




PRIORITY ISSUES	ASSESSMENT PROTOCOLS	Minimum Actions	Expanded Actions
RADON <i>(continued)</i>		<p>For homes equipped with an active radon mitigation system:</p> <ul style="list-style-type: none"> <li>• Verify that the radon vent fan is operating.</li> <li>• If a previously installed radon mitigation system is not operating correctly OR if the post-work tested radon level is <math>\geq 4</math> pCi/L, advise the client to consult the state radon office.</li> </ul> <p><b>Relevant Guidance/Standards</b>            ASTM C920.            ASTM E2121.            EPA Indoor airPLUS Specification 1.2.            EPA Radon Guidance: Citizen's Guide to Radon.</p>	

**Table 1: Radon Testing Options and Reduction Strategies**



Pre-Work Test Result and Precautionary Measures	Post-Work Test Result	Minimum Actions	Expanded Actions
<b>&lt;2 pCi/L</b> <i>Consider precautionary radon-reduction actions as part of energy upgrade work, especially covering exposed earth, air sealing open sumps, ensuring floor drains have traps and that traps are not dry.</i>	<2 pCi/L	No action.	
	>2 and <4 pCi/L	Complete foundation air sealing strategies.	For post-work radon levels between 2 and 4 pCi/L, refer client to EPA's Citizen's Guide to Radon and Consumer's Guide to Radon Reduction and/or mitigate in accordance with ASTM E2121.
	≥4 pCi/L ≥4 pCi/L	Mitigate in accordance with ASTM E2121.	
<b>&gt;2 and &lt;4 pCi/L</b> <i>Take precautionary radon-reduction actions: complete foundation air sealing strategies as part of energy upgrade work.</i>	<4 pCi/L and NOT higher than pre-work level.	No further minimum action.	For post-work radon levels between 2 and 4 pCi/L, refer client to EPA's Citizen's Guide to Radon and Consumer's Guide to Radon Reduction and/or mitigate in accordance with ASTM E2121.
	<4 pCi/L AND higher than pre-work level.	Verify that foundation air sealing strategies were completed appropriately and correct deficiencies.	For post-work radon levels between 2 and 4 pCi/L, refer client to EPA's Citizen's Guide to Radon and Consumer's Guide to Radon Reduction and/or mitigate in accordance with ASTM E2121.
	≥4 pCi/L	Mitigate in accordance with ASTM E2121.	
<b>≥4 pCi/L</b> <i>Complete all foundation air sealing strategies as part of energy upgrade work.</i>	<4 pCi/L	No further minimum action.	For post-work radon levels between 2 and 4 pCi/L, refer client to EPA's Citizen's Guide to Radon and Consumer's Guide to Radon Reduction and/or mitigate in accordance with ASTM E2121.
	≥4 pCi/L but NOT higher than pre-work level.	Refer client to EPA's Citizen's Guide to Radon and recommend radon mitigation.	Mitigate in accordance with ASTM E2121.
	≥4 pCi/L AND higher than pre-work level.	Mitigate in accordance with ASTM E2121.	
<b>No Pre-Work Test</b> <i>Consider precautionary radon-reduction actions as part of energy upgrade work, especially covering exposed earth, air sealing open sumps, ensuring floor drains have traps and that traps are not dry.</i>	<4 pCi/L	No further minimum action.	For post-work radon levels between 2 and 4 pCi/L, refer client to EPA's Citizen's Guide to Radon and Consumers Guide to Radon Reduction and/or mitigate in accordance with ASTM E2121.
	≥4 pCi/L	Mitigate in accordance with ASTM E2121.	

PRIORITY ISSUES	ASSESSMENT PROTOCOLS	Minimum Actions	Expanded Actions
WOOD SMOKE AND OTHER SOLID FUEL EMISSIONS			
	<p>Determine whether there are wood- or coal-burning appliances (e.g., wood stove or furnace, wood pellet stove, fireplace) in the home.</p> <p>If wood- or coal-burning appliances are present, determine whether there is evidence of wood smoke emissions affecting the home, using any of the following practices or the equivalent (note that many of the following may require input from certified/trained professionals):</p> <ul style="list-style-type: none"> <li>• Look for evidence of soot on the walls or ceiling or creosote staining near the flue pipe.</li> <li>• Determine whether the inside of the home smells like wood smoke.</li> <li>• Ask occupants whether they regularly (i.e., daily) smell wood smoke during the heating season.</li> <li>• If certified/trained professionals are available, consider using a particle counter to quantify particulates in the indoor air.</li> </ul> <p>Assess appliance safety by considering:</p> <ul style="list-style-type: none"> <li>• Appliance condition, especially leaks, cracks or faulty flue connections.</li> <li>• Proper distance of appliance to combustible materials (minimum clearances) and/or proper protection of combustibles.</li> <li>• Proper size and materials of floor protection.</li> <li>• Proper venting system (Vented Combustion Appliances [page 18] and Unvented Combustion Appliances [page 20]).</li> </ul> <p>Determine whether the wood- or coal-burning appliance is EPA-certified (i.e., more energy efficient and cleaner burning).</p> <p>Determine whether a hydronic heater (e.g., outdoor wood-fired boiler) is present.</p> <p>If the wood- or coal-burning appliance is operating during the assessment, observe the opacity of the smoke leaving the chimney.</p>	<p>Assess what the proper size of any wood- or coal-burning appliances will be after the retrofit is complete. If the current unit is oversized, recommend replacement with a properly sized, EPA-certified appliance.</p> <p>If evidence of soot, wood smoke or other health safety concern is apparent, determine the source of the problem and work with the appropriate certified professional (e.g., NFI, CSIA, etc.) to resolve it.</p> <p>Encourage the homeowner to have a certified professional chimney sweep (e.g., certified by the Chimney Safety Institute of America) inspect the chimney and wood- or coal-burning appliance annually. </p> <p>Share EPA Burn Wise tips with the homeowner: <a href="http://www.epa.gov/burnwise/pdfs/BurnWiseTips.pdf">http://www.epa.gov/burnwise/pdfs/BurnWiseTips.pdf</a>. </p> <p><b>Relevant Guidance/Standards</b></p> <p>CSIA.</p> <p>EPA Burn Wise Guides: Burn Wise Guide for Best Burn Practices for Wood Stoves.</p> <p>EPA Burn Wise Tips.</p> <p>NESCAUM Regulations.</p> <p>NFPA 211.</p>	<p>Replace non-certified wood- or coal-burning appliances with properly sized and installed EPA-certified wood- or coal-burning appliances after the retrofit is complete. Appliances should be installed according to the manufacturer's instructions.</p> <p><b>Relevant Guidance/Standards</b></p> <p>EPA Burn Wise Lists.</p>

