



HEALTHY INDOOR ENVIRONMENT PROTOCOLS FOR HOME ENERGY UPGRADES



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This document is available for public review and comment until December 9, 2010.

Purpose:

The **Healthy Indoor Environment Protocols for Home Energy Upgrades** are intended to enhance the ability of other federal agencies, industry standard organizations, state and local programs, and the home energy retrofit industry to better integrate health protections into home energy upgrade programs. The protocols apply to single family and multifamily low-rise residential dwellings, and are intended for voluntary adoption by weatherization assistance programs, federally funded housing programs, private sector home performance contracting organizations, and others working on residential retrofit or remodeling efforts.

This document DOES NOT:

- Set new EPA regulatory standards.
- Provide guidance for diagnosing occupant health problems or building-related illness.
- Replace the need for training or training documents.
- Provide detailed guidance on how to achieve the intent of each recommendation in all situations.

The U.S. Environmental Protection Agency (EPA) is developing these voluntary protocols in conjunction with the U.S. Department of Energy (DOE) **Workforce Guidelines for Home Energy Upgrades**, and coordinated with the White House Council on Environmental Quality (CEQ) Recovery Through Retrofit initiative. Together, these complementary documents will: provide a robust and practical set of resources for retrofit contractors, trainers, and program administrators; help improve the quality of the work performed in this expanding industry; promote occupant health and safety; and drive consumer demand for energy efficiency retrofit services.

For more information:

<http://www.epa.gov/iaq/homes/retrofits.html>

http://www.weatherization.energy.gov/retrofit_guidelines

http://www.whitehouse.gov/sites/default/files/Recovery_Through_Retrofit_Final_Report.pdf

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Why EPA Developed These Protocols:

Millions of American homes will be retrofitted in the coming years to improve energy efficiency or make them more “green.” Integrated healthy home and energy efficiency retrofit activities can lower utility costs for Americans and improve indoor air quality at the same time. Leading weatherization assistance and energy efficiency retrofit programs have demonstrated the feasibility of integrating many occupant health and safety improvements into their work. However, there is also the potential for home energy retrofit activities to negatively impact indoor air quality and public health – if the appropriate home assessment is not made before work begins and issues that may impact indoor air quality are not appropriately addressed. These protocols provide guidance for conducting such home assessments and also provide the specific responses necessary to maintain or improve health and safety in conjunction with energy efficiency retrofits or other remodeling activities.

The protocols are intended to enhance the ability of other federal agencies, industry standard organizations, state and local programs, and the home energy retrofit industry (i.e., home weatherization, energy efficiency retrofit and housing rehabilitation professionals) to better integrate health protections into energy focused programs. The protocols apply to single family and multifamily low-rise residential dwellings. Together with better resources for workers and programs, the protocols will improve the quality of home weatherizations and other energy efficiency retrofit or remodeling jobs, and reduce failures and call-backs.

How The Protocols Are Organized:

The document is organized to highlight priority health concerns that may relate to home energy efficiency retrofits. Priority Issues are identified based on whether they are known to pose significant health risks to occupants or workers and whether they can be affected by energy efficiency retrofit activities. For each Priority Issue identified in Column 1, the matrix identifies the following:

1. **Assessment Protocols** in Column 2 provide EPA-recommended assessment protocols for evaluating both existing conditions of concern and the potential for additional health concerns that may arise as a result of retrofit activities.
2. **Minimum Actions** in Column 3 include actions that weatherization and home energy retrofit contractors should take to ensure that the work they perform in a home does not introduce new health concerns or make existing conditions worse. These often reference existing standards.
3. **Expanded Actions** in Column 4 include recommended indoor environment improvements that can be made during many home energy retrofit projects. The expanded actions are usually low- or no-cost, simple improvements that can be performed by home energy retrofit workers with proper training and sufficient resources.

EPA anticipates the need for supplemental assessment tools such as worksheets and checklists, to help assessors and contractors manage critical job information. Therefore, EPA plans to develop sample assessment tools to accompany these protocols, such as the following sample tool concepts (not included in this draft):

- Sample Mold and Moisture Assessment Form
- Sample Radon Testing and Assessment Form
- Sample Home Ventilation Worksheet

For more information, please see <http://www.epa.gov/iaq/homes/retrofits.html>.

