How Can I Protect My Family?

a. Why Should I Buy a Radon-Resistant Home?

Radon-resistant techniques work. When installed properly and completely, these simple and inexpensive passive techniques can help to reduce radon levels. In addition, installing them at the time of construction makes it easier to reduce radon levels further if the passive techniques don't reduce radon levels to below 4 pCi/L. Radon-resistant techniques may also help to lower moisture levels and those of other soil gases. Radon-resistant techniques:

- ***Make Upgrading Easy*:** Even if built to be radon-resistant, **every new home should be tested for radon as soon as possible after occupancy**. If you have a test result of 4 pCi/L or more, a vent fan can easily be added to the passive system to make it an active system and further reduce radon levels.

- ***Are Cost-Effective*:** Building radon-resistant features into the house during construction is easier and cheaper than fixing a radon problem from scratch later. Let your builder know that radon-resistant features are easy to install using common building materials.

- ***Save Money*:** When installed properly and completely, radon-resistant techniques can also make your home more energy efficient and help you save on your energy costs.

Including passive radon-resistant features in a **new home** during construction usually costs less than fixing the home later. If your radon level is 4 pCi/L or more, consult a qualified mitigator to estimate the cost of upgrading to an active system by adding a vent fan to reduce the radon level. In an **existing home,** the cost to install a radon mitigation system is about the same as for other common home repairs. Check with, and get an estimate from, one or more qualified mitigators before fixing.

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b. What Are Radon-Resistant Features?

Radon-resistant techniques (features) may vary for different foundations and site requirements. If you're having a house built, ask your builder if they're using a recognized approach (International Residential Code, Appendix F, ASTM E 1465-08, and ANSI/AARST RRNC 2.0 as examples). If your new house was built (or will be built) to be radon-resistant, it will include these basic elements:

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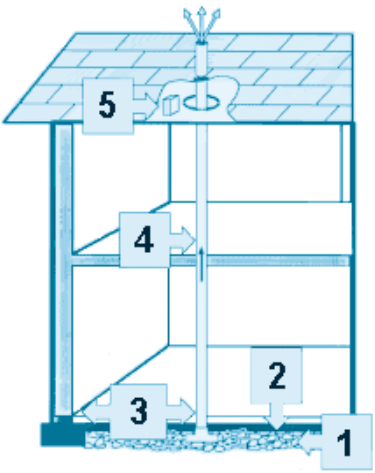
1. **Gas-Permeable Layer:** This layer is placed beneath the slab or flooring system to allow the soil gas to move freely underneath the house. In many cases, the material used is a 4-inch layer of clean gravel. This gas-permeable layer is used only in homes with basement and slab-on-grade foundations; it is not used in homes with crawlspace foundations.

2. **Plastic Sheeting:** Plastic sheeting is placed on top of the gas-permeable layer and under the slab to help prevent the soil gas from entering the home. In crawl spaces, the sheeting (with seams sealed) is placed directly over the crawlspace floor.

3. **Sealing and Caulking:** All below-grade openings in the foundation and walls are sealed to reduce soil gas entry into the home.

4. **Vent Pipe:** A 3- or 4-inch PVC pipe (or other gas-tight pipe) runs from the gas-permeable layer through the house to the roof, to safely vent radon and other soil gases to the outside.

5. **Junction Boxes:** An electrical junction box is included in the attic to make the wiring and installation of a vent fan easier. For example, you decide to activate the passive system because your test result showed an elevated radon level (4 pCi/L or more). A separate junction box is placed in the living space to power the vent fan alarm. An alarm is installed along with the vent fan to indicate when the vent fan is not operating properly.



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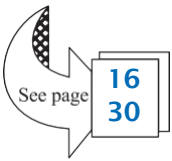
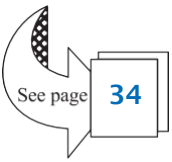
5. How Can I Get Reliable Radon Test Results?

Radon testing is easy and the only way to find out if you have a radon problem in your home.

a. Types of Radon Devices

Since you cannot see or smell radon, special equipment is needed to detect it. When you're ready to test your home, you can order a radon test kit by mail from a qualified radon measurement services provider or laboratory. You can also hire a qualified radon tester, very often a home inspector, who will use a radon device(s) suitable to your situation. The most common types of radon testing devices are listed below. As new testing devices are developed, you may want to check with your state radon office before you test to get the most up-to-date information.





✓ *Passive Devices*

Passive radon testing devices do not need power to function. These include **charcoal canisters, alpha-track detectors, charcoal liquid scintillation devices,** and **electret ion chamber detectors,** which are available in hardware, drug, and other stores; they can also be ordered by mail or phone. These devices are exposed to the air in the home for a specified period of time and then sent to a laboratory for analysis. Both short-term and long-term passive devices are generally inexpensive. Some of these devices may have features that offer more resistance to test interference or disturbance than other passive devices. Qualified radon testers may use any of these devices to measure the home's radon level.

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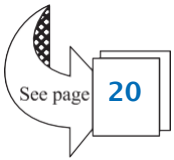
✓ *Active Devices*

Active radon testing devices require power to function. These include **continuous radon monitors** and **continuous working level monitors**. They continuously measure and record the amount of radon or its decay products in the air. Many of these devices provide a report of this information which can reveal any unusual or abnormal swings in the radon level during the test period. A qualified tester can explain this report to you. In addition, some of these devices are specifically designed to deter and detect test interference. Some technically advanced active devices offer anti-interference features. Although these tests may cost more, they may ensure a more reliable result.

b. General Information for All Devices

A state or local radon official can explain the differences between devices and recommend the ones which are most appropriate for your needs and expected testing conditions.

Make sure to use a radon measurement device from a qualified laboratory. Certain precautions should be followed to avoid interference during the test period; see the *Radon Testing Checklist* for more information on how to get a reliable test result.



Radon Test Device Placement

EPA recommends that the test device(s) be placed in the lowest level of the home that could be used regularly, whether it is finished or unfinished. Conduct the test in any space that could be used by the buyer as a bedroom, play area, family room, den, exercise room, or workshop. Based on their client's intended use of the space, the qualified testing professional should identify the appropriate test location and inform their client (buyer). Do **not** test in a closet, stairway, hallway, crawl space or in an enclosed area of high humidity or high air velocity. An enclosed area may include a kitchen, bathroom, laundry room or furnace room.

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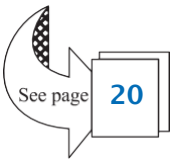
c. Preventing or Detecting Test Interference

There is a potential for test interference in real estate transactions. There are several ways to prevent or detect test interference:

- Use a test device that frequently records radon or decay product levels to detect unusual swings;
- Employ a motion detector to determine whether the test device has been moved or if testing conditions have changed;
- Use a proximity detector to reveal the presence of people in the room which may correlate to possible changes in radon levels during the test;
- Record the barometric pressure to identify weather conditions which may have affected the test;
- Record the temperature to help assess whether doors and windows have been opened;
- Apply tamper-proof seals to windows to ensure closed-house conditions; and
- Have the seller/occupant sign a non-interference agreement.



Home buyers and sellers should consult a qualified radon test provider about the use of these precautions.

d. Length of Time to Test

Because radon levels tend to vary from day to day and season to season, a short-term test is less likely than a long-term test to tell you your year-round average radon level. However, if you need results quickly, a short-term test may be used to decide whether to fix the home.

There Are Two General Ways to Test Your Home for Radon:

✓ *Short-Term Testing*

The quickest way to test is with short-term tests. Short-term tests remain in your home from two to 90 days, depending on the device. There are two groups of devices which are more commonly used for short-term testing. The passive device group includes **alpha track detectors, charcoal canisters, charcoal liquid scintillation detectors,** and **electret ion chambers**. The active device group consists of different types of **continuous monitors**.

> Whether you test for radon yourself or hire a qualified tester, all radon tests should be taken for a minimum of 48 hours. Some devices require a longer (minimum) length of time, e.g., a 7-day charcoal canister device.