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PRIORITY ISSUES	ASSESSMENT PROTOCOLS	Minimum Actions	Expanded Actions
WOOD SMOKE AND OTHER SOLID FUEL EMISSIONS <i>(continued)</i>			
	<p><b>Note</b>  <i>One hundred percent opacity means nothing can be seen through the smoke. At 20% opacity, there is very little smoke and you can see almost completely through it. Smoke with opacity of more than 20% is an indication that unseasoned wood is being burned, a non-EPA approved stove is in use or poor operation.</i></p> <p><b>Relevant Guidance/Standards</b>  EPA Burn Wise Guides: Burn Wise Guide for Identifying Cleaner-Burning Appliances.  Carbon Monoxide (CO) and Other Combustion Appliance Emissions (<a href="#">page 6</a>).  NFPA 211.  Unvented Combustion Appliances (<a href="#">page 20</a>)  Vented Combustion Appliances (<a href="#">page 18</a>)</p>		
CRITICAL BUILDING SYSTEMS FOR HEALTHY INDOOR ENVIRONMENTS			
HEATING, VENTILATING AND AIR CONDITIONING (HVAC) EQUIPMENT			
	<p>Evaluate the condition of the existing HVAC system components (e.g., furnace, boiler, air handler, heat pump, associated ductwork) in accordance with minimum inspection standards of ANSI/ACCA Standard 4 (Maintenance of Residential HVAC Systems), ASHRAE handbooks or other equivalent standards and guidelines.</p> <p>Ventilation requirements are also addressed in Source Ventilation (<a href="#">page 21</a>), Whole-House Ventilation for Distributed Contaminant Sources (<a href="#">page 22</a>) and Multi-Family Ventilation (<a href="#">page 22</a>).</p> <p>The HVAC assessment is to include an evaluation of whether the system is functioning properly, based on ANSI/ACCA checklists appropriate for the type of equipment. Determine whether the HVAC system is properly sized in accordance with ASHRAE handbook, or other equivalent standardized guidelines.</p>	<p>Based on an assessment of equipment condition and sizing, repair, modify or replace equipment to meet minimum corrective actions for proper HVAC function.</p> <p>If repairs are needed to restore HVAC to proper functioning, repair in accordance with ANSI/ACCA Standard 6 (Restoring the Cleanliness of HVAC Systems), ASHRAE handbooks or other equivalent standards and guidelines.</p> <p>If replacing equipment, base sizing calculations on post-retrofit conditions. Refer to Sections 4.1 and 4.2 of EPA Indoor airPLUS Construction Specifications.</p> <p>Install new equipment in accordance with ANSI/ACCA Standard 5 (HVAC Quality Installation Specification) AND verify installation in accordance with ANSI/ACCA Standard 9 (HVAC Quality Installation Verification Protocols), ASHRAE handbooks or other equivalent standards and guidelines.</p>	<p>Replace functioning HVAC equipment that is near the end of its service life with new energy-efficient HVAC equipment and base sizing calculations on post-retrofit conditions. Refer to Sections 4.1 and 4.2 of EPA Indoor airPLUS Construction Specifications.</p> <p>Follow ANSI/ACCA Standard 5 (HVAC Quality Installation Specification), Standard 9 (HVAC Quality Installation Verification Protocols), ASHRAE handbooks or other equivalent standards and guidelines. Consider using filters with a high MERV rating (11 or above) if equipment capacity is sufficient to accommodate the pressure drop. For existing systems, check with the manufacturer to determine whether MERV 11 filters can be installed.</p>

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PRIORITY ISSUES	ASSESSMENT PROTOCOLS	Minimum Actions	Expanded Actions
HEATING, VENTILATING AND AIR CONDITIONING (HVAC) EQUIPMENT <i>(continued)</i>			
	<p>If HVAC replacement or modification is anticipated, base sizing calculations on post-retrofit conditions. Refer to Sections 4.1 and 4.2 of EPA Indoor airPLUS Construction Specifications.</p> <p><b>Relevant Guidance/Standards</b> ACCA 4 QM-2007.</p> <p>ASHRAE Handbooks: ASHRAE Handbook Series.</p> <p>EPA Indoor airPLUS Specifications: 4.1 and 4.2.</p> <p>Multi-Family Ventilation (<a href="#">page 22</a>).</p> <p>Source Ventilation (<a href="#">page 21</a>).</p> <p>Whole-House Ventilation for Distributed Contaminant Sources (<a href="#">page 22</a>).</p>	<p>Ensure newly installed central forced-air HVAC systems have a minimum MERV 6 filter, no filter bypass, and no air cleaners designed to intentionally produce ozone.</p> <p><b>Relevant Guidance/Standards</b> ACCA 5 QI-2010. ACCA 6 QR-2007. ACCA 9 QIVP-2008. ASHRAE 62.2-2010, Section 6.7. ASHRAE Handbooks: ASHRAE Handbook Series. ASHRAE 52.2-2007. EPA Indoor airPLUS Specifications: 4.1, 4.2 and 4.7. EPA IAQ: Residential Air Cleaners.</p>	<p><b>Relevant Guidance/Standards</b> ACCA 5 QI-2010. ACCA 9 QIVP-2008. ASHRAE Handbooks: ASHRAE Handbook Series. ASHRAE 52.2-2007. EPA Indoor airPLUS Specifications: 4.1, 4.2 and 4.7.</p>
VENTED COMBUSTION APPLIANCES			
	<p>Complete a safety inspection of all vented combustion appliances in the dwelling (e.g., furnaces, boilers, space heaters, water heaters). The inspection shall include observations for proper clearances, condition of venting, assessment of the potential for backdrafting, integrity of fuel lines, safety of electrical connections and the appliance itself.</p> <ul style="list-style-type: none"> <li>For gas-fired appliances and equipment, make this assessment using applicable installation standards, including the National Fuel Gas Code, ANSI Z223.1/NFPA 54, the applicable ANSI Z21 gas-fired appliance safety standard and manufacturer's instructions. Determine whether gas-fired appliance installations comply with Section 9.3 "Air for Combustion and Ventilation" of ANSI Z223.1/NFPA 54 for proper venting, including influences of other building ventilation and exhausting equipment.</li> </ul>	<p>Complete all applicable actions under the Assessment Protocols AND ensure compliance with applicable codes and standards. Test combustion appliances for proper draft and venting under worst case conditions before and after retrofit measures that affect envelope leakage and airflows (e.g., air sealing, insulation, addition or upgrade of exhaust fans). Repair, remove or replace combustion equipment and address other issues or deficiencies as needed to meet the applicable codes and standards.</p> <p><b>Note:</b> <i>All equipment removals should include proper disposal so that hazardous units are not reinstalled or used elsewhere.</i></p> <p>Address depressurization and potential backdrafting problems (e.g., with combustion make-up air, fan interlocks, transfer grilles, jumper ducts, louvered doors or door undercuts) OR disable the exhaust equipment causing the problems.</p> <p>If a whole-house fan is used for cooling at night, advise occupants to open several windows before operating the fan. </p>	<p>If replacing combustion equipment located in occupied or conditioned spaces as part of the retrofit process, recommend power vented or sealed combustion equipment (see Section 5.1 of EPA's Indoor airPLUS Construction Specifications). Install new combustion equipment in accordance with ANSI/ACCA 5 QI 2010 HVAC Quality Installation Specifications.</p> <p><b>Relevant Guidance/Standards</b> ACCA 5 QI-2010. EPA Indoor airPLUS Specification 5.1.</p>

PRIORITY ISSUES	ASSESSMENT PROTOCOLS	Minimum Actions	Expanded Actions
VENTED COMBUSTION APPLIANCES <i>(continued)</i>			
	<ul style="list-style-type: none"> <li>For oil-fired appliances and equipment, make this assessment using applicable installation standards, including the Standard for the Installation of Oil-Burning Equipment, ANSI/NFPA 31, the applicable ANSI/UL oil-fired appliance safety standard and manufacturer's instructions.</li> </ul> <p>Performance test vented combustion appliances (e.g., boilers, furnaces, space heaters and water heaters) to ensure proper draft under worst case depressurization and perform CO testing.</p> <p>Conduct Combustion Appliance Zone (CAZ) Worst Case Depressurization testing in accordance with BPI-1100-T-2010, Section 7.5, to determine whether there are any combustion safety issues that may result from changes to the building envelope.</p> <p><b>Note</b>  <i>When conducting CAZ testing, a 5 Pa depressurization limit may not be appropriate for all venting conditions. See the BPI CAZ Depressurization Limits table referenced below.</i></p> <p><b>Relevant Guidance/Standards</b>  ANSI Z223.1/NFPA 54.  ANSI Z21 Series Standards for Residential Gas-Fired Appliances.  BPI-1100-T-2010, Combustion Appliance Testing section.  BPI Technical Standards: Technical Standards for the Building Analyst Professional, CAZ Depressurization Limits Table.  Carbon Monoxide (CO) and Other Combustion Appliance Emissions (<a href="#">page 6</a>).  NFPA 31.  NFPA 211.</p>	<p><b>Relevant Guidance/Standards</b>  ANSI Z223.1/NFPA 54.  ANSI Z21 Series Standards for Residential Gas-Fired Appliances.  ASHRAE 62.2-2010 Section 6.4.  BPI-1100-T-2010, Combustion Appliance Testing section.  BPI Technical Standards: Technical Standards for the Building Analyst Professional, CAZ Depressurization Limits Table.  Carbon Monoxide (CO) and Other Combustion Appliance Emissions (<a href="#">page 6</a>).  NFPA 31.  NFPA 211.</p>	