HEALTHY INDOOR ENVIRONMENT PROTOCOLS FOR HOME ENERGY UPGRADES

PRIORITY ISSUES	ASSESSMENT PROTOCOL	HEALTHY INDOOR ENVIRONMENTS	
		Minimum Actions	Expanded Actions
	Assessment measures to help weatherization and home energy retrofit contractors identify serious threats to occupant health commonly found inside homes. This is not a guide for diagnosing occupant health problems or building-related illness.	Critical steps to ensure work does not increase known health risks to occupants or workers (i.e., “Do No Harm”). EPA recommends these protections for ALL retrofit projects.	Simple, mostly inexpensive additional actions to promote occupant health that are feasible for most energy efficiency retrofit projects. EPA recommends consideration of these improvements when feasible.

CONTAMINANT SOURCES OF CONCERN

ASBESTOS		
<p>Determine potential asbestos hazard. Consider the age of housing, especially homes built after 1930 and before the 1970s, which may have asbestos as insulation. Asbestos may be present in other building materials in homes built or renovated prior to the 1990s. If unsure whether material contains asbestos, contact a qualified asbestos professional to assess the material and sample and test as needed. Possible asbestos containing areas include:</p> <ul style="list-style-type: none"> • Attic insulation (especially vermiculite) • Wall insulation (e.g., vermiculite, insulation blocks, etc.) • Insulation on steam pipes, boilers and furnace ducts • Vinyl flooring (including 9 x 9 inch or 12 x 12 inch floor tiles, vinyl sheet flooring and the mastics and adhesives used to secure the flooring) • Cement sheet, millboard and paper used as insulation around furnaces and wood burning stoves • Door gaskets in furnaces, wood stoves and coal stoves (seals may contain asbestos) • Soundproofing or decorative surface materials sprayed on walls or ceilings • Patching and joint compounds and textured paints on walls and ceilings • Roofing, shingles and siding (including asbestos in cement or adhesives) • Artificial ashes and embers (used in gas-fired fireplaces) <p>Assessment Guidance: N/A</p>	<ul style="list-style-type: none"> • If suspected asbestos-containing material (ACM) is in good condition, do not disturb. If suspected ACM is damaged (e.g., unraveling, frayed, breaking apart, etc.), immediately isolate the area and do not disturb. Contact a professional for abatement or repair. • If unsure whether material contains asbestos, contact a qualified asbestos professional to assess the material and sample and test as needed. • Keep activities to a minimum in any areas having damaged material that may contain asbestos. • When working around ACM, do not: <ul style="list-style-type: none"> • Dust, sweep or vacuum debris. • Saw, sand, scrape or drill holes in the material. • Use abrasive pads or brushes to strip materials. • Do not remove or disturb the attic insulation that looks like vermiculite (as opposed to fiberglass, cellulose or urethane foams). <p>Note: <i>In addition to the continued safety of the occupants, appropriate identification of ACM is vital to the safety of workers, who may not be cognizant of asbestos hazards.</i></p> <p>Note: <i>“Blower doors” (which are powerful fans used to detect leaks by lowering pressure inside) can potentially disturb asbestos in homes, thereby potentially establishing or increasing a hazard.</i></p> <p>Relevant Guidance: EPA Guidance on “Asbestos in Your Home” http://www.epa.gov/asbestos/</p>	<ul style="list-style-type: none"> • If ACM is damaged, it may be abated by repair or removal by a trained professional. Typically, asbestos can be repaired by either: <ul style="list-style-type: none"> • Sealing or Encapsulation: Treat the material with a sealant that either binds the asbestos fibers together or coats the material so fibers are not released. Pipe, furnace and boiler insulation can be repaired this way. • Covering or Enclosure: Place a protective layer over or around the ACM to prevent release of fibers. Exposed insulated piping may be covered with a protective wrap or jacket. • If there is a significant advantage to removing asbestos (and it can be done safely), it should be completed only by a professional trained to handle asbestos safely. <p>Relevant Guidance: EPA Guidance on “Asbestos in Your Home” http://www.epa.gov/asbestos/</p>