✓ *Long-Term Testing*

Long-term tests remain in your home for more than 90 days. **Alpha track** and **electret ion chamber detectors** are commonly used for this type of testing. A long-term test result is more likely to tell you your home's year-round average radon level than a short-term test. If time permits (more than 90 days), long-term tests can be used to confirm initial short-term results. When long-term test results are 4 pCi/L or higher, EPA recommends fixing the home.

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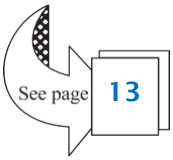
e. Doing a Short-Term Test...

If you are testing in a real estate transaction and you need results quickly, any of the following three options for short-term tests are acceptable in determining whether the home should be fixed. Any real estate test for radon should include steps to prevent or detect interference with the test device.



When Choosing a Short-Term Testing Option...

There are trade-offs among the short-term testing options. Two tests taken at the same time (simultaneous) would improve the precision of this radon test. One test followed by another test (sequential) would most likely give a better representation of the seasonal average. Both active and passive devices may have features which help to prevent test interference. Your state radon office can help you decide which option is best.

Short-Term Testing Options	What to Do Next
Passive: Take two short-term tests at the same time in the same location for at least 48 hours.	Fix the home if the average of the two tests is 4 pCi/L or more.
or	
Take an initial short-term test for at least 48 hours. Immediately upon completing the first test, do a second test using an identical device in the same location as the first test.	Fix the home if the average of the two tests is 4 pCi/L or more.
Active: Test the home with a continuous monitor for at least 48 hours.	Fix the home if the average radon level is 4 pCi/L or more.

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f. Using Testing Devices Properly for Reliable Results

✓ *If You Do the Test Yourself*

When you are taking a short-term test, close windows and doors to the outside and keep them closed, except for normal entry and exit. If you are taking a short-term test lasting less than four days, be sure to:

- Close your windows and outside doors at least 12 hours before beginning the test;
- Do not conduct short-term tests lasting less than four days during severe storms or periods of high winds;
- Follow the testing instructions and record the start time and date;
- Place the test device at least 20 inches above the floor in a location where it will not be disturbed and where it will be away from drafts, high heat, high humidity, and exterior walls;
- Leave the test kit in place for as long as the test instructions say; and
- Once the test is finished, record the stop time and date, reseal the package, and return it immediately to the lab specified on the package for analysis.

You should receive your test results within a few days or weeks. If you need results quickly, you should find out how long results will take and, if necessary, request expedited service.

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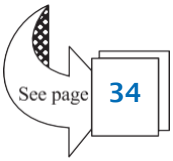
✓ *If You Hire a Qualified Radon Tester*



In many cases, home buyers and sellers may decide to have the radon test done by a qualified radon tester who knows the proper conditions, test devices, and guidelines for obtaining a reliable radon test result. They can also:

- Evaluate the home and recommend a testing approach designed to make sure you get reliable results;
- Explain how proper conditions can be maintained during the radon test;
- Emphasize to a home's occupants that a reliable test result depends upon their cooperation. Interference with, or disturbance of, the test or closed-house conditions will invalidate the test result;
- Analyze the data and report the measurement results; and
- Provide an independent test result.

Your state radon office may also have information about qualified radon testers and certification requirements.

g. Interpreting Radon Test Results

The average indoor radon level is estimated to be about 1.3 pCi/L; roughly 0.4 pCi/L of radon is normally found in the outside air. The U.S. Congress has set a long-term goal that indoor radon levels be no more than outdoor levels. While this goal is not yet technologically achievable for all homes, radon levels in many homes *can* be reduced to 2 pCi/L or less. A radon level below 4 pCi/L still poses a risk. Consider fixing when the radon level is between 2 and 4 pCi/L.

Radon and Smoking

RADON RISK IF YOU SMOKE

Radon Level	If 1,000 people who smoked were exposed to this level over a lifetime*. . .	The risk of cancer from radon exposure compares to**. . .	WHAT TO DO: Stop Smoking and. . .
20 pCi/L	About 260 people could get lung cancer	250 times the risk of drowning	Fix your home
10 pCi/L	About 150 people could get lung cancer	200 times the risk of dying in a home fire	Fix your home
8 pCi/L	About 120 people could get lung cancer	30 times the risk of dying in a fall	Fix your home
4 pCi/L	About 62 people could get lung cancer	5 times the risk of dying in a car crash	Fix your home
2 pCi/L	About 32 people could get lung cancer	6 times the risk of dying from poison	Consider fixing between 2 and 4 pCi/L
1.3 pCi/L	About 20 people could get lung cancer	(Average indoor radon level)	(Reducing radon levels below 2 pCi/L is difficult)
0.4 pCi/L	About 3 people could get lung cancer	(Average outdoor radon level)	

Note: If you are a former smoker, your risk may be lower.

RADON RISK IF YOU HAVE NEVER SMOKED

Radon Level	If 1,000 people who never smoked were exposed to this level over a lifetime*. . .	The risk of cancer from radon exposure compares to**. . .	WHAT TO DO:
20 pCi/L	About 36 people could get lung cancer	35 times the risk of drowning	Fix your home
10 pCi/L	About 18 people could get lung cancer	20 times the risk of dying in a home fire	Fix your home
8 pCi/L	About 15 people could get lung cancer	4 times the risk of dying in a fall	Fix your home
4 pCi/L	About 7 people could get lung cancer	The risk of dying in a car crash	Fix your home
2 pCi/L	About 4 people could get lung cancer	The risk of dying from poison	Consider fixing between 2 and 4 pCi/L
1.3 pCi/L	About 2 people could get lung cancer	(Average indoor radon level)	(Reducing radon levels below 2 pCi/L is difficult)
0.4 pCi/L		(Average outdoor radon level)	

Note: If you are a former smoker, your risk may be higher.
*Lifetime risk of lung cancer deaths from *EPA Assessment of Risks from Radon in Homes* (EPA 402-R-03-003).
**Comparison data calculated using the Centers for Disease Control and Prevention's 1999-2001 National Center for Injury Prevention and Control Reports.

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Sometimes short-term tests are less definitive about whether the radon level in the home is at or above 4 pCi/L; particularly when the results are close to 4 pCi/L. For example, if the average of two short-term tests is 4.1 pCi/L, there is about a 50 percent chance that the year-round average is somewhat below, or above, 4 pCi/L.

However, EPA believes that any radon exposure carries some risk; no level of radon is safe. Even radon levels below 4 pCi/L pose some risk. You can reduce your risk of lung cancer by lowering your radon level.

As with other environmental pollutants, there is some uncertainty about the magnitude of radon health risks. However, we know more about radon risks than risks from most other cancer-causing substances. This is because estimates of radon risks are based on data from human studies (underground miners). Additional studies on more typical populations are under way.

Your radon measurement will give you an idea of your risk of getting lung cancer. Your chances of getting lung cancer from radon depend mostly on:

- ✓ Your home's radon level;
- ✓ The amount of time you spend in your home; and
- ✓ Whether you are a smoker or have ever smoked.

Smoking combined with radon is an especially serious health risk. If you smoke or are a former smoker, the presence of radon greatly increases your risk of lung cancer. If you stop smoking now and lower the radon level in your house, you will reduce your lung cancer risk.

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Radon Testing Checklist

For reliable test results, follow this *Radon Testing Checklist* carefully. Testing for radon is not complicated. Improper testing may yield inaccurate results and require another test. Disturbing or interfering with the test device, or with **closed-house conditions***, may invalidate the test results and is illegal in some states. If the seller or qualified tester cannot confirm that all items have been completed, take another test.

✓ *Before Conducting a Radon Test:*

- ☐ Notify the occupants of the importance of proper testing conditions. Give the occupants written instructions or a copy of this *Guide* and explain the directions carefully.
- ☐ Conduct the radon test for a minimum of 48 hours; some test devices have a minimum exposure time greater than 48 hours.
- ☐ When doing a short-term test ranging from 2-4 days, it is important to maintain closed-house conditions for at least 12 hours before the beginning of the test and during the entire test period.
- ☐ When doing a short-term test ranging from 4-7 days, EPA recommends that closed-house conditions be maintained.
- ☐ If you conduct the test yourself, use a qualified radon measurement device and follow the laboratory's instructions. Your state may be able to provide you with a list of do-it-yourself test devices available from qualified laboratories.
- ☐ If you hire someone to do the test, hire only a qualified individual. Some states issue photo identification (ID) cards; ask to see it. The tester's ID number, if available, should be included or noted in the test report.