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UNVENTED COMBUSTION APPLIANCES			
	<p>Identify any unvented gas or kerosene space heaters or vent-free combustion appliances (e.g., fireplaces, cooktops, ovens, kerosene or gas space heaters).</p> <p>Determine whether any state or local regulations prohibiting these devices apply.</p> <p><b>Relevant Guidance/Standards</b> Carbon Monoxide (CO) and Other Combustion Appliance Emissions (<a href="#">page 6</a>).</p> <p>State or local regulations.</p>	<p>Verify that the kitchen exhaust fan vents to the outdoors. If not, see Source Ventilation (<a href="#">page 21</a>) for recommended actions.</p> <p>Identify illegal unvented gas or kerosene space heaters that do not conform to state and local regulations and, with the occupant's permission, remove them as appropriate. If the space heaters are the primary source of heat, replace them with electric or vented, code-compliant heating systems.</p> <p><b>Note:</b> <i>All equipment removals should include proper disposal so that hazardous units are not reinstalled or used elsewhere.</i></p> <p>With the occupant's permission, remove other unvented heaters, except when used as a secondary heat source AND when it can be confirmed that the unit is being used in conformance with ANSI Z21.11.2. Units that are not being operated in compliance with ANSI Z21.11.2 should be removed prior to the retrofit, but may remain until a replacement heating system is in place.</p> <p>If the occupant objects to these recommendations:</p> <ul style="list-style-type: none"> <li>• Provide the occupant with information about the hazards of operating illegal unvented space heaters or operating vent-free appliances contrary to manufacturers' instructions. For example, the manufacturers' instructions may call for open windows because use of the device requires adequate or additional ventilation to remove products of combustion such as CO, nitrogen oxides, CO<sub>2</sub>, PM and water vapor. 🏠</li> <li>• For gas-fired unvented space heaters without an oxygen depletion sensor (ODS) shutoff system, suggest the occupant replace with a vented appliance or, at a minimum, consider upgrading the heater to a new model consistent with ANSI Z21.11.2/CSA.</li> <li>• For gas-fired unvented space heaters and vent-free fireplaces that are oversized for the application, advise the occupant of the improper sizing of the appliance.</li> </ul>	<p>This cell is intentionally blank.</p>



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PRIORITY ISSUES	ASSESSMENT PROTOCOLS	Minimum Actions	Expanded Actions
UNVENTED COMBUSTION APPLIANCES <i>(continued)</i>			
		<ul style="list-style-type: none"> <li>Advise the occupant that it is always important to consult and follow the manufacturer's instructions for proper operation and maintenance. If the manufacturer's instructions are not available to the occupant, advise or assist the occupant in obtaining replacement instructions or contacting the Air-Conditioning, Heating and Refrigeration Institute (AHRI) for information on obtaining these instructions for gas appliances.</li> </ul> <p><b>Relevant Guidance/Standards</b> AHRI. ANSI Z21.11.2/CSA. Carbon Monoxide (CO) and Other Combustion Appliance Emissions (<a href="#">page 6</a>). Source Ventilation (<a href="#">page 21</a>).</p>	
SOURCE VENTILATION			
	<p>Determine whether the home complies with the local exhaust requirements for kitchens and baths of ASHRAE Standard 62.2-2010, Section 5 and Appendix A, as applicable. Determine whether kitchen and bath exhausts are present and vent to the outdoors.</p> <p>Determine whether the home complies with the local exhaust requirements for clothes dryers in ASHRAE Standard 62.2-2010, Section 6. Determine whether clothes dryers vent to the outdoors. (Condensing dryers are exempt.) Inspect or verify that clothes dryer exhaust duct(s) do not discharge into crawlspaces or attics or within walls. Inspect clothes dryer vents for restrictions and lint buildup.</p> <p><b>Relevant Guidance/Standards</b> ASHRAE 62.2-2010. BPI-1100-T-2010, Indoor Air Quality and Ventilation and Baseload Energy Efficiency sections.</p>	<p>If ASHRAE Standard 62.2-2010 requirements for bathroom, kitchen and clothes dryer exhaust requirements are not met, repair, replace or install local exhaust ventilation to meet the requirements, ensuring ducts are sized, installed and vented properly to the outdoors, OR increase whole-house ventilation airflow to compensate for deficiencies of local exhaust in bathrooms and kitchens using the alternative compliance method (Appendix A of Standard 62.2-2010).</p> <ul style="list-style-type: none"> <li>In multi-family buildings, common spaces should be served by dedicated ventilation systems.</li> <li>Ensure that all clothes dryers exhaust to the outdoors and cannot be readily diverted indoors. (Condensing dryers are exempt.)</li> </ul> <p><b>Relevant Guidance/Standards</b> ASHRAE 62.2-2010. BPI-1100-T-2010, Indoor Air Quality and Ventilation section.</p>	<p>If the home is in compliance with ASHRAE Standard 62.2-2010 without bathroom or kitchen exhaust fans (i.e., using Appendix A), EPA recommends installation of exhaust fans vented to the outdoors, in accordance with Section 5 of ASHRAE Standard 62.2-2010 requirements, to improve pollutant source removal.</p> <p>For spaces with strong, localized pollutant sources, consider installing additional (dedicated) local exhaust ventilation.</p> <p><b>Relevant Guidance/Standards</b> ASHRAE 62.2-2010.</p>



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WHOLE-HOUSE VENTILATION FOR DISTRIBUTED CONTAMINANT SOURCES			
	<p>Determine whether the home complies with the ventilation requirements of ASHRAE Standard 62.2-2010:</p> <ul style="list-style-type: none"> <li>• Use Section 4 requirements OR use Appendix A – Existing Buildings if local exhaust ventilation in bathrooms and kitchens is deficient. Blower door testing and measuring fan flows (e.g., bathroom or kitchen exhaust) will be required.</li> <li>• Determine whether additional ventilation measures are needed to meet the ASHRAE Standard 62.2-2010 requirements.</li> </ul> <p><b>Relevant Guidance/Standards</b> ASHRAE 62.2-2010.</p>	<p>Install additional ventilation measures as necessary to meet ASHRAE Standard 62.2-2010 requirements for whole-building ventilation.</p> <p>If the local exhaust ventilation in bathrooms and kitchens is deficient, use the alternative compliance supplement (Appendix A of Standard 62.2-2010).</p> <p><b>Relevant Guidance/Standards</b> ASHRAE 62.2-2010.</p>	<p>Install a balanced, whole-house ventilation system (e.g., heat recovery ventilator [HRV]).</p> <p><b>Relevant Guidance/Standards</b> NAHB Research Center, <a href="http://www.toolbase.org">http://www.toolbase.org</a>. Search “whole-house ventilation” and “HRV” for additional resources.</p>
MULTI-FAMILY VENTILATION			
	<p>Determine ventilation system type (e.g., fan-powered exhaust, fan-powered outdoor supply or a combination of the two) and whether each system serves individual units, each floor or the entire building.</p> <p>Determine whether existing ventilation meets ASHRAE Standard 62.2-2010 requirements using Appendix A – Existing Buildings for each unit. Determine whether all doors between dwelling units and common hallways are gasketed and airtight with weather stripping (except when the ventilation system design requires air transfer from corridors to units). See ASHRAE Standard 62.2-2010 for additional requirements for each dwelling unit.</p> <p>Determine whether ventilation for common corridors meets ASHRAE 62.1-2010 Table 6-1 (0.06 cfm/ft<sup>2</sup> floor area).</p> <p><b>Relevant Guidance/Standards</b> ASHRAE 62.2-2010. ASHRAE 62.1-2010.</p>	<p>If each dwelling unit is served by its own ventilation equipment, follow Minimum Actions for Whole-House Ventilation for Distributed Contaminant Sources (<a href="#">page 22</a>) and Source Ventilation (<a href="#">page 21</a>). Be certain to include the sealing measures between dwelling units required in Section 6.1 of ASHRAE Standard 62.2-2010.</p> <p>If multiple dwelling units are served by a single exhaust fan, fan-powered outdoor air, or combination of the two, meet 62.2-2010 requirements, paying special attention to sealing measures in Section 6.1 plus:</p> <ul style="list-style-type: none"> <li>• Seal all the holes that can be sealed in the ventilation ductwork.</li> <li>• Specify and install a balancing device at each exhaust or supply point that, in combination with a sufficiently high operating pressure, ensures constant continuous ventilation which meets the target ventilation rate during all seasons.</li> <li>• Adjust or replace fans so that outlets or inlets have at least 0.2 inches water column (w.c.) pressure difference across the balancing devices in each dwelling unit.</li> <li>• Ensure that ventilation systems run continuously or have dampers installed that prevent airflow between dwelling units when the system is off.</li> </ul>	<p>If each dwelling unit is served by its own ventilation equipment, follow the Expanded Actions for Whole-House Ventilation for Distributed Contaminant Sources (<a href="#">page 22</a>) and Source Ventilation (<a href="#">page 21</a>).</p> <p>If multiple dwelling units are served by a single exhaust fan, fan-powered outdoor air, or a combination of the two, meet all the Minimum Actions for Multi-Family Ventilation AND conduct extensive air sealing to compartmentalize each dwelling unit OR design and install individual ventilation systems for each unit to meet the requirements of ASHRAE 62.2-2010 as it applies to new construction.</p> <p><b>Relevant Guidance/Standards</b> ASHRAE 62.2-2010. MNCEE: Reduction of Environmental Tobacco Smoke Transfer in Minnesota Multifamily Buildings Using Air Sealing and Ventilation Treatments. NCHH Fact Sheet: Improving Ventilation in Existing or New Buildings with Central Roof Exhaust. NCHH Fact Sheet: Improving Ventilation in Multi-Family Buildings That Do Not Have Fan-Powered Ventilation Systems.</p>