PRIORITY ISSUES	ASSESSMENT PROTOCOL	HEALTHY INDOOR ENVIRONMENTS	
		Minimum Actions	Expanded Actions
ENVIRONMENTAL TOBACCO SMOKE (ETS)			
	<p>Determine if there is a smoke-free building policy (multi-family buildings only).²</p> <p>Assessment Guidance: N/A</p>	<p>Occupant Education: Provide information on local smoking cessation, if appropriate. Also provide general information about tightening homes and the goals of minimizing pollutants and chemicals in homes.</p>	<p>In multi-family buildings, recommend adoption of smoke-free housing policy.</p> <p>Relevant Guidance: EPA Indoor airPLUS Construction Specification 5.4</p> <p>http://www.epa.gov/indoorairplus/construction_specifications.html</p>
GARAGE AIR POLLUTANTS			
	<p>If there is an attached or tuck-under garage, identify the location of air leaks from the garage to occupied spaces, which may provide pathways for hazardous emissions to enter occupied spaces. For example, look for leaks around walls, doors, ceilings, duct work, air conditioners, furnaces, and electrical and pipe penetrations.</p> <p>Assessment Guidance: EPA Draft Model Healthy Indoor Environment Assessment Questionnaire (under development)</p>	<ul style="list-style-type: none"> • Air seal walls/ceilings separating living spaces. At a minimum, air seal these locations (if present): <ul style="list-style-type: none"> • Doors (ensure tight closure and install weather-stripping) • Electrical, plumbing and duct penetrations. • Cracks between mud sill, rim joists, subfloors and/or bottom of gypsum board • Duct work, supply diffusers, return grilles and air handlers in the garage • Test-in and test-out using advanced blower door techniques • Specify carbon monoxide (CO) monitors/alarms in homes with attached garages, at least one per floor level <p>Relevant Standard: BPI Home Energy Auditing Standard 7.10 and 8.1.3</p> <p>NFPA 720 OR Consumer Product Safety Commission Carbon Monoxide Questions and Answers: CPSC Document #466; Blasnik and Fitzgerald advanced blower door methods</p>	<ul style="list-style-type: none"> • If occupants spend significant time in the garage (e.g., workshops, playrooms, hobbies, etc.), install exhaust fan(s) rated for continuous operation and vented outdoors in attached garages in accordance with Section 5.6 of EPA Indoor airPLUS Construction Specifications. • Educate occupants about safe storage of chemicals (e.g., oil, gasoline, pool cleaners, fertilizers, etc.) that may be stored in garages. <p>Relevant Guidance: EPA Indoor airPLUS Construction Specification 5.6</p> <p>http://www.epa.gov/indoorairplus/construction_specifications.html</p>

PRIORITY ISSUES	ASSESSMENT PROTOCOL	HEALTHY INDOOR ENVIRONMENTS	
		Minimum Actions	Expanded Actions
LEAD	<p>Assume lead-based paint exists in pre-1978 homes unless testing confirms otherwise. Determine if paint will be disturbed by the work.</p> <p>Assessment Code/Standard: EPA Renovation, Repair and Painting (RRP) Program Rule (40 CFR Part 745)</p> <p>http://www.epa.gov/lead/pubs/renovation.htm</p> <p>HUD Lead-Based Paint Poisoning Prevention in Certain Residential Structures, Subparts J and R (24 CFR 35.900; 24 CFR 35.1340 & 35.1350)</p>	<ul style="list-style-type: none"> Comply with EPA's RRP Rule.³ Key elements include: <ul style="list-style-type: none"> Follow lead-safe work practices if disturbing greater than 6 feet² interior or 20 feet² of exterior painted surfaces. Contain the work area to avoid resident exposure. Minimize lead dust and leave work area clean. Achieve visual post-cleaning criteria. Use a Certified Renovator.⁴ <p>Relevant Code/Standard: EPA's Renovation, Repair and Painting (RRP) Program Rule (40 CFR Part 745) & Proposed Rulemaking (FR Vol.75, No.87, May 6, 2010, pp.25038-25073)</p> <p>http://www.epa.gov/lead/pubs/renovation.htm</p> <p>http://edocket.access.gpo.gov/2010/pdf/2010-10102.pdf</p> <p>Occupant Education: EPA Renovate Right pamphlet</p> <p>http://www.epa.gov/lead/pubs/renovaterightbrochure.pdf</p>	<ul style="list-style-type: none"> Follow the U.S. Department of Housing and Urban Development (HUD) lead-safe rehabilitation practices (required for HUD projects that use up to \$5,000 of federal assistance⁵). In addition to EPA's RRP, this rule: <ul style="list-style-type: none"> Lowers the thresholds from 6 feet² interior to 2 feet² in any room. Requires repair of paint that is disturbed using lead-safe work practices. Requires meeting dust clearance testing standards if greater than 2 feet² of paint is disturbed.⁶ <p>Relevant Code/Standard: 24 CFR Part 35, Subpart J: Rehabilitation, and relevant elements of Subpart R: Methods and Standards for Lead-Paint Hazard Evaluation and Hazard Reduction Activities (e.g., 24 CFR 35.1340; 24 CFR 35.1350)</p>
MOISTURE⁷ (MOLD AND OTHER BIOLOGICALS)	<p>Determine if there are signs of water damage, wet spots, condensation or mold. Determine if there is evidence of past water damage (e.g., rot, stains, etc.) in interior occupied spaces, attics, basements/crawl spaces or exteriors. Note the location, moisture source, recommended repair or past effective repair. Measure interior relative humidity to determine if large sources of interior humidity exist.</p> <p>Determine if the air conditioning (AC) unit or central system components are the likely cause of any liquid water sources or high indoor relative humidity (e.g., incorrectly installed condensate pan, broken or improperly insulated or dripping condensate lines, low air flow, low refrigerant levels, clogged coil, leaky or uninsulated ducts).</p>	<ul style="list-style-type: none"> If moisture issues can be solved (see Expanded Actions column to the right), then weatherization and energy retrofit activities proceed in conjunction with moisture control interventions. If moisture issues cannot be solved: <ul style="list-style-type: none"> If moisture issue will likely lead to or aggravate high indoor humidity problems, do not air seal, replace atmospherically-vented combustion equipment with high efficiency units or otherwise lower air infiltration rate.⁸ This includes homes that have significant condensation/humidity problems, such as condensation on multiple windows, condensation in attics or significant moisture/mold beyond the scope of remedies in the Expanded Actions column. 	<p>Wet Attics:</p> <ul style="list-style-type: none"> Repair minor roof leaks prior to attic insulation or air sealing. Provide adequate attic insulation. Prevent roof underlayment (roof decking) condensation or ice dam problems by meticulously air sealing the ceiling (between the living area and the attic). Address indoor humidity sources causing attic condensation (see remedies below). Air seal and insulate all attic ductwork if it is beyond the scope of the weatherization to extend the thermal envelope.