*Closed-house conditions means keeping all windows closed, keeping doors closed except for normal entry and exit, and not operating fans or other machines which bring in air from outside. Fans that are part of a radon-reduction system or small exhaust fans operating for only short periods of time may run during the test.

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Radon Testing Checklist

(continued)

- ☐ The test should include method(s) to prevent or detect interference with testing conditions or with the testing device itself.

- ☐ If the house has an active radon-reduction system, make sure the vent fan is operating properly. If the fan is not operating properly, have it (or ask to have it) repaired and then test.

✓ *During a Radon Test*:

- ☐ Maintain closed-house conditions during the entire duration of a short-term test, especially for tests shorter than one week in length.

- ☐ Operate the home's heating and cooling systems normally during the test. For tests lasting less than one week, operate only air-conditioning units which recirculate interior air.

- ☐ Do not disturb the test device at any time during the test.

- ☐ If a radon-reduction system is in place, make sure the system is working properly and will be in operation during the entire radon test.

✓ *After a Radon Test*:

- ☐ If you conduct the test yourself, be sure to promptly return the test device to the laboratory. Be sure to complete the required information, including start and stop times, test location, etc.

- ☐ If an elevated radon level is found, fix the home. Contact a qualified radon-reduction contractor about lowering the radon level. EPA recommends that you fix the home when the radon level is 4 pCi/L or more.

- ☐ Be sure that you or the radon tester can demonstrate or provide information to ensure that the testing conditions were not violated during the testing period.

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6. What Should I Do if the Radon Level is High?

a. High Radon Levels Can Be Reduced

EPA recommends that you take action to reduce your home's indoor radon levels if your radon test result is 4 pCi/L or higher. It is better to correct a radon problem before placing your home on the market because then you have more time to address a radon problem.

If elevated levels are found during the real estate transaction, the buyer and seller should discuss the timing and costs of radon reduction. The cost of making repairs to reduce radon levels depends on how your home was built and other factors. Most homes can be fixed for about the same cost as other common home repairs. Check with and get an estimate from one or more qualified mitigators.

b. How to Lower the Radon Level in Your Home

A variety of methods can be used to reduce radon in homes. Sealing cracks and other openings in the foundation is a basic part of most approaches to radon reduction. EPA does not recommend the use of sealing alone to limit radon entry. Sealing alone has not been shown to lower radon levels significantly or consistently.

In most cases, a system with a vent pipe(s) and fan(s) is used to reduce radon. These "sub-slab depressurization" systems do not require major changes to your home. Similar systems can also be installed in homes with crawl spaces. These systems prevent radon gas from entering the home from below the concrete floor and from outside the foundation. Radon mitigation contractors may use other methods that may also work in your home. The right system depends on the design of your home and other factors.

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Techniques for reducing radon are discussed in EPA's *Consumer's Guide to Radon Reduction*. As with any other household appliance, there are costs associated with the operation of a radon-reduction system.

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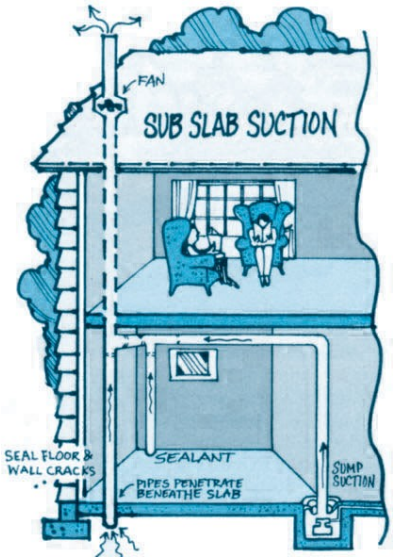
Radon and Home Renovations

If you are planning any major renovations, such as converting an unfinished basement area into living space, it is especially important to test the area before you begin.

If your test results indicate an elevated radon level, radon-resistant techniques can be inexpensively included as part of the renovation. Major renovations can change the level of radon in any home. Test again after the work is completed.

You should also test your home again after it is fixed to be sure that radon levels have been reduced. If your living patterns change and you begin occupying a lower level of your home (such as a basement), you should retest your home on that level. In addition, it is a good idea to retest your home sometime in the future to be sure radon levels remain low.



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c. Selecting a Radon-Reduction (Mitigation) Contractor

Select a qualified radon-reduction contractor to reduce the radon level in your home. Any mitigation measures taken or system installed in your home must conform to your state's regulations. In states without regulations covering mitigation, EPA recommends that the system conform to ASTM E 2121.

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EPA recommends that the mitigation contractor review the radon measurement results before beginning any radon-reduction work. Test again after the radon mitigation work has been completed to confirm that previous elevated levels have been reduced. EPA recommends that the test be conducted by an independent, qualified radon tester.

d. What Can a Qualified Radon-Reduction Contractor Do for You?

A qualified radon-reduction (mitigation) contractor should be able to:

- Review testing guidelines and measurement results, and determine if additional measurements are needed;
- Evaluate the radon problem and provide you with a detailed, written proposal on how radon levels will be lowered;
- Design a radon-reduction system;
- Install the system according to EPA recommended standard, or state and local codes; and
- Make sure the finished system effectively reduces radon levels to acceptable levels.

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Choose a radon mitigation contractor to fix your radon problem just as you would for any other home repair. You may want to get more than one estimate, and ask for and check their references. Make sure the person you hire is qualified to install a mitigation system. Some states regulate or certify radon mitigation services providers.

Be aware that a potential conflict of interest exists if the same person or firm performs the testing and installs the mitigation system. Some states may require the homeowner to sign a waiver in such cases. If the same person or firm does the testing and mitigation, make sure the testing is done in accordance with the *Radon Testing Checklist*. Contact your state radon office for more information.

e. Radon in Water

The radon in your home's indoor air can come from two sources, the soil or your water supply. Compared to radon entering your home through the water, radon entering your home through the soil is a much larger risk. If you've tested for radon in air and have elevated radon levels **and** your water comes from a private well, have your water tested. The devices and procedures for testing your home's water supply are different from those used for measuring radon in air.

The radon in your water supply poses an inhalation risk and an ingestion risk. Research has shown that your risk of lung cancer from breathing radon in air is much larger than your risk of stomach cancer from swallowing water with radon in it. Most of your risk from radon in water comes from radon released into the air when water is used for showering and other household purposes.

Radon in your home's water is not usually a problem when its source is surface water. A radon in water problem is more likely when its source is ground water, e.g., a private well or a public water supply system that uses ground water. Some public water systems treat their water to reduce radon levels before it is delivered to your home. If you are concerned that radon may be entering your home through the water and your water comes from a public water supply, contact your water supplier.

If you've tested your private well and have a radon in water problem, it can be fixed. Your home's water supply can be treated in one of two ways. **Point-of-entry** treatment can effectively remove radon from the water before it enters your home. Point-of-entry treatment usually employs either granular activated carbon (GAC) filters or aeration devices. While GAC filters usually cost less than aeration devices, filters can collect radioactivity and may require a special method of disposal. **Point-of-use** treatment devices remove radon from your water at the tap, but only treat a small portion of the water you use, e.g., the water you drink. Point-of-use devices are not effective in reducing the risk from breathing radon released into the air from all water used in the home.

For information on radon in water, testing and treatment, and existing or planned radon in drinking water standards, visit https://archive.epa.gov/water/archive/web/html/index-9.html, an EPA web site. If your water comes from a private well, you can also contact your state radon office.