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MULTI-FAMILY VENTILATION <i>(continued)</i>		<ul style="list-style-type: none"> <li>Use minimum MERV 6 filters on supply ventilation systems.</li> <li>In buildings where vertical shafts or ducts and passive rooftop ventilators provide non-fan-powered exhaust to multiple dwelling units, add exhaust fans in combination with the above requirements to provide a more effective ventilation system.</li> </ul> <p><b>Relevant Guidance/Standards</b> ASHRAE 62.2-2010.</p> <p>MNCEE: Reduction of Environmental Tobacco Smoke Transfer in Minnesota Multifamily Buildings Using Air Sealing and Ventilation Treatments.</p> <p>NCHH Fact Sheet: Improving Ventilation in Existing or New Buildings with Central Roof Exhaust.</p> <p>NCHH Fact Sheet: Improving Ventilation in Multi-Family Buildings That Do Not Have Fan-Powered Ventilation Systems.</p> <p>Source Ventilation (<a href="#">page 21</a>).</p> <p>Whole-House Ventilation for Distributed Contaminant Sources (<a href="#">page 22</a>).</p>	<p>Source Ventilation (<a href="#">page 21</a>).</p> <p>Whole-House Ventilation for Distributed Contaminant Sources (<a href="#">page 22</a>).</p>
SAFETY			
HOME SAFETY			
	<p>Determine whether there are working smoke alarms and CO alarms.</p> <p>Identify knob and tube electrical wiring.</p> <p>Identify harmful chemicals in accessible locations.</p> <p>Check whether there is a fire extinguisher in the home.</p> <p>Determine whether the hot water heater temperature setting is within the allowable limits of the local and state codes.</p> <p>Document other home safety hazards that are observed during the energy audit/assessment/retrofit (e.g., missing handrails, non-intact stairs, insufficient lighting, holes in floors).</p>	<p>Replace non-working smoke and CO alarms. If smoke alarms or CO alarms are not present, install new alarms. If new batteries are used, install 10-year lithium batteries. (It is recommended that CO alarms have a digital display and provide peak level readings.)</p> <p>Correct life-threatening safety risks (i.e., fall hazards) and provide client education on safety concerns. </p> <p>Do not bury unsafe wiring in attic insulation.</p> <p><b>Relevant Guidance/Standards</b> CPSC Document #466. NFPA 720.</p>	<p>Install CO alarms that can detect and store peak CO levels of less than 30 ppm.</p> <p>Have qualified personnel replace knob and tube wiring in accordance with applicable electrical codes.</p> <p>For households with small children or elderly occupants, discuss scald prevention with clients AND adjust hot water heater set-point to 120 degrees Fahrenheit to prevent scalding.</p> <p>In homes with elderly persons, install grab bars, handrails and lighting as appropriate.</p>

PRIORITY ISSUES	ASSESSMENT PROTOCOLS	Minimum Actions	Expanded Actions
<b>HOME SAFETY</b> <i>(continued)</i>			
	<p><b>Relevant Guidance/Standards</b>            CDC Fall Prevention Checklist.            CDC Home Safety Checklists.            HUD Notice: Public Housing Assessment System Physical Condition Scoring Process Interim Scoring, Corrections and Republication.</p>		<p>For households with small children, recommend installation of gates at the tops of stairs.</p> <p>Recommend installation of light switches at the top and bottom of stairs.</p> <p>Recommend installation of safety lighting above stairs. Consider energy-efficient LED lighting.</p> <p>Recommend repair of malfunctioning doors, windows, roofs and floors.</p> <p>Recommend appropriate and controlled storage of hazardous chemicals (e.g., strong cleaners, household hazardous materials) and pesticides (e.g., remove from accessible locations).</p> <p>Repair identified safety hazards.</p> <p><b>Relevant Guidance/Standards</b>            ANSI/UL 2034.            EPA Design for the Environment.</p>
<b>JOBSITE SAFETY</b>			
 	<p>Evaluate existing and potential health concerns and activities. Refer to Appendix A: Worker Protection for recommended evaluation measures and actions. </p> <p><b>Note</b>  <i>By law, employers and supervisors are required to ensure that workers are working with an OSHA written Safety and Health Plan. More details about these requirements and resources are available in Appendix A: Worker Protection.</i></p>	<p>Protect workers and occupants from on-site health and safety hazards by:</p> <ul style="list-style-type: none"> <li>• Ensuring proper isolation (e.g., sealed with plastic sheeting) and ventilation of work area to the outdoors during activities that result in VOC emissions (e.g., installing spray foam insulation, painting, sealing, finishing) AND ventilating as close to the source of VOCs as possible.</li> <li>• Using appropriate dust control and protective equipment.</li> <li>• Thoroughly cleaning work area before re-occupancy.</li> <li>• Adding precautions to protect occupants during and after installation of spray polyurethane foam:               <ul style="list-style-type: none"> <li>• Evacuating building occupants and other unprotected trade workers from the work area.</li> </ul> </li> </ul>	<p>For additional information on each of the topics, visit the resources provided under each issue in Appendix A: Worker Protection. </p>

PRIORITY ISSUES	ASSESSMENT PROTOCOLS	Minimum Actions	Expanded Actions
JOBSITE SAFETY <i>(continued)</i>		<ul style="list-style-type: none"> <li>Using appropriate personal protective equipment (e.g., chemical-resistant [nitrile] gloves, appropriate respirator, chemical-resistant clothing) for anyone in work area.</li> <li>Cleaning the area thoroughly and waiting until the foam cures before allowing unprotected workers or occupants to reoccupy the work area.</li> </ul> <p>See Appendix A: Worker Protection for recommended actions to protect worker safety, including available resources. </p>	

# CLIENT EDUCATION

### Why Provide Client Education

Home energy upgrades, when completed in accordance with **EPA's Healthy Indoor Environment Protocols for Home Energy Upgrades**, can help improve the indoor air quality and safety in homes. Energy upgrade work also presents a valuable chance to interact with occupants, giving the contractor an opportunity to provide helpful education on indoor air quality and safety to further ensure the positive impact of a more energy efficient, healthier home. With effective education, occupants are better prepared to maintain healthy home improvements and less likely to create new health hazards in their homes.

### Key Issues

Programs, crews and contractors are encouraged to incorporate into their client education strategies a set of messages related to 12 topics identified in the protocols for occupant education (presented here alphabetically):

1. Asbestos.
2. Asthma triggers.
3. Carbon monoxide (CO) and other combustion pollutants.
4. Environmental tobacco smoke (ETS).
5. Lead.
6. Mold and moisture.
7. Pests.
8. Polychlorinated biphenyls (PCBs).
9. Radon.
10. Safety.
11. Volatile organic compounds (VOCs) in household products and materials.
12. Wood smoke and solid fuel emissions.

These issues and health messages are described in Table 3, which summarizes how these priority indoor environmental concerns affect occupants and provides suggested occupant education health messages. Occupant health messages can be used to communicate key points regarding these 12 important topics for healthy indoor environments.

EPA has many publications suitable for occupant education on indoor air quality in homes, including **Care for Your Air: A Guide to Indoor Air Quality**, which can be found on EPA's Indoor Air Quality home page, [www.epa.gov/iaq](http://www.epa.gov/iaq).