PRIORITY ISSUES	ASSESSMENT PROTOCOL	HEALTHY INDOOR ENVIRONMENTS	
		Minimum Actions	Expanded Actions
MOISTURE (MOLD AND OTHER BIOLOGICALS) <i>(continued)</i>	<p>Assessment Guidance: Air Conditioning Contractors of America (ACCA) Quality Installation (QI) Specification http://www.acca.org/quality/</p> <p>Also see: Sample Mold and Moisture Assessment Form (under development)</p>	<ul style="list-style-type: none"> If there are plumbing leaks or rainwater leaks in wall cavities, attics or ceiling cavities beyond the scope of remedies in the Expanded Actions column, do not insulate these areas until the leaks are fixed. <p>Relevant Guidance: N/A</p>	<p>Exterior Water:</p> <ul style="list-style-type: none"> Prior to insulating basement or crawl space walls near wet areas, address surface water pooling near the foundation by: <ul style="list-style-type: none"> Repairing, modifying or replacing gutters and down spouts. Grading and subsurface drainage at critical locations (e.g., localized drain and grading beneath valleys) per EPA Indoor airPLUS Construction Specification Section 1.1. Ensure energy efficient replacement windows and doors are installed with proper flashing details to ensure drainage to the exterior. See EPA Indoor airPLUS Construction Specification Section 1.6. <p>Wall Assemblies:</p> <ul style="list-style-type: none"> Use caution when increasing insulation levels of wall assemblies, especially increasing cavity insulation, which can lead to moisture and condensation problems. Consider installing any new insulation over the exterior of sheathing, if possible, with exterior wall cladding/siding installed over the new insulation. Consider back-ventilating and back-draining behind the wall cladding/siding (Note: these are more expensive options). <p>Interior Humidity or Condensation:</p> <ul style="list-style-type: none"> Cover exposed earth in basement or crawlspaces with a vapor barrier material (e.g., 6-mil polyethylene sheeting), taped at all seams and edges per EPA Indoor airPLUS Construction Specification Section 1.2. Depending on the Climate Zone, provide dehumidification to address high humidity and condensation problems (e.g., adding whole house ventilation to meet ASHRAE Standard 62.2-2010 (see Section 4, Whole Building Ventilation), improving dehumidification performance of the home's air conditioning system, or adding an ENERGY STAR qualified dehumidifier to the basement, crawlspace or air conditioning system).