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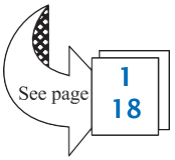
7. Radon Myths and Facts

***MYTH* #1**: Scientists are not sure that radon really is a problem.

FACT: Although some scientists dispute the precise number of deaths due to radon, all the major health organizations (like the Centers for Disease Control, the American Lung Association, and the American Medical Association) agree with estimates that radon causes thousands of preventable lung cancer deaths every year. This is especially true among smokers, since the risk to smokers is much greater than to non-smokers.

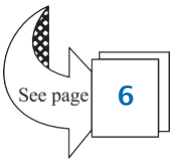


***MYTH* #2**: Radon testing devices are not reliable and are difficult to find.

FACT: Reliable radon tests are available from qualified radon testers and companies. Active radon devices can continuously gather and periodically record radon levels to reveal any unusual swings in the radon level during the test. Reliable testing devices are also available by phone or mail-order, and can be purchased in hardware stores and other retail outlets. Contact your state radon office for a list of qualified radon test companies.

***MYTH* #3**: Radon testing is difficult and time-consuming.

FACT: Radon testing is easy. You can test your home yourself or hire a qualified radon test company. Either approach takes only a small amount of time and effort.



***MYTH* #4**: Homes with radon problems cannot be fixed.

FACT: There are solutions to radon problems in homes. Thousands of home owners have already lowered their radon levels. Most homes can be fixed for about the same cost as other common home repairs. Contact your state radon office for a list of qualified mitigation contractors.

***MYTH* #5**: Radon only affects certain types of homes.

FACT: Radon can be a problem in all types of homes, including old homes, new homes, drafty homes, insulated homes, homes with basements, and homes without basements. Local geology, construction materials, and how the home was built are among the factors that can affect radon levels in homes.

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***MYTH* #6**: Radon is only a problem in certain parts of the country.

FACT: High radon levels have been found in every state. Radon problems do vary from area to area, but the only way to know a home's radon level is to test.

***MYTH* #7**: A neighbor's test result is a good indication of whether your home has a radon problem.

FACT: It is not. Radon levels vary from home to home. The only way to know if your home has a radon problem is to test it.

***MYTH* #8**: Everyone should test their water for radon.

FACT: While radon gets into some homes through the water, it is important to first test the air in the home for radon. If your water comes from a public water system that uses ground water, call your water supplier. If high radon levels are found and the home has a private well, call the Safe Drinking Water Hotline at (800) 426-4791 for information on testing your water. Also, call your state radon office for more information about radon in air.

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***MYTH* #9**: It is difficult to sell a home where radon problems have been discovered.

FACT: Where radon problems have been fixed, home sales have not been blocked. The added protection will be a good selling point.

***MYTH* #10**: I have lived in my home for so long, it does not make sense to take action now.

FACT: You will reduce your risk of lung cancer when you reduce radon levels, even if you have lived with an elevated radon level for a long time.

***MYTH* #11**: Short-term tests cannot be used for making a decision about whether to reduce the home's high radon levels.

FACT: Short-term tests can be used to decide whether to reduce the home's high radon levels. However, the closer the short-term testing result is to 4 pCi/L, the less certainty there is about whether the home's year-round average is above or below that level. Keep in mind that radon levels below 4 pCi/L still pose some risk and that radon levels can be reduced to 2 pCi/L or below in most homes.

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8. Need More Information about Radon?

If you have a radon-related question, you should contact your state radon office. The following web sites, hotlines, and publications are your best sources of information. Visit our Frequent Questions web site at https://iaq.zendesk.com/hc/en-us/sections/202370518-Indoor-Air-Quality. You can also find indoor air quality information and publications on EPA's many web sites.

a. World Wide Web Sites (EPA)

These are EPA's most important web sites for information on radon and indoor air quality in homes. All the EPA publications listed in this section are available on EPA's web sites.

- https://www.epa.gov/radon/. EPA's main radon page. Includes links to the NAS radon report, radon-resistant new construction, the map of radon zones, radon publications, hotlines, and more.

- https://www.epa.gov/radon/find-information-about-local-radon-zones-and-state-contact-information. Provides detailed information on contacting your state's radon office, including links to some state web sites. State indoor air quality contacts are also included.

- https://www.epa.gov/radon/publications-about-radon. Offers the full text version of EPA's most popular radon publications, including the *Home Buyer's and Seller's Guide to Radon*, the *Consumer's Guide to Radon Reduction*, and the
  - *Model Standards and Techniques for Control of Radon in New Residential Buildings*, and others.

- https://www.epa.gov/iaq. EPA's main page on indoor air quality. Includes information on indoor risk factors, e.g., asthma, secondhand smoke, carbon monoxide, duct cleaning, ozone generating devices, indoor air cleaners, flood
  - cleanup, etc.

- https://archive.epa.gov/water/archive/web/html/index-9.html. EPA's main page on radon in water. Includes information on statutory requirements and links to the drinking water standards program.

EPA 402/K-13/002 | March 2018 (revised)

b. Radon Hotlines (Toll-Free)

EPA supports the following hotlines to best serve consumers with radon-related questions and concerns.

☎ **1-800-SOS-RADON (767-7236).*** Purchase radon test kits by phone.

☎ **1-800-55RADON (557-2366).*** Get live help for your radon questions.

☎ **1-800-644-6999**.* Radon Fix-It Hotline. For general information on fixing or reducing the radon level in your home.

☎ **1-866-528-3187**.* Línea Directa de Información sobre Radón en Español. Hay operadores disponibles desde las 9:00 AM hasta las 5:00 PM para darle información sobre radón y como ordenar un kit para hacer la prueba de radón en su hogar.

☎ **1-800-426-4791**. Safe Drinking Water Hotline. For general information on drinking water, radon in water, testing and treatment, and standards for radon in drinking water. Operated under a contract with EPA.

*Operated by Kansas State University in partnership with EPA.

EPA 402/K-13/002 | March 2018 (revised)

9. State Radon Offices

(https://www.epa.gov/radon/find-information-about-local-radon-zones-and-state-contact-information

Up-to-date information on how to contact your state radon office is available on the web (above). You will also find a list of state hotlines, state indoor air coordinators, and state web sites (if available). Some states can also provide you with a list of qualified radon services providers. Native Americans living on Tribal Lands should contact their Tribal Health Department or Housing Authority for assistance.

EPA 402/K-13/002 | March 2018 (revised)

10. EPA Regional Offices

(https://www.epa.gov/radon/find-information-about-local-radon-zones-and-state-contact-information

E

REGION	STATES	PHONE / FAX
US EPA New England/ **Region 1** One Congress Street, Suite 1100 John F. Kennedy Federal Bldg. Boston, MA 02114-2023	CT, MA, ME, NH, RI, VT	617-918-1630 617-918-4940-fax
US EPA/ **Region 2** 290 Broadway, 28th Floor New York, NY 10007-1866	NJ, NY, PR, VI	212-637-3745 212-637-4942-fax
US EPA/ **Region 3** 1650 Arch Street Philadelphia, PA 19103	DC, DE, MD, PA, VA , WV	800-438-2474 Toll-free 215-814-2086 215-814-2101-fax
US EPA/ **Region 4** 61 Forsyth Street, SW Atlanta, GA 30303-3104	AL, FL, GA, KY, MS, NC, SC, TN	404-562-9145 404-562-9095-fax
US EPA/ **Region 5** 77 West Jackson Blvd., (AE-17J) Chicago, IL 60604	IL, IN, MI, MN, OH, WI	312-353-6686 312-886-0617-fax
US EPA/ **Region 6** 1445 Ross Avenue (6PD-T) Dallas, TX 75202-2733	AR, LA, NM, OK, TX	800-887-6063 Toll-free 214-665-7550 214-665-6762-fax
US EPA/ **Region 7** 901 North 5th Street (ARTD / RALI) Kansas City, KS 66101	IA, KS, MO, NE	913-551-7260 913-551-7065-fax
US EPA/ **Region 8** 999 18th Street, Suite 500 (8P-AR) Denver, CO 80202-2466	CO, MT, ND, SD, UT, WY	800-227-8917 Toll-free 303-312-6031 303-312-6044-fax
US EPA/ **Region 9** 75 Hawthorne Street (Air-6) San Francisco, CA 94105	AZ, CA, HI, NV, GUAM	415-744-1046 415-744-1073-fax
US EPA/ **Region 10** 1200 Sixth Avenue (OAQ-107) Seattle, WA 98101	AK, ID, OR, WA	206-553-7299 206-553-0110-fax

EPA 402/K-13/002 | March 2018 (revised)

11. Index

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U.S. SURGEON GENERAL HEALTH ADVISORY

"Indoor radon is the second-leading cause of lung cancer in the United States and breathing it over prolonged periods can present a significant health risk to families all over the country. It's important to know that this threat is completely preventable. Radon can be detected with a simple test and fixed through well-established venting techniques." January 2005

Consumers need to know about the health of a house they are considering purchasing, including whether there is a radon problem, and if so, how to fix it. The *Home Buyer's and Seller's Guide to Radon* provides practical consumer information that every home buyer needs to know.