**Table 3: Priority Health Concerns and Recommended Occupant Health Messages**

Priority Health Concerns	Recommended Occupant Health Messages
<p><b>Asbestos</b> – Asbestos-containing materials (ACM) in homes may include pipe and furnace insulation, vermiculite insulation installed before 1990, floor tiles, exterior shingles and roofing. Exposure can cause lung cancer, mesothelioma (cancer of the lining of the chest and abdominal cavity) and asbestosis, in which the lungs become scarred with fibrous tissue.</p>	<ul style="list-style-type: none"> <li>• Do not disturb materials that may contain asbestos including pipe insulation, attic vermiculite insulation, exterior shingles and floor tiles (particularly 9-inch by 9-inch tiles).</li> <li>• Consult state requirements for asbestos testing and mitigation.</li> </ul>
<p><b>Asthma Triggers</b> – Asthma triggers are commonly found in homes, schools and offices and include moisture, mold, dust mites, pests such as cockroaches or mice, secondhand smoke and pet dander. A home may have mold growing on a shower curtain, dust mites in pillows, blankets or stuffed animals, secondhand smoke in the air and cat and dog hairs on the carpet or floors.</p> <p>Asthma triggers cause symptoms including coughing, chest tightness, wheezing and breathing problems. An asthma attack occurs when symptoms keep getting worse or are suddenly very severe. Asthma attacks can be life threatening.</p>	<ul style="list-style-type: none"> <li>• Asthma can be controlled with the right medicines and by reducing asthma triggers.</li> <li>• For dust mites, wash bedding in hot water once a week and dry completely. Use dust-proof (allergen-impermeable) mattress and pillow covers. Choose washable stuffed toys; wash them often in hot water, and dry thoroughly.</li> <li>• Keep pets out of bedrooms and off furniture. Consider keeping pets outside, if possible.</li> <li>• See sections of this table on Environmental Tobacco Smoke, Mold and Moisture, and Pests for recommendations regarding these asthma triggers.</li> </ul>
<p><b>Carbon Monoxide (CO) and Other Combustion Pollutants</b> – Combustion pollutants are gases or particles that come from burning materials. Common combustion pollutants include carbon monoxide (CO) and nitrogen dioxide (NO<sub>2</sub>).</p> <p>Exposure to CO can cause headaches, impaired vision and coordination, flu symptoms, dizziness, and at high concentrations, confusion, nausea and death. CO sources include combustion equipment (e.g., furnaces and wood stoves), unvented combustion appliances (e.g., vent-free fireplaces), portable generators, and other combustion equipment and automobiles operated in attached garages.</p> <p>NO<sub>2</sub> is a colorless, odorless gas that causes eye, nose and throat irritation, shortness of breath and an increased risk of respiratory infection.</p>	<ul style="list-style-type: none"> <li>• CO alarms should be installed in all homes.</li> <li>• Annually test CO alarms. Replace every five to seven years. It is recommended that CO alarms have a digital display and provide peak level readings. <i>Note: Some CO alarms can detect and store low level peak CO levels (less than 30 ppm).</i></li> <li>• Never operate a portable generator or any gasoline engine-powered tool in or near an enclosed space such as a garage, house or other building. Even with open doors and windows, these spaces can trap CO and allow it to quickly build to lethal levels.</li> <li>• Never warm up cars in attached garages, even if the garage door to the outside is open.</li> <li>• For gas vent-free heaters and fireplaces, inform occupant of identified operation or installation issues and suggested actions.</li> <li>• Consult manufacturer installation and operating instructions for proper operation and maintenance of gas appliances. If manufacturer instructions are not available, contact manufacturer to obtain replacement instructions or contact the Air-Conditioning, Heating and Refrigeration Institute (AHRI) for information on obtaining these instructions for gas appliances.</li> </ul>
<p><b>Environmental Tobacco Smoke (ETS)</b> – Exposure to ETS, also known as “secondhand smoke,” can occur if someone smokes in a home or apartment building. Exposure to secondhand smoke increases the risk of lung cancer in adults. Children are at increased risk of ear infections, bronchitis and pneumonia, Sudden Infant Death Syndrome (SIDS) and asthma symptoms. Secondhand smoke triggers symptoms in people who have asthma or chronic obstructive pulmonary disease (COPD).</p>	<ul style="list-style-type: none"> <li>• Secondhand smoke poses health risks to non-smokers (e.g., cancer in adults, SIDS, breathing problems in children).</li> <li>• Do not allow smoking in the home. Smoke outside to reduce the risk to others in the home.</li> <li>• Provide access to information on local smoking cessation programs for those who want to quit.</li> <li>• Explore smoke-free housing policies for multi-family properties. Explain financial and reduced liability benefits to owners. See the National Center for Healthy Housing’s fact sheet Reasons to Explore Smoke Free Housing for additional information.</li> </ul>

Priority Health Concerns	Recommended Occupant Health Messages
<p><b>Lead</b> – Housing-related lead sources include flaking or peeling lead-based paint, leaded dust, lead in soil and lead in drinking water. Exposure can cause learning difficulties, behavior problems, hearing damage and in extreme cases seizures or death. Children under six years of age and pregnant women are at greatest risk.</p>	<ul style="list-style-type: none"> <li>• Pregnant women and children under six years are at greatest risk.</li> <li>• In homes built before 1978: 1) If repainting, remodeling or disturbing paint, use lead safe-work practices; 2) Repair peeling paint using lead safe work practices in homes where young children or pregnant women live.</li> <li>• Consider testing blood lead levels in children younger than six years of age, if living in a pre-1978 home.</li> <li>• For pre-1978 homes with chipping exterior paint: Test soil for lead content and remove or cover lead-contaminated soil.</li> </ul>
<p><b>Mold and Moisture</b> – Mold can grow almost anywhere there is moisture in a house. Asthma symptoms, allergic reactions, and other respiratory symptoms can be triggered by damp indoor environments and mold. Inhaling mold spores can trigger asthma attacks in people sensitive to molds.</p>	<ul style="list-style-type: none"> <li>• If you see mold on hard surfaces, clean it up with soap and water. Let the area dry completely.</li> <li>• Repair moisture problems to avoid dampness or mold.</li> <li>• Dry water-damaged areas and items within 24-48 hours after a leak or spill to prevent mold growth.</li> <li>• Avoid installing carpet in areas prone to wetting or moisture problems.</li> <li>• Run bathroom and kitchen fans when showering, cooking, etc., and run whole-house ventilation system according to manufacturer's instructions to help minimize moisture and contaminant buildup.</li> </ul>
<p><b>Pests</b> – Rodents, cockroaches, termites, birds, bats and other pests can be found in homes. Exposure to some pest droppings and body parts (e.g., from mice and cockroaches) can trigger asthma attacks. Rodents can also carry diseases such as hantavirus, which can result in a deadly condition called hantavirus pulmonary syndrome (HPS). Misusing pesticides to address pest problems can sometimes result in harmful exposures to carcinogens or chemicals that result in respiratory problems or allergic reactions.</p>	<ul style="list-style-type: none"> <li>• Follow integrated pest management (IPM) strategies to reduce pest infestations and to avoid the overuse of pesticides: 1) Reduce pest access to water and food by properly storing food and trash and by using effective housekeeping techniques; 2) Limit pest entry by sealing holes and cracks; 3) Use targeted and least toxic pesticides.</li> <li>• Clean up pest droppings and body parts to reduce allergens.</li> <li>• Safely store pesticides out of reach of children.</li> </ul>
<p><b>Polychlorinated Biphenyls (PCBs)</b> – PCBs were manufactured domestically from 1929 until their manufacture was banned in 1979. PCBs have been shown to cause a variety of adverse health effects, including effects on the immune system, reproductive system, nervous system and endocrine system in animals. PCBs have also been shown to cause cancer in animals. Studies in humans provide supportive evidence for potential carcinogenic and non-carcinogenic effects of PCBs.</p>	<ul style="list-style-type: none"> <li>• Although no longer commercially produced in the U.S., PCBs may be present in products and materials produced before the 1979 PCB ban (e.g., transformers and capacitors, cable insulation, oil-based paint, caulk, plastics, floor finish).</li> <li>• Materials suspected of PCB contamination should be sampled, tested and safely abated by a professional.</li> </ul>
<p><b>Radon</b> – Radon is the #1 cause of lung cancer for non-smokers. It is the 2<sup>nd</sup> leading cause of lung cancer overall (after smoking), accounting for 21,000 deaths annually. A radioactive gas that comes from the natural decay of uranium in soil and water, radon can enter homes through openings in walls and floors where they come into contact with the ground. An estimated one in every 15 U.S. homes has radon levels at or above EPA's action level of 4 pCi/L.</p>	<ul style="list-style-type: none"> <li>• The only way to know the radon level in your home is to test for it.</li> <li>• EPA and the Surgeon General recommend testing all homes below the third floor for radon.</li> <li>• Mitigate radon in homes if levels are greater than or equal to 4 pCi/L. Strongly consider mitigating homes with levels between 2 and 4 pCi/L. <ul style="list-style-type: none"> <li>○ Radon levels below 4 pCi/L still pose a health risk and in many cases may be reduced. See EPA's <b>A Citizen's Guide to Radon</b>.</li> </ul> </li> <li>• Make sure any existing radon mitigation system is functioning properly. If a vent fan is installed, check its condition first.</li> </ul>