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PRIORITY ISSUES	ASSESSMENT PROTOCOL	HEALTHY INDOOR ENVIRONMENTS	
		Minimum Actions	Expanded Actions
<p>MOISTURE (MOLD AND OTHER BIOLOGICALS) <i>(continued)</i></p>			<ul style="list-style-type: none"> • Prevent condensation on cold surfaces by adding vapor barriers and insulation between cold surfaces and warm-humid air, with vapor barriers installed on the warm side of the insulation. • Install new ENERGY STAR qualified bath fans, or repair existing bath fans, vented outdoors per ASHRAE Standard 62.2-2010, to address bathroom moisture/humidity issues (see Section 5, local exhaust). • Recalculate the home’s heating and cooling design loads after expected weatherization modifications, and compare with ratings of existing equipment. Ensure the capacity of any new heating and cooling equipment matches the expected design loads after weatherization, including the latent capacity of cooling and dehumidification equipment. Oversized cooling equipment will have significantly reduced moisture removal/dehumidification capabilities, and oversized heating and cooling equipment may be prone to short cycling and premature equipment failure. Notify homeowners/clients of any existing equipment that may be oversized after weatherization modifications. <p>Simple AC System Tune-up and Repairs:</p> <ul style="list-style-type: none"> • In homes with AC systems, find the cause of condensation or poor AC performance and repair: <ul style="list-style-type: none"> • Insulate condensate lines. • If appropriate, reinstall window AC units to ensure condensate drips to the exterior and not on or into the wall. • Find and repair cause of condensation on supply grilles. • Replace dirty filter and clean evaporator coil. • Adjust slope of condensate pan to drain correctly. • Seal duct leaks. • Investigate and repair other performance problems (i.e., low supply or return air flow, low refrigerant charge), if feasible.

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PRIORITY ISSUES	ASSESSMENT PROTOCOL	HEALTHY INDOOR ENVIRONMENTS	
		Minimum Actions	Expanded Actions
MOISTURE (MOLD AND OTHER BIOLOGICALS) (continued)			
			<p>Relevant Guidance: Air Conditioning Contractors of America (ACCA) Quality Installation (QI) Specification</p> <p>http://www.acca.org/quality/</p> <p>ASHRAE Standard 62.2-2010, "Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings," including Normative Appendix A – Existing Buildings</p> <p>EPA Indoor airPLUS Construction Specifications 1.1, 1.2 and 1.6.</p> <p>http://www.epa.gov/indoorairplus/construction_specifications.html</p>
OZONE			
	<p>Determine if there is any air-cleaning equipment designed to produce ozone (i.e., ozone generators) in the house.</p> <p>Assessment Guidance: California Air Resources Board (CARB) resources on ozone producing air cleaners.</p> <p>http://www.arb.ca.gov/research/indoor/ozone.htm</p>	<ul style="list-style-type: none"> Recommend removal of air-cleaning equipment designed to produce ozone (i.e., ozone generators). <p>Relevant Guidance: EPA Indoor airPLUS Construction Specification 4.7</p> <p>http://epa.gov/indoorairplus/construction_specifications.html</p> <p>http://www.epa.gov/iaq/pubs/ozonegen.html</p>	<p>This cell is intentionally blank.</p>
PESTS			
	<p>Identify evidence of mice, squirrels and other rodents; termites as indicator of moisture problems; birds; bats; or other pest infestations. Note the location. Identify if pesticides and/or rodenticides are used.</p> <p>Assessment Guidance: Alliance for Healthy Homes, Community Environmental Health Resource Center Protocols</p> <p>http://www.afhh.org/res/res_cehrc.htm</p> <p>http://www.cdc.gov/rodents</p>	<ul style="list-style-type: none"> If there is indication of current or past infestation, educate the clients about Integrated Pest Management (IPM) through pamphlets or other appropriate guidance. Advise owner/resident to regularly clean/fix screens (e.g., when replacing HVAC filters), remove clutter, eliminate wood piles near house, and remove any bushes, trees or other vegetation closer than 2 feet away from structure. Alert owner of any termite infestations and inform of the need to seek assistance from an IPM Greenpro or Greenshield certified professional. 	<ul style="list-style-type: none"> Patch exterior holes 1/4-inch x 3/8-inch or larger using pest resistant materials (e.g., copper mesh, hardware cloth, sheet metal, concrete, etc.) before applying air sealing materials that are less resistant (e.g., caulk or foam) or before insulating. Protect air intake and exhaust vents from rodents, birds and pest entry. For example, cover openings with 1/4-inch galvanized mesh. Apply boric acid or gels in holes for roach issues. (Note: Some states require licensing). Follow relevant state pesticide applicator standards.