Consumer Federation of America Foundation

AMERICAN LUNG ASSOCIATION®

NATIONAL ENVIRONMENTAL HEALTH ASSOCIATION

NACO National Association of Counties

American Society of Home Inspectors

ENVIRONMENTAL LAW • INSTITUTE®

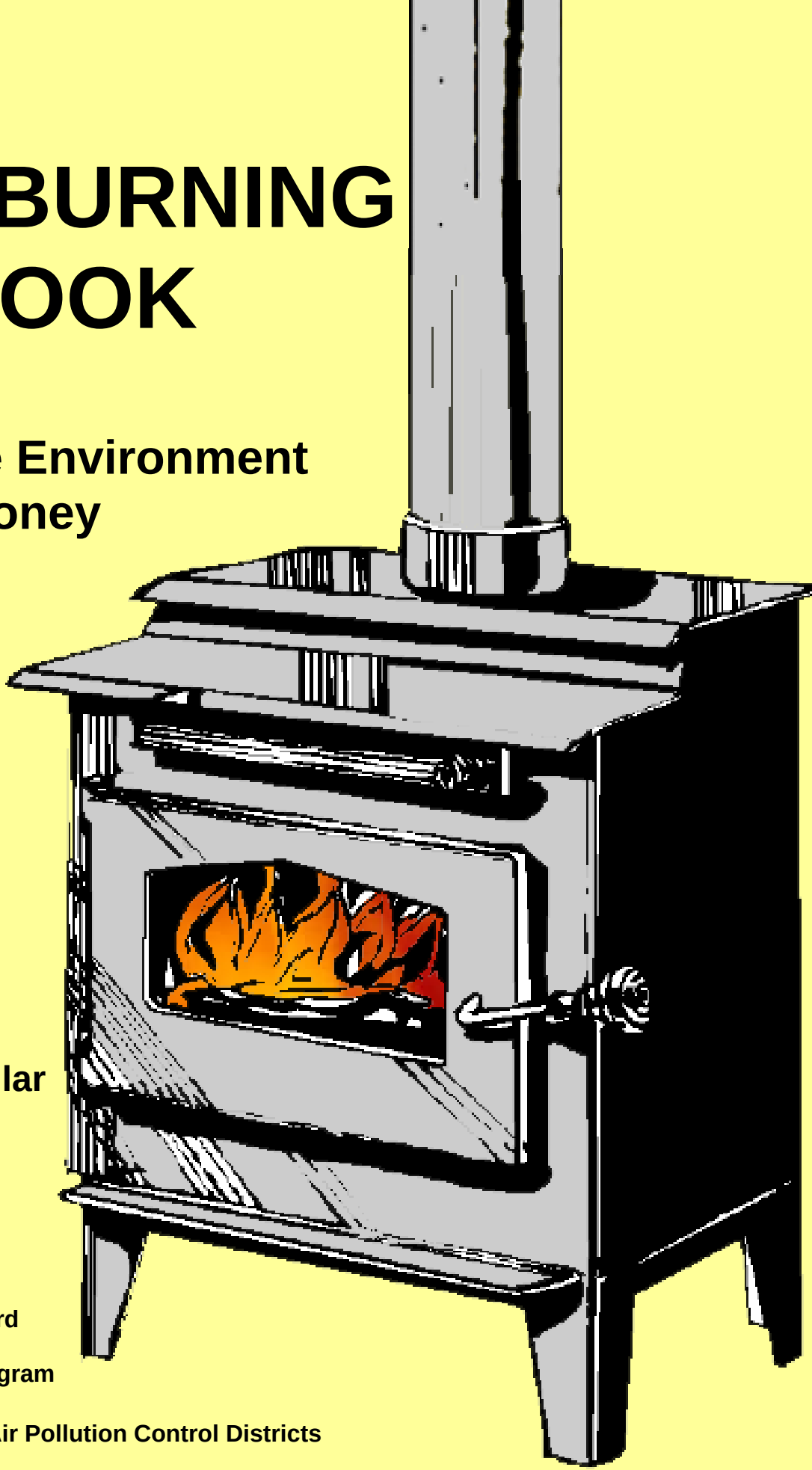
National Safety Council

EPA United States Environmental Protection Agency

Indoor Environments Division (6609J)
EPA 402/K-13/002 | September 2013 (revised) | www.epa.gov/radon

WOOD BURNING HANDBOOK

Protecting the Environment and Saving Money



Alternatives to Burning Wood

Reducing Wood Smoke Pollution

Getting More Heat For Your Fuel Dollar

Cal/EPA Air Resources Board
Enforcement Division
Compliance Assistance Program

In Cooperation With Local Air Pollution Control Districts

Burning Wood Produces Wood Smoke and Air Pollution!

The California Environmental Protection Agency and your local air district are asking you to help clear the air of wood smoke. In this handbook you will find information about the air pollutants in wood smoke, health effects of smoke, how wood burns, why it smokes and how you can reduce wood smoke pollution.

Smoke from neighborhood stoves and fireplaces, a common source of both odor and reduced visibility, greatly contributes to the air pollution problems people complain about most. When you include the health-related problems caused by inhaling smoke pollutants, health costs for individuals and the community can be significant. To be a good neighbor, eliminate wood burning. If you do burn, learn to limit the amount of wood smoke produced.

Sources of Wood Burning and Air Pollution…

Air pollution affects millions of Californians every day. It damages our health, our crops, our property and our environment. In neighborhoods everywhere across California, residential wood burning is a growing source of air pollution. Most wood heaters, such as woodstoves and fireplaces, release far more air pollution, indoors and out, than heaters using other fuels. In winter, when we heat our homes the most, cold nights with little wind cause smoke and air pollutants to remain stagnate at ground level for long periods.

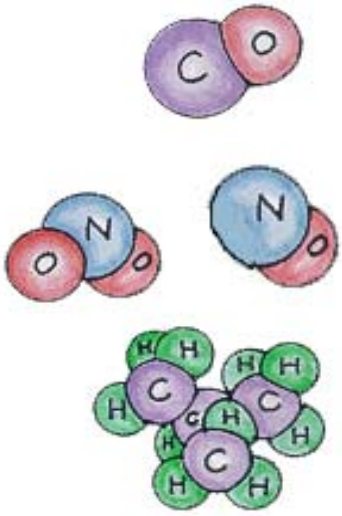
Burning Wood Causes Indoor Air Pollution

High levels of smoke pollutants leaking from stoves and fireplaces have been measured in some wood burning homes. If you or family members suffer from chronic or repeated respiratory problems like asthma or emphysema, or have heart disease, you should not burn wood at all. If you must burn wood, make sure your stove or fireplace doesn't leak and that you operate it correctly.

Remember - If you can smell smoke, you are breathing smoke!

What Happens when Wood Burns?