Priority Health Concerns	Recommended Occupant Health Messages
<p><b>Safety</b> – Trips and falls, poisoning and burns are significant injury risks in homes. Poor lighting, lack of handrails, unstable stairs and other housing hazards increase the risk of falls. Improperly stored chemicals increase the risk of poisoning.</p>	<ul style="list-style-type: none"> <li>• Smoke alarms and CO alarms should be installed in all homes and tested regularly. Replace batteries annually. Replace smoke alarms every 10 years and CO alarms every five to seven years.</li> <li>• Set hot water heater thermostats to 120 degrees Fahrenheit to reduce burns and scalds.</li> <li>• In homes where elderly persons live, reduce trip hazards, provide sufficient lighting on stairs, ensure handrails and grab bars are in key locations, and follow CDC's guide Check for Safety: A Home Fall Prevention Checklist for Older Adults.</li> <li>• In homes with young children, install gates at the tops of stairs and securely store chemicals and pesticides.</li> </ul>
<p><b>Volatile Organic Compounds (VOCs) in Household Products and Materials</b> – VOCs are found in many household products and materials including paints, carpets and pads, pressed wood, composite wood, cleaning supplies, air fresheners and furniture. Exposures can cause eye, nose and throat irritation, liver damage and cancer.</p>	<ul style="list-style-type: none"> <li>• Select low-VOC products when possible (e.g., paint, carpet, furniture, cabinets, adhesives and cleaning products). Green testing and rating programs that assess products for VOCs and other health hazards include: <ul style="list-style-type: none"> <li>○ California Department of Public Health, Emission Testing Method for California Specification 01350.</li> <li>○ Carpet and Rug Institute (CRI) Green Label or Green Label Plus program criteria or equivalent standards for carpet.</li> <li>○ Collaborative for High Performance Schools (CHPS) High Performance Products Database.</li> <li>○ Green Seal Standard GS-11.</li> <li>○ Greenguard Children and Schools Certification Program.</li> <li>○ Master Painters Institute (MPI) Green Performance Standards GPS-1 or GPS-2.</li> <li>○ Scientific Certification Systems (SCS) Standard EC-10.2-2007 (Indoor Advantage Gold).</li> </ul> </li> <li>• If using pressed or composite wood products, avoid products containing urea formaldehyde. Select products compliant with California Title 17.</li> <li>• Local ventilation can be used when strong sources of VOCs or other airborne contaminants are isolated to a specific room or area. Whole-house ventilation will also help reduce VOCs and other airborne contaminants in most homes.</li> <li>• Safely store chemicals out of reach of children.</li> </ul>
<p><b>Wood Smoke and Solid Fuel Emissions</b> – Wood stoves and fireplaces can create emissions, and exposures can cause breathing problems.</p>	<ul style="list-style-type: none"> <li>• Ensure fireplace chimney or wood stove flue is working properly (i.e., there is no wood smoke in the home).</li> <li>• Clean chimney once a year.</li> <li>• Follow EPA's Guide for Best Burn Practices for Wood Stoves.</li> <li>• If purchasing a new stove, ensure it is EPA-certified.</li> </ul>

## Client Education Resources:

### Asbestos

**EPA Asbestos:** Asbestos in Your Home. 1990. U.S. Environmental Protection Agency.

<http://www.epa.gov/asbestos/pubs/ashome.html>

<http://www.epa.gov/asbestos/>

### Asthma Triggers

**EPA Asthma:** Indoor Environmental Asthma Triggers. 2011. U.S. Environmental Protection Agency.

<http://www.epa.gov/asthma/triggers.html>

### Carbon Monoxide

**AHRI:** Air-Conditioning, Heating and Refrigeration Institute.

<http://www.ahrinet.org/default.aspx>

**CPSC Document #466:** Carbon Monoxide Questions and Answers. 2008. U.S. Consumer Product Safety Commission.

<http://www.cpsc.gov/cpscpub/pubs/466.html>

**EPA IAQ:** An Introduction to Indoor Air Quality (IAQ), Carbon Monoxide. U.S. Environmental Protection Agency. 2011.

<http://www.epa.gov/iaq/co.html>

# Make **YOUR** House



## A Healthy Home

*and more environmentally-friendly, too!*

**Did you know** that most people spend over 90% of their time indoors? This brochure offers ways to make your home a healthy place for you and your family. It provides you with information on **mold, radon, carbon monoxide, asthma and allergies, second-hand smoke, volatile organic compounds,**

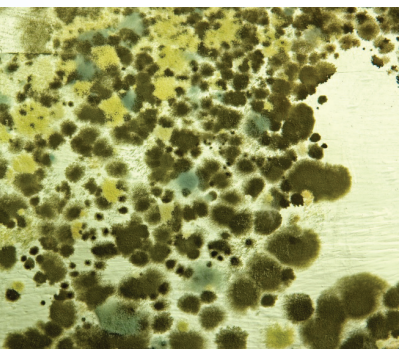
**drinking water contaminants, lead, mercury, and pesticides.**

There are also many things you can do in and around your home to help protect and conserve the environment. In this brochure there are tips to help you save energy, save money and make your home **more environmentally-friendly.**

**Learn how you can make  
your home a healthy place to live.**



- ***Do you have mold in your home?***
- ***Is there moisture in your home that could cause mold to grow?***
- ***How do you clean up mold?***



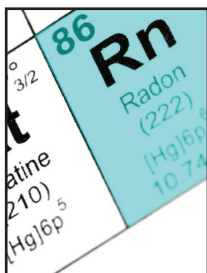
***Molds are living organisms*** that grow on wet or damp surfaces like in basements, showers and around plumbing fixtures. Molds reproduce by releasing tiny spores that you can't see into your indoor and outdoor air. When you breathe in mold spores, they get into your lungs. Prolonged exposure to high levels of mold can result in reduced lung function in an otherwise healthy adult. Some people with asthma are particularly sensitive to mold.

## **How you can clean up and prevent mold:**

- ***Scrub mold with water and detergent.***
- ***Run bathroom and kitchen vents while bathing and cooking.***
- ***Vent bathrooms and clothes dryers to the outside.***
- ***When first turning on home or car air conditioners, leave the room or drive with the windows open for several minutes to allow mold spores to disperse.***
- ***Cover window wells if they leak to prevent moisture from building up indoors.***

For more information on mold and ways to clean up a mold problem safely in your home, go to **[www.epa.gov/mold](http://www.epa.gov/mold)**

- ***What is radon?***
- ***How might you be affected by radon?***
- ***How do you know if you have radon in your home?***



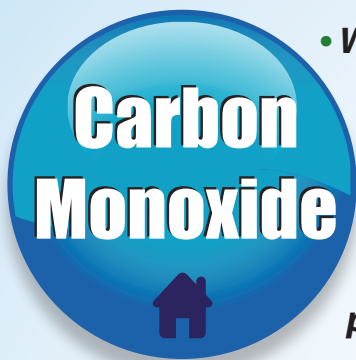
**Radon** is a colorless and odorless radioactive gas that forms when naturally occurring uranium in the soil breaks down and gets into the air you breathe. It cannot be felt when breathing it into your lungs. Radon may enter homes through cracks and holes in the basement or foundation and can become trapped and build up to dangerously high levels. It may be a problem in old and new homes. Prolonged exposure to radon can cause lung cancer in non-smokers and smokers alike. Higher radiation doses may result in children due to their smaller bodies and faster breathing rates compared to adults. The EPA estimates that radon is responsible for 20,000 lung cancer deaths every year, making radon the second leading cause of lung cancer in the U.S., after smoking.