PRIORITY ISSUES	ASSESSMENT PROTOCOL	HEALTHY INDOOR ENVIRONMENTS	
		Minimum Actions	Expanded Actions
PESTS (continued)		<p>Relevant Guidance: http://www.healthyhomestraining.org/ipm http://www.epa.gov/pesticides/factsheets/ipm.htm</p> <p>Occupant Education: How To Control Pests Safely. New York City Department of Health and Mental Hygiene http://www.healthyhomestraining.org/ipm/NYC_Pests_Healthy_Home.pdf</p>	<ul style="list-style-type: none"> Provide sealable garbage cans and/or advise clients to use them. <p>Relevant Guidance: How To Control Pests Safely, New York City Department of Health and Mental Hygiene http://www.healthyhomestraining.org/ipm/NYC_Pests_Healthy_Home.pdf</p>
RADON	<p>Test homes for radon to help ensure home energy retrofit actions do not increase radon exposure. Tests, and follow-up action if needed, may be conducted using either of the options described in the Minimum Actions column at right.</p> <p>Perform radon testing in accordance with state and federal guidance, as appropriate. Some states regulate the activities of radon services providers through registration, certification or licensing programs. Individuals conducting radon tests should be trained/certified through either:</p> <ul style="list-style-type: none"> The National Environmental Health Association (NEHA) National Radon Proficiency Program, or The National Radon Safety Board (NRSB) certification program. <p>Note: <i>An optional second pre-work radon test may be taken and averaged with the initial pre-work test, to increase confidence that the short term test better reflects the annual average radon level in the home.</i></p> <p>Determine whether the home has a radon mitigation system. Most mitigation systems use active soil depressurization and include a radon vent fan, usually located in an attic, attached garage or on the exterior of the home.</p>	<p>The options described below are intended to minimize the potential for increased occupant exposure to radon that may be caused by home energy retrofit work, while minimizing additional costs.</p> <p>Perform radon testing and mitigation in accordance with state and federal guidance, as appropriate (see Assessment Protocol at left).</p> <p>Note: <i>An optional second post-work radon test may be taken and averaged with the initial post-work radon test to increase confidence that the short term test better reflects the annual average radon level. DO NOT average the pre-work and post-work test results.</i></p> <p>Test-In/Test-Out Option: Test for radon before and after energy retrofit work.</p> <p><i>If pre-work radon level is 4 pCi/L or greater, take appropriate limited radon reduction actions during retrofit work (see Expanded Actions column at right), AND</i></p> <ul style="list-style-type: none"> IF post-work radon level is less than 4 pCi/L, no further action is required. IF post-work radon level is 4 pCi/L or greater, but NOT greater than pre-work radon level, inform client about radon and provide client with EPA's Citizen's Guide to Radon. 	<p>EPA recommends radon mitigation in all homes that test at 4 pCi/L or greater. Radon levels less than 4 pCi/L still can pose a health risk, and in many cases may be reduced.</p> <p>The following recommended lower cost, limited actions may help reduce the radon level in a home or aid more advanced mitigation if necessary:</p> <ul style="list-style-type: none"> Air seal sumps (e.g., install airtight sump cover) in such a way that water can drain from above and below the sump cover. Install airtight drain fittings (e.g., trap or flange system) in foundation floor drains. Seal and caulk penetrations, openings, or cracks in floors and below grade walls that contact the ground, per ASTM C920. Cover exposed earth floors in basements and crawlspaces per Section 1.2 of EPA Indoor airPLUS Construction Specifications or ASTM E2121. <p>Note: <i>Only active soil depressurization (ASD) systems installed per ASTM E2121 have been shown to reliably reduce radon below 4 pCi/L. If all the above limited radon reduction actions are attempted and radon remains high, EPA recommends full compliance with ASTM E2121.</i></p>