Complete combustion gives off light, heat, and the gases carbon dioxide and water vapor. Because when wood burns complete combustion does not occur, it also produces wood smoke, which contains the following major air pollutions, regulated by State and federal rules because of their known health effects:



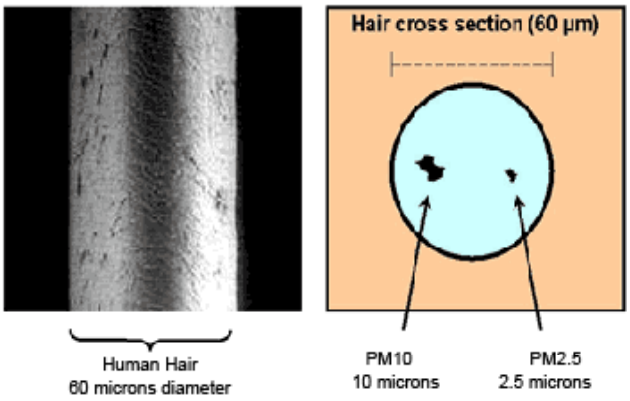
Carbon Monoxide (CO) – An odorless, colorless gas, produced in large amounts by burning wood with insufficient air. CO reduces the blood's ability to supply oxygen to body tissues, and can cause stress on your heart and reduce your ability to exercise. Exposure to CO can cause long-term health problems, dizziness, confusion, severe headache, unconsciousness and even death. Those most at risk from CO poisoning are the unborn child, and people with anemia, heart, circulatory or lung disease.

Oxides of Nitrogen (NOx) – NOx impairs the respiratory system and its ability to fight infection. NOx also combines with VOCs to make ozone and with water vapor to form acid rain or acid fog.

Volatile Organic Compounds (VOCs) – Evaporated carbon compounds which react with NOx in sunlight to form ozone (photochemical smog). Ozone injures the lungs and makes breathing difficult, especially in children and exercising adults. NOx and VOCs also form particulate matter through reactions in the atmosphere.

Toxic Pollutants - Wood smoke also contains VOCs which include toxic and/or cancer-causing substances, such as benzene, formaldehyde and benzo-a-pyrene, a polycyclic aromatic hydrocarbon (PAH). Manufactured fireplace logs, for instance, are not recommended for burning because they produce toxic fumes, including PCBs (polychlorinated biphenyls). Researchers are now studying these and other smoke products to learn more about their effects on human health.

Relative Size of Particulate Matter



Particulate Matter less than 10 microns in diameter (PM10) are very small droplets of condensed organic vapors of wood tar and gases. These particles are a result of unburned fuel and have a diameter of 10 microns or smaller (the diameter of a human hair is about 50 to 100 microns), which allows them to be inhaled into the lungs. Exposure to PM10 aggravates a number of respiratory illnesses.

PM10 includes a smaller group of particles called **PM2.5**, particles with diameters of 2.5 microns and less. These finer particles pose an increased health risk because they can lodge deep in the lungs and contain substances that are particularly harmful to human health, contributing to lung diseases and cancer. Exposure to PM2.5 may even cause early death in people with existing heart and lung disease.

Fireplaces and Old Woodstoves Are Inefficient, Expensive Heaters!

Why…Because of the Way Wood Burns -

As the fire temperature rises, different stages occur:

Stage 1 – Water Boils Off

As the log heats, moisture contained in the log vaporizes, and escapes through the log's surface as water vapor. More energy is used up vaporizing the moisture than is used to burn the log. That heat energy could be warming your house instead of drying your wood before it burns.

Stage 2 - Vaporizes Wood Gases

Before burning, firewood "cooking" creates and releases hundreds of new volatile organic gases, which contain VOCs, tars and charcoal or carbon. Because the log temperature at this stage is too low to burn gases and tars, they escape up the flue. As they cool, some of the gases will combine with water vapor to form highly flammable **creosote** that sticks to the flue walls; other gases condense into smoke particles.

Stage 3 - Log Charcoal Burns

At temperatures above 600 degrees Fahrenheit the escaping gases start burning, ignited by nearby flames. As the temperature reaches 1000 degrees, the log charcoal burns and emits heat. Burning the charcoal produces most of the fire's usable heat.

As you can see, most of your investment in wood goes up in smoke. This is an expensive way to produce a little heat!

Most Fireplaces are Not Good Heaters!

Most fireplaces rob your house of heat because they draw air from the room and send it up the chimney! Yes, you'll be warmed if you sit within six feet of the fire, but the rest of your house is getting colder as outdoor air leaks in to replace the hot air going up the chimney.

The key to burning clean and hot is to control the airflow. Most fireplaces waste wood because of unrestricted airflow. A lot of air helps the fire burn fast, but a load of wood will last only one or two hours.

Some older fireplaces actually pollute more if you install glass doors on an old fireplace insert that is not a certified clean-burning model. Restricting the air supply causes the fire to smolder and smoke. Make sure you install a new, certified clean-burning fireplace insert.

Where Does Your Heat Go? Check your Insulation and Weather-Stripping

Warm air is always escaping from your house, and is replaced by unheated outdoor air. The typical house has one-half to two air exchanges per hour, and more on windy and/or very cold days. If your house has little insulation and many air leaks, you are paying to heat the outdoors**. And if the outside air is smoky, soon your air inside will be too.**

Some air exchange is necessary because of the many sources of air pollution in the home (wood heater, gas stove, consumer products, cigarettes, etc.) Sufficient fresh air inlets are needed to replace air forced out of the house by exhaust fans, dryers, furnaces, water heaters, or wood fires. Here are some suggestions to minimize excess air exchange:

Install Ceiling Insulation. When hot air rises, much of the heat is lost through the ceiling and roof. Wall and floor insulation also reduce heat loss. Recommended amounts of insulation have increased in recent years, so be sure your house has all it needs.

Caulk around all windows, doors, pipes, and any opening into the house.

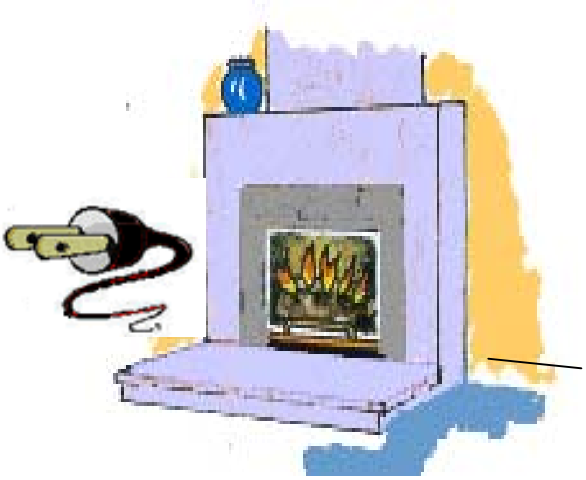
Weather-strip all door and window openings. Consider installing double-paned glass, outdoor or indoor storm windows, and/or insulated curtains.

Close the damper tightly when the heater is not in use. Stoves and fireplaces allow air to leak out of the house even when they are not operating, unless they are literally airtight.

Close off unused rooms if you do not use central heating – Don't waste the heat!

Clean up your Air Guzzling Fireplace by Trying Alternate Heating Methods…

Use an Electric Fireplace



Electric fireplaces can be installed anywhere, and no vent is required. They can be plugged into any standard household electrical (120V) outlet and can operate with or without heat. Most fireplaces are made with an adjustable thermostat that maintains room temperatures. The fireplace glass does not absorb heat, so is safe to touch whether or not the heater is operating.

Switch to Gas

Gas fireplaces are very popular and look like a real wood fire! They are self-contained units, which can be fitted into your existing (vented) fireplace. They send less of your heated air up the chimney. This equipment burns cleaner, is easy to start, convenient, safe and inexpensive to operate, and is a good source of heat. Gas fireplaces are also a good choice if you're remodeling a home and replacing a wood fireplace.

Install a Certified Wood Burning Fireplace Insert

Fireplace inserts have been developed which meet federal emission standards and provide high fuel efficiency. They are available in many sizes and styles to fit into your masonry fireplace. They provide excellent fire viewing and heat output with very little smoke.

Try a Pellet Stove

Pellet stoves are the most efficient and least polluting of the new stove designs. Most are exempt from certification because they provide less than 1 gram per hour of particulate emissions. Usually these stoves have some moving parts and require electricity. The fuel, which is made from compressed wood waste and formed into pellets, automatically feeds into the firebox. Combustion air is drawn in and the fire burns hot and clean. Another fan blows room air through a heat exchanger and into the room.