## How you can **eliminate** the risk of radon in your home:

- *Test your home for radon gas using a cheap and easy-to-use radon test kit purchased from your local hardware store.*
- *If indoor radon levels are 4pCi/L or higher, the EPA recommends using a certified radon specialist.*

More information about radon can be found on EPA's website at [www.epa.gov/radon](http://www.epa.gov/radon)

You can also purchase radon test kits by contacting the **National Radon Helpline at (800) 557-2366**, or their website at [www.sosradon.org](http://www.sosradon.org)



- ***What is carbon monoxide (CO)?***
- ***What are signs of CO poisoning?***
- ***How can you protect yourself and your family from CO poisoning?***

**Carbon monoxide**, or CO, is a colorless, odorless gas that can cause sudden illness and death. It can be found in carbon-based fuels used in gas appliances, cars and trucks, and is a by-product of burning wood, charcoal,

gas or oil. Common symptoms of CO poisoning are flu-like symptoms such as dizziness, fatigue, headaches, and nausea. High levels of CO can result in loss of consciousness and death.



## **How you can prevent CO poisoning in your home:**

- ***Never idle your car or lawnmower in the garage, even if the garage door is open.***
- ***Never use charcoal grills, portable generators or kerosene heaters indoors, on balconies, near doors or next to vents or windows.***
- ***Never heat your home with a gas oven.***
- ***Install carbon monoxide alarms near sleeping areas.***
- ***Have all indoor gas appliances regularly inspected, vented and maintained.***

For more information on carbon monoxide, visit EPA's website at **[www.epa.gov/iaq/co.html](http://www.epa.gov/iaq/co.html)**

# Asthma & Allergies



- ***What are some things that can trigger asthma and allergies?***
- ***How can asthma risks be minimized?***
- ***Does anyone smoke inside your home?***

**Asthma is a disease** that affects the lungs and makes it hard for people to breathe. Allergies can also make it hard for people to breathe by causing an asthma attack. The most common symptoms of asthma are chest tightness, shortness of breath, wheezing, and nighttime or early morning coughing. Common signs of allergies are a stuffy or runny nose, itching, or a rash. Things that can set off, or trigger, an asthma attack in one person may not be a problem for another. Some common triggers include: mold; first and second-hand smoke; dust mites; cockroaches; rodents; and pet fur or saliva. Asthma can be controlled with medications and by avoiding common triggers that can cause asthma attacks.

## How you can **minimize risks** presented by **asthma and allergy triggers**:

- ***Dust surfaces with a damp cloth, and vacuum carpets and floors often.***
- ***Wash sheets and blankets weekly in hot water.***
- ***After playing with your pet, wash your hands and clean your clothes to remove pet allergens.***
- ***Smokers should always go outdoors to smoke.***
- ***Add mats on both sides of the door to trap dirt, allergens, bacteria and lawn chemicals.***

For more information on asthma and asthma triggers, visit EPA's website at [www.epa.gov/asthma/triggers.html](http://www.epa.gov/asthma/triggers.html)





- ***Can breathing problems be triggered by second-hand tobacco smoke?***
- ***What are the effects of second-hand smoke?***
- ***How can you eliminate the risks to your family of second-hand smoke?***

***Environmental tobacco smoke***, also known as second-hand smoke, is smoke from tobacco products used by other people. The Surgeon General has found that second-hand smoke is responsible for heart disease, lung cancer, and death in children and adults. Second-hand smoke is also an asthma trigger and can contribute to breathing problems such as bronchitis, respiratory tract infections and reduced lung function.

Smoke-free rules in homes and vehicles can reduce second-hand smoke exposure among children and adults. Some studies indicate that these rules can also help smokers

quit and can reduce the risk of adolescents becoming smokers.

Exposure to a natural mineral fiber called asbestos also increases your risk of developing lung disease, and is made worse by smoking. Asbestos was added to building materials because of its good insulating, sound-proofing, and corrosion-resistance properties. Common products that might have contained asbestos in the past include insulation on steam pipes, boilers and furnace ducts, floor tiles and adhesives for floor tile, and decorative material sprayed on walls and ceilings.

For more information on asbestos, go to [\*\*\*www.epa.gov/asbestos/pubs/help.html\*\*\*](http://www.epa.gov/asbestos/pubs/help.html)



## **How you can reduce the risk of second-hand tobacco smoke in your home:**

- ***Take the smoke-free home pledge.***
- ***Adopt a smoke-free home.***
- ***Smoke outdoors in areas where children or adults are not present.***
- ***If you are concerned about possible asbestos exposure, consult a physician who specializes in lung diseases (pulmonologist).***

For information on EPA's "Take the Smoke Free Home Pledge" go to [\*\*\*www.epa.gov/smokefree/pledge\*\*\*](http://www.epa.gov/smokefree/pledge)





- ***Is indoor air pollution a concern in your home?***
- ***What things in your home can cause indoor air pollution?***
- ***How might you and your family be affected by indoor air pollution?***

***When you buy a new car*** that has that "new car smell," this is an organic vapor or volatile organic compound (VOC) that you smell. In the home, new carpeting, wood paneling, fresh paint, furniture, building materials and other household items are made with the use of chemicals that give off vapors. VOCs can also come from some room fresheners, scented candles, perfumes, deodorants and other products that are used to produce or mask an odor.

VOCs are a health concern because they can trigger asthma

attacks, cause eye, nose, and throat irritation, cause headaches and loss of coordination, and damage the liver, kidneys and nervous system. Persons who are sensitive to chemicals are particularly at risk. In fact, the EPA has said that formaldehyde, used in construction glues and other building materials, may also cause cancer.



### **How you can minimize the exposure of organic vapors or VOCs in your home:**

- ***Make sure you provide plenty of fresh air when using products with strong vapors.***
- ***Dispose of any unused products as directed and in a safe manner according to label directions.***
- ***Choose products with low vapors or VOCs.***
- ***When buying a new home, or when having work done on your existing home, ask that low VOC construction materials be used - low VOC paints, carpets, and other materials are available if requested.***

For more information on VOCs visit EPA's website at [www.epa.gov/iaq/voc.html](http://www.epa.gov/iaq/voc.html)



- ***Is your drinking water safe?***
- ***Where does your water come from?***
- ***Has your water been tested lately?***

**Clean drinking water** is necessary for good health. Harmful chemicals and germs can get into your drinking water and pose a threat to your health.

If you have a well or other private water supply, test your water frequently (minimum of once a year) to ensure that the water is safe to drink. Public water systems are regulated by the EPA, some states and tribes, and are required to test for contaminants and report results.

If present, elevated levels of lead in your water can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. You can minimize the potential for lead exposure by flushing your tap from 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested.



### **How you can be sure that you have clean water in your home:**

- ***If your water comes from a public water system, read your water quality report carefully.***
- ***Do not flush unused prescription drugs or dispose of hazardous items down the toilet or drain.***
- ***Do not wash antifreeze or car oil into storm drains.***
- ***If you have a private well, have it tested – your county should be able to assist with testing.***

Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline (**1-800-426-4791**) or at **[www.epa.gov/safewater/lead](http://www.epa.gov/safewater/lead)**

- ***How can you find out if you have lead on your walls or in your home?***
- ***What are the effects of lead poisoning in children?***
- ***How do you keep lead out of your home?***



**Lead is a highly toxic metal** and can affect anyone. The most common way lead gets into the body is from dust. Lead dust comes from deteriorating lead-based paint and lead-contaminated soil that gets tracked into your home. Children ages 6 and younger are at particular risk of lead poisoning because their brains are developing rapidly and they frequently place their hands, toys, and other objects that could have dust from lead-based paint in their mouths. Some older and newer toys may contain lead or lead paint, and toys can pick up lead from contaminated soil or house dust.

Exposure to lead can result in lower IQ scores in children and has been associated with behavioral and attention problems. Lead can cause kidney, liver, brain and nerve damage. At very high levels, it can cause seizures, coma and even death.

If your home was built before 1978, there is a good chance it has lead-based paint; you may wish to have it tested. Paint chips and dust from cracking paint or activities that cause friction, such as opening and closing windows, doors, or drawers, can contain dangerous levels of lead.