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PRIORITY ISSUES	ASSESSMENT PROTOCOL	HEALTHY INDOOR ENVIRONMENTS	
		Minimum Actions	Expanded Actions
RADON <i>(continued)</i>	<p>Assessment Guidance: Follow state regulation where it exists. Otherwise see EPA guidance for testing and mitigation at http://www.epa.gov/radon/pubs/index.html.</p> <p>Also see: Sample Radon Assessment Form (under development)</p>	<ul style="list-style-type: none"> • IF post-work radon level is greater than pre-work radon level, mitigate per ASTM E2121 OR take further radon reduction actions (see Expanded Actions) to reduce radon to pre-work conditions or below, then re-test. Repeat this step until post-work radon level is at or below pre-work radon level. <p><i>If pre-work radon level is less than 4 pCi/L, radon reduction actions may not be necessary. Consider limited radon reduction actions during retrofit work if pre-work radon level is close to 4 pCi/L (see Expanded Actions) AND</i></p> <ul style="list-style-type: none"> • IF post-work radon level is NOT greater than pre-work radon level, no further action is required. • IF post-work radon level is greater than pre-work radon level, but less than 4 pCi/L, radon reduction is not required to comply with EPA guidance. However, greater radon risk may be present and appropriate radon reduction actions are recommended (see Expanded Actions). • IF post-work radon level is greater than pre-work radon level AND is 4 pCi/L or greater, mitigate per ASTM E2121 OR take limited radon reduction actions (see Expanded Actions) to reduce radon to pre-work conditions or below, then re-test. Repeat this step until post-work radon level is at or below pre-work radon level. <p>OR</p> <p>Post-Work Test Option: Test radon after retrofit work is performed, AND</p> <ul style="list-style-type: none"> • If post-work radon level is 4 pCi/L or greater, mitigate per ASTM E2121. • If post-work radon level is less than 4 pCi/L, no further action is required. 	<p>Homes with an active radon mitigation system: If the existing radon mitigation system does not reduce radon below 4 pCi/L or is not working as designed, troubleshoot the system. Follow state residential radon regulations where applicable.</p> <p>Relevant Guidance: ASTM C920, Standard Specification for Elastomeric Joint Sealants, Class 25.</p> <p>For guidance on sealing crawlspaces, see EPA Indoor airPLUS Construction Specification 1.2 or ASTM E2121, Standard Practice for Installing Radon Mitigation Systems in Existing Low-Rise Residential Buildings (section 7.3).</p>

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PRIORITY ISSUES	ASSESSMENT PROTOCOL	HEALTHY INDOOR ENVIRONMENTS	
		Minimum Actions	Expanded Actions
RADON (continued)			
		<p>Homes with an active radon mitigation system: Verify that the radon fan is operating. If not operating or if the tested radon level is 4 pCi/L or more, advise the client to consult their state radon office (http://www.epa.gov/radon/whereyoulive.html) or a qualified radon mitigation contractor (http://www.epa.gov/radon/radontest.html).</p> <p>Relevant Standards/Guidance: ASTM E2121, Standard Practice for Installing Radon Mitigation Systems in Existing Low-Rise Residential Buildings</p> <p>EPA's Citizen's Guide to Radon http://www.epa.gov/radon/pubs/citguide.html</p>	
OTHER BELOWGROUND CONTAMINANT SOURCES			
	<p>If there is a sewer gas smell in the home (e.g., during fan depressurization test), visually evaluate the integrity of sewer vent system (e.g., ensure drain traps have water in them, inspect drain lines for breaks or leaks).</p> <p>If soil or groundwater contamination is suspected on or near the building site (e.g., former industrial sites), volatile contaminants or breakdown products may pose an indoor air quality risk through soil gas intrusion. In such cases, EPA recommends further assessment before air sealing. Consult your state or tribal brownfield voluntary cleanup program or environmental regulatory agency for information on the risks of vapor intrusion in your area.</p> <p>Without discovering and correcting the cause or source, corrective measures, such as the installation of plastic sheathing or air sealing, will only exaggerate these problems.</p>	<ul style="list-style-type: none"> • Fill dry drain traps with a non-toxic liquid that has a slow evaporation rate (e.g., mineral oil), and repair or replace failed or unattached sewer vent system components before air-sealing activities. • If soil gas vapor intrusion is suspected, assess and mitigate in accordance with state or local regulation. If state or local regulation does not exist, follow EPA guidance. <p>Note: <i>Soil depressurization systems similar to radon mitigation systems are typically recommended to solve soil gas vapor intrusion problems.</i></p> <p>Relevant Guidance: American Society of Plumbing Engineers Data Book: A Plumbing Engineer's Guide to System Design and Specifications. Volume 2, Plumbing Systems (p. 10).</p>	<p>If there is an untrapped floor drain, consider a low-cost floor drain seal retrofit often used during radon mitigations.</p>