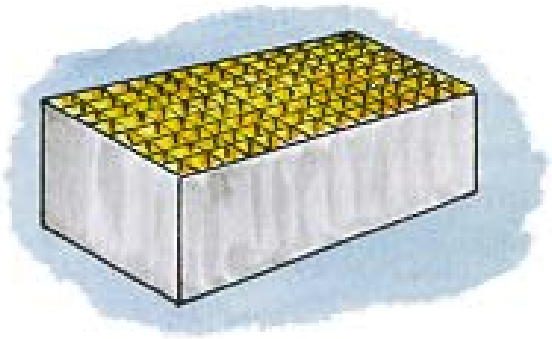
U.S. EPA Certified Wood Stoves

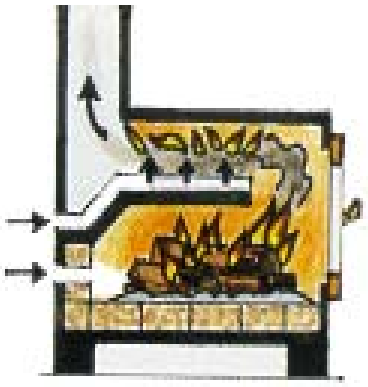
U.S. EPA Certified Wood Stoves Heat More and Pollute Less

U.S. EPA requires wood stove manufacturers to conduct a quality assurance program for wood heaters. Wood heaters must be certified. A permanent label on a wood heater indicates that it meets the emission standards. A consumer information label is also required that specifies the emission rate, the heating range of the wood heater, and overall efficiency. Certified stoves heat better with less wood because they burn more of the combustible gases that would otherwise become smoke in fireplaces and old stoves. There are two types of certified wood stove designs to choose from:

Catalytic Stoves

Similar to the smog control device on new cars, the catalytic combustor in these stoves allows the volatile gases to burn at lower temperatures. Smoke passes through a ceramic honeycomb coated with a rare-metal catalyst, which allows complete smoke combustion and heat release at only 500-700 degrees F. Their efficiency does drop over time and the catalyst device requires replacement after three to seven years of use.





Non-Catalytic Stoves

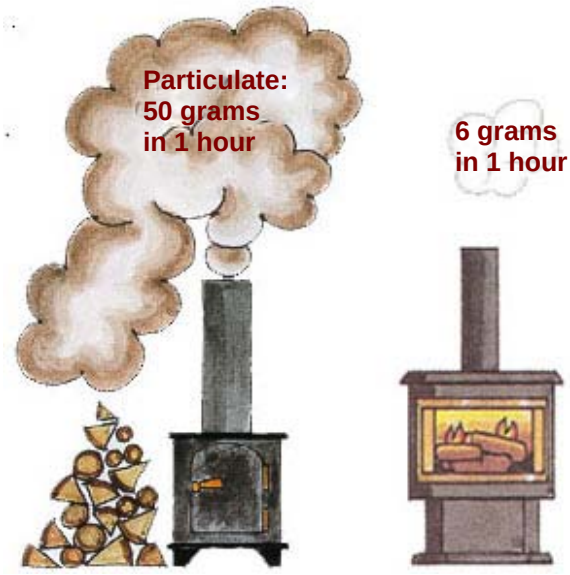
These stoves are designed with baffles and/or secondary combustion chambers, which route the burnable gases through the hottest part of the firebox and mix them with sufficient air to burn them more completely. They can attain up to four stages of combustion and completely burn the wood smoke before it escapes.

If your woodstove is not U.S.EPA certified, you should consider buying a new certified woodstove. A new U.S. EPA certified stove will increase combustion efficiency, produce far less smoke and creosote buildup, and reduce air pollution. It uses the latest and best technology available on transfer efficiency, and will provide more heat for your house and less for your flue. If you want to pollute less and save money on fuel, you should insist on an EPA Certified device, which will be clearly labeled as such.

For a list of U.S. EPA certified stoves see:
http://www.epa.gov/Compliance/monitoring/programs/woodstoves/index.html

U.S. EPA Certified Wood Stoves Release Fewer Particulate Emissions

Because of incomplete combustion, old wood stoves can produce up to 50 grams of particulate per hour. EPA Certified fireplace inserts and EPA Certified wood stoves are considerably more efficient, producing only 6 grams per hour. EPA Certified devices create the right conditions for complete combustion; the right amount of air, high temperature, and time to allow the gases to fully burn.



Non-Certified Stove U.S.EPA Certified Stove

Check How Much Heat You Get …

The heating efficiency of any wood heater depends on combining two factors:

- How completely it burns the firewood (combustion efficiency), and
- How much of the fire's heat gets into the room, rather than going up the flue (transfer efficiency).

How efficiently <u>your</u> wood heater operates depends on 2 more factors:

- Installation – is it located on an outside wall? Too big for house? Flue draws well?
- Operation – Is the wood green? Is the stove stuffed with wood? Is the fire starved for air?

Your operating techniques account for the largest variations in your woodstove's heating efficiency.

HEATING EFFICIENCY	
Masonry Fireplace	**-10% to 10%**
Manufactured Fireplace	**-10% to 10%**
Freestanding Fireplace	**-10% to 30%**
Antique Stove	**20% to 40%**
Fireplace Insert	**35% to 50 %**
Airtight Stove	**40% to 50%**
Certified Stoves, Inserts, Fireplaces	**60% to 80%**
Gas Heater	**60% to 90%**
Pellet Stove	**75% to 90%**
Electric Fireplace	**100%**

Look for the Permanent U.S.EPA Label on Certified Devices!

For maximum safety and efficiency have a professional installer calculate the correct stove size for the area, install the stove, and design and install the chimney.

If you Still Must Burn Wood, Follow These Tips on Clean Burning – To Heat More Efficiently and Reduce Air Pollution!

➢ Start Your Fire With Softwood Kindling

Softwoods (pine, fir) are generally low in density, ignite easily, burn fast and hot and will heat the firebox and flue quickly. They are ideal for kindling and starting your fires, but form creosote easily due to the high resin (sap) content.

➢ Burn Longer and Cleaner With Hardwood

Hardwoods (oak, cherry) are denser and take longer to ignite, but burn slower and more evenly, producing less smoke. They also provide more heat energy than softwood logs of the same size.

➢ Burn Only "Seasoned" Firewood

Firewood should dry, or "season" a minimum of 6 to 12 months after splitting. Hardwoods dry more slowly than softwoods and may take over a year to dry. Seasoned firewood by definition contains 20 percent moisture or less by weight. Wood dries faster in a warmer storage area with more air circulation.

➢ To Speed Drying:

Split and Stack – logs dry from the outside in, so split big logs right away for faster drying. Stack loosely in a crosswise fashion to get good air circulation.

Store High & Dry – Stack a foot or more above the ground and away from buildings in a sunny, well-ventilated area. Cover the top to keep dew and rain off the wood, but leave the sides open to breezes.

➢ Be Careful when Buying Wood Advertised as "Seasoned". *Look for*:

- **Dark colored, cracked ends**, with cracks radiating from the center like bicycle spokes.
- **Light in weight,** meaning there is little moisture left; hardwood logs will weigh more than softwood.
- **Sound** - Hit two pieces together. Wet wood makes a dull "thud" sound. Dry wood rings with a resonant "crack," like a bat hitting a baseball.
- **Easily peeled or broken bark**. No green should show under the bark.

➢ Build a Small, HOT Fire First…

- **Open Damper Wide -** allow in maximum air to fuel the fire. And leave it and other air inlets open for 30 minutes.
- **Start Small and Hot -** leave a thin layer of ash for insulation. Crumple a few sheets of newspaper and add some small pieces of kindling, then light. Add bigger kindling a few at a time as the fire grows. Get it burning briskly to form a bed of hot coals. Now add 2 or 3 logs.
- **Position the next logs carefully** - place logs close enough together to keep each other hot, but far apart enough to let sufficient air (oxygen) move between them.