### **How you can minimize the risk of lead in your home:**

- ***Keep your home clean and dust-free.***
- ***Wipe up any paint chips or visible dust with a wet sponge or rag.***



- ***Wash children's hands, bottles, pacifiers and toys often.***
- ***Wipe and remove your shoes at the door and wash your hands often.***
- ***During home renovations, repairs or maintenance jobs, hire only contractors that are trained in lead-safe work practices as required by law.***

For more information on lead, visit EPA's website at **[www.epa.gov/lead](http://www.epa.gov/lead)**

For more information on how to live lead-safe in your home, go to **[www.leadfreekids.org](http://www.leadfreekids.org)**



- **Do fish contain mercury?**
- **Is there mercury in your home?**
- **Did you know that fluorescent light bulbs contain mercury?**



**Mercury is highly toxic** and can affect adults and children, particularly children in the womb. Mercury may be found in some fish and shellfish caught in local lakes and streams or bought in a grocery store. Children exposed to high levels of mercury in the womb can have problems with memory, attention, language, and fine motor and visual skills. Mercury from broken liquid thermometers or fluorescent light bulbs can also cause health effects when inhaled.

Symptoms of mercury poisoning include: tremors; mood swings; irritability; nervousness; insomnia; weakness; and headaches. At higher exposures there may be kidney effects, respiratory failure and death.

### How you can minimize the risk of mercury in your home:

- **To clean up broken fluorescent light bulbs and mercury thermometers, first open a window to air out the room. Next, using rubber or latex gloves carefully scoop or pick up broken pieces by using stiff paper or cardboard, or a sticky tape, and place them in a glass jar with metal lid or in a plastic bag to minimize any exposure to released mercury vapor.**
- **Pregnant women and children should avoid eating high amounts of fish such as shark, swordfish, king mackerel, or tilefish, because they contain high levels of mercury.**
- **Recycle burned out fluorescent light bulbs or old mercury thermometers rather than disposing of them in regular household trash by contacting your local waste collection agency or your local building supply store.**

For information on fish advisories go to [www.epa.gov/waterscience/fish](http://www.epa.gov/waterscience/fish)  
For information on clean up go to [www.epa.gov/cfl/cflcleanup.html](http://www.epa.gov/cfl/cflcleanup.html) and  
[www.epa.gov/mercury/spills/index.htm#thermometer](http://www.epa.gov/mercury/spills/index.htm#thermometer)

- ***Are you bugged by bugs?***
- ***Do you have ants in your home or weeds in your garden?***
- ***Is there a safer way to control pests?***



**Exposure to some** household chemicals, such as pesticides, may cause harm to humans, pets or the environment, if not used properly. Effects may range from mild distress like nausea or dizziness, to injury to the lungs or damage to the nervous, reproductive, endocrine and immune systems.

Examples of household pesticides include: cockroach sprays and baits; insect repellents for personal use; rat and other rodent poisons; flea and tick sprays; kitchen, laundry, and bath disinfectants and sanitizers; and some lawn and garden products such as weed killers.



Homes may have common pests such as cockroaches, fleas, ants, and mice. Weeds and harmful insects might be found outdoors in lawns and gardens. Pesticides are often used to kill and prevent these common pests.

Always carefully read and follow all instructions on product labels for use and storage of pesticides, and keep them out of the reach of children. Properly dispose of unused pesticides and empty pesticide containers according to the product label.

## **How you can reduce pests and the use of pesticides in your home:**

- ***Clean up crumbs, spills and pet food to prevent pests.***
- ***Store food and pet food in tightly sealed glass or plastic containers.***
- ***Place tight-fitting lids on trash cans.***
- ***Properly dispose of unused pesticides and empty containers according to the product label.***
- ***Install door sweeps and weatherstripping and seal cracks and crevices around pipes and other areas to prevent pests from entering your home.***

For more information go to  
[www.epa.gov/pesticides/about/index.htm](http://www.epa.gov/pesticides/about/index.htm)



# Make Your <sup>a</sup>Home Green Home

*Tips to save energy, save money, and  
make your home more environmentally-friendly*

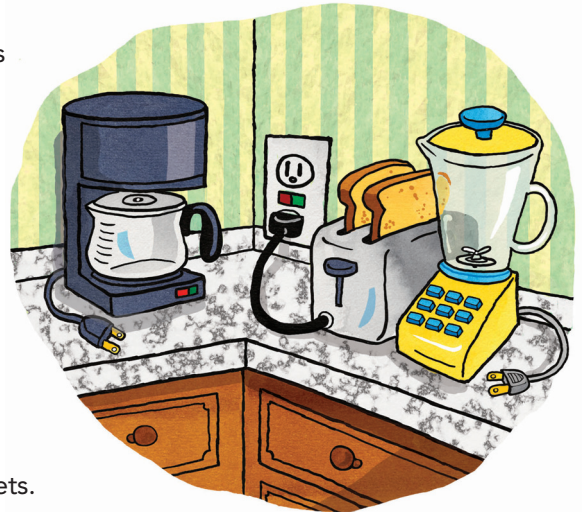
- Reuse items such as old computers, clothing, and appliances by repairing them, donating them to charity, or selling them to reduce landfill waste.
- Recycle materials such as newspapers, glass, metals, plastics, computers, and cell phones.
- Compost food and yard wastes to be used in gardens and landscaping.
- Use mulch around trees and plants.
- Never pour paints, cleaners, oils, batteries, pesticides or other chemicals down the drain, on the ground, into the storm sewer, or throw them in the regular trash – properly dispose of these products at your local county collection site.
- Turn off unused lights and unplug appliances when not in use.
- Choose products that carry the ENERGY STAR® label.
- Use caulk or weather stripping to seal your home's outer walls and gaps around windows and doors to conserve energy.
- Save water and money by running your clothes washer, dryer, and dishwasher only with a full load.
- Repair leaky faucets, showerheads, and toilets.
- Take a 5-minute shower, which uses 10-25 gallons of water, rather than a full bathtub, which uses up to 70 gallons!
- Turning off the faucet while you brush your teeth can save 8 gallons of water a day!





# Electrical Safety: Checklist

- ☐ **Call a qualified electrician or your landlord if you have:**
  - Frequent problems with blowing fuses or tripping circuit breakers
  - A tingling feeling when you touch an electrical appliance
  - Discolored or warm wall outlets
  - A burning or rubbery smell coming from an appliance
  - Flickering or dimming lights
  - Sparks from an outlet
- ☐ **Inspect your home** for hidden electrical hazards.
- ☐ **Check electrical cords** to make sure the wires are not damaged, cracked or loose. If the cords need to be repaired, take the item to a professional repair shop, hire an electrician or replace with a new item.
- ☐ **Make sure cords** are not running across doorways or under carpets. If they are, have a qualified electrician install more outlets.
- ☐ **Keep children away** from electric cords and outlets. Cords placed in the mouth can cause a burn and objects placed in a receptacle can cause a shock, burns or electrocution.
- ☐ **Make sure that** all receptacle outlets and switches have faceplates.
- ☐ **Never put more** than one plug in each receptacle. An outlet may have one or more receptacles — one to receive each plug.
- ☐ **Be sure that the bulbs** in your lights match what is safe for the lamp. There should be a sticker that indicates the maximum wattage for the light bulb — such as use maximum of a 60 watt bulb.
- ☐ **Light bulbs in the living area** of your home, including closets, should have a shade or globe for protection. Light bulbs can get very hot and cause a fire if something that can burn is too close.
- ☐ **Ground-fault circuit interrupters** (GFCIs) reduce the risk of shock by shutting off an electrical circuit when the circuit could be a shock hazard. Your home should have GFCIs in the kitchen, bathroom(s), laundry, basement, garage, and outdoor areas.
- ☐ **Heat producing appliances** such as a toaster, coffee maker, iron or microwave oven draw a lot of electricity. Plug only one heat producing appliance in each outlet to prevent wiring from overheating.
- ☐ **Buy only appliances** that are listed by a qualified testing laboratory.
- ☐ **Arc-fault circuit interrupters** (AFCIs) protect against fire by monitoring the electrical current in a circuit and shutting off the circuit when unintended arcing occurs. AFCIs should be installed in your home. If not, have a qualified electrician install them for you.
- ☐ **Keep ladders away** from overhead power lines, including the electrical service into your home.



**Think Green!** Turn off lights when you are not in the room. Unplug appliances when not in use.



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