➢ Refuel While the Coals Are Still Hot!

If a fireplace insert or glass door is present, open it slightly for a minute to prevent back puffing of smoke into the room. When smoke subsides, then open the door fully.

Preheat again by placing a few pieces of kindling onto the red-hot coals. Add more as they catch fire, then add a few larger pieces. Small, frequent loading causes less smoke than a big load in most older stoves.

After refueling, leave the dampers and inlets open for about 30 minutes. The fire will get plenty of air and burn hot, retarding creosote formation (which forms early in a burn).

Light & Refuel your fire quickly and carefully.
These are the times it will smoke the most.

➢ Don’t Burn Anything but Clean, Seasoned Wood, Fireplace Logs, and Non-glossy White Paper

- ***No* Garbage**
- ***No* Rubber**
- ***No* Particleboard**
- ***No* Glossy Paper**
- ***No* Solvent or Paint**
- ***No* Coal or Charcoal**
- ***No* Plastics**
- ***No* Waste**
- ***No* Plywood**
- ***No* Colored Paper**
- ***No* Oil**
- ***No* Painted/ Treated Wood**

Burning these materials can produce noxious, corrosive smoke and fumes that may be toxic. They can foul your catalytic combustor, your flue, and the lungs of your family and neighbors.

Warning: Kiln-Dried Lumber vaporizes too rapidly, causing creosote buildup.

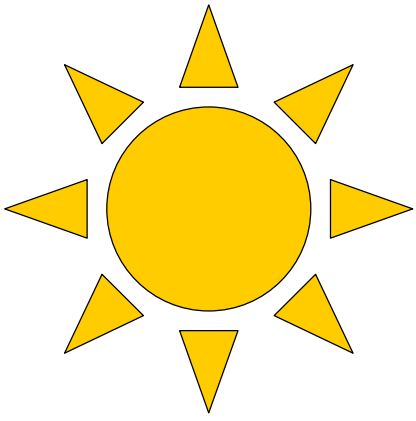
Overnight Heating

When using an open fireplace, DO NOT burn overnight unattended - it's a major fire hazard. This can also lead to a back draft of the smoke into your own home, causing very hazardous indoor air pollution.

Build a small, hot fire and let it burn out completely. Rely on your home's insulation to hold in enough heat for the night. When the fire is out, close the damper tightly.

➢ Heating in Warmer Weather

If you do need extra heat in warmer weather, and a small space heater will not suffice, open the air controls wide, build a small, hot fire, using more finely split wood, and let it burn out.
DO NOT try to reduce the heat from a big fire by reducing its air supply because this leads to smoldering, creosote buildup and air pollution.



➢ Maintain Your Fire Properly – Watch the Temperature

- **Do Not Close the Damper or Air Inlets Too Tightly -** The fire will smoke from lack of air.
- **Follow the Wood Stove or Fireplace Manufacturer's Instructions Carefully -** Be sure that anyone who operates it is also familiar with these instructions.
- **Your Actions Determine How Efficiently Your Fireplace or Wood Stove Will Operate -** A good wood stove/fireplace is designed to burn cleanly and efficiently, but it can not do its job right if you do not cooperate.

➢ Watch for Smoke Signals!

Get into the habit of glancing out at your chimney top every so often. Apart from the half hour after lighting and refueling, a properly burning fire should give off only a thin wisp of white steam. If you see smoke, adjust your dampers or air inlets to let in more air. The darker the smoke, the more pollutants it contains and the more fuel is being wasted.

➢ Inspection and Upkeep - For Safety's Sake

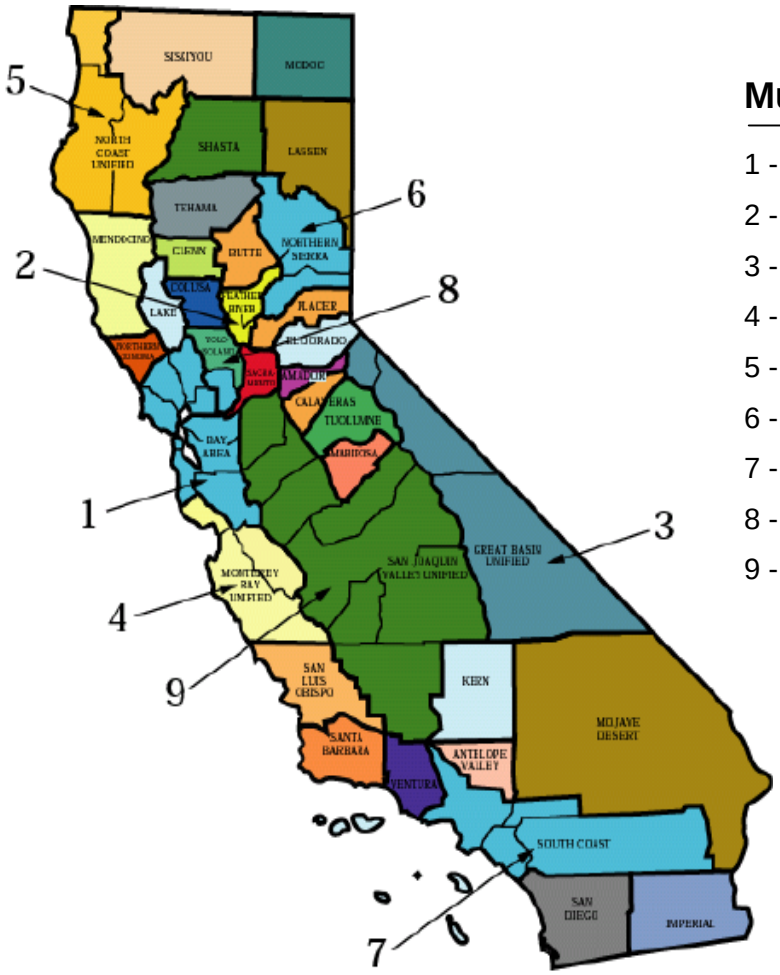
Periodic inspection of your wood stove or fireplace is essential to ensuring its continued safe and clean-burning operation. Keep in mind the following points when performing your fireplace inspection:

- **Chimney Caps** can be plugged by debris, which will reduce draft.
- **Chimneys** should be cleaned professionally at least once a year to remove creosote buildup. **Remember – Creosote can fuel a chimney fire that can burn down your house!**
- **Catalytic Combustor** holes can plug up; follow instructions to clean.
- **Stovepipe** angles and bolts are particularly subject to corrosion.
- **Gaskets** on airtight stove doors need replacement every few years.
- **Seams** on stoves sealed with furnace cement may leak. Eventually the cement dries out, becomes brittle, and may fall out.
- **Firebricks** may be broken or missing.
- **Grates** or stove bottoms can crack or break.

Need More Information?

Air Resources Board (800) 952-5588

District: _____



Multi-County Air Districts

1 - Bay Area (415) 771-6000
2 - Feather River (530) 634-7659
3 - Great Basin (760) 872-8211
4 - Monterey Bay (831) 647-9411
5 - North Coast (707) 443-3093
6 - Northern Sierra (530) 274-9360
7 - South Coast (909) 396-2000
8 - Yolo-Solano (530) 757-3650
9 - San Joaquin Valley (559) 230-6000

County Air Districts

Amador (209) 257-0112
Antelope Valley (661) 723-8070
Butte (530) 891-2882
Calaveras (209) 754-6504
Colusa (530) 458-0590
El Dorado (530) 621-6662
Glenn (530) 934-6500
Imperial (760) 482-4606
Kern (661) 862-5250
Lake (707) 263-7000
Lassen (530) 251-8110
Mariposa (209) 966-2220
Mendocino (707) 463-4354
Modoc (530) 233-6419
Mojave Desert (760) 245-1661
No. Sonoma (707) 433-5911
Placer (530) 889-7130
Sacramento (916) 874-4800
San Diego (858) 650-4700
San Luis Obispo (805) 781-4247
Santa Barbara (805) 961-8800
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