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PRIORITY ISSUES	ASSESSMENT PROTOCOL	HEALTHY INDOOR ENVIRONMENTS	
		Minimum Actions	Expanded Actions
OTHER BELOWGROUND CONTAMINANT SOURCES <i>(continued)</i>			
	<p>Assessment Standard: EPA Vapor Intrusion Primer, ASTM E2600, or EPA Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils.</p> <p>http://www.epa.gov/waste/hazard/correctiveaction/eis/vapor.htm</p> <p>Also see: http://www.epa.gov/ada/gw/vapor.html</p>	<p>State or local regulation where applicable. Otherwise EPA Vapor Intrusion Primer, ASTM E2600, or EPA Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils.</p> <p>http://www.epa.gov/waste/hazard/correctiveaction/eis/vapor.htm</p>	
EMERGING ISSUES			
PCBs, DRYWALL & SPRAY POLYURETHANE FOAM			
	<p>Assess if there are any concerns over the following emerging issues (additional guidance may be necessary):</p> <ul style="list-style-type: none"> • PCBs in caulk • Contaminated drywall • Spray polyurethane foam <p>Assessment Guidance: No inexpensive assessments have been identified for these emerging issues.</p>	<ul style="list-style-type: none"> • When using spray polyurethane foam, ensure workers use proper protection including an appropriate respirator, chemical resistant gloves and additional chemical resistant clothing to prevent dermal exposure. Ensure sufficient ventilation and foam cure time to protect tenants before re-entry in the home. Also see: http://www.epa.gov/dfe/pubs/projects/spf/spray_polyurethane_foam.html 	<ul style="list-style-type: none"> • If PCBs may be present, see: http://www.epa.gov/pCBSincaulk/ • If contaminated drywall issues are suspected in the home, see: http://www.cpsc.gov/info/drywall/guidance0410.pdf
CRITICAL BUILDING SYSTEMS FOR OCCUPANT HEALTH			
COMBUSTION SAFETY (CO, VOCs & PARTICULATES)			
VENTED APPLIANCES			
	<p>Determine if there are any existing or potential safety issues with combustion appliances, such as gas, kerosene or oil burning ranges, ovens, stoves, furnaces, wood stoves or fireplaces.</p> <p>Determine if there are any potential safety issues that may result from changes to the building envelope, using Combustion Appliance Zone (CAZ) Worst Case Depressurization testing per BPI Section 7.5.</p> <p>Assessment Standard: BPI Home Energy Auditing (EA) Standard 10/19/09, Section 7</p>	<ul style="list-style-type: none"> • Conduct CAZ Testing per BPI Standards and ensure compliance. • If a whole house fan is used for night cooling, warn occupants to open many windows before operating the fan. • Repair, modify or replace combustion equipment (e.g., water heater, furnace, boiler, gas range, fireplaces, woodstoves, etc.) and address other issues/deficiencies as needed to meet BPI standards. • If the home smells of wood smoke, investigate cause and repair. • Install carbon monoxide (CO) monitors/alarms if not present, one per floor level. 	<ul style="list-style-type: none"> • Address CAZ pressure — with combustion make-up air, fan interlocks, transfer grilles, jumper ducts, louvered doors or door undercuts — or disable offending exhaust equipment. • When water heaters are replaced, add a heat trap to the hot water line of new set-up. • If replacing combustion equipment as part of the retrofit process, replace existing with sealed combustion equipment, per Section 5.1 of EPA Indoor airPLUS Construction Specification and ACCA QI Standards.

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PRIORITY ISSUES	ASSESSMENT PROTOCOL	HEALTHY INDOOR ENVIRONMENTS	
		Minimum Actions	Expanded Actions
VENTED APPLIANCES (continued)			
	<p>Note: When conducting CAZ testing, 5 Pa depressurization limit may not be appropriate for all venting conditions. See BPI CAZ Depressurization Limits table: http://www.bpi.org/Web%20Download/BPI%20Standards/Building%20Analyst%20Professional_2-28-05nNC-newCO.pdf</p>	<p>Relevant Standard: BPI Home Energy Auditing Standard, Section 7 NFPA 720 OR Consumer Product Safety Commission Carbon Monoxide Questions and Answers CPSC Document #466</p>	<p>Relevant Guidance: EPA Indoor airPLUS Construction Specification Section 5.1 ACCA QI Standards http://www.epa.gov/indoorairplus/construction_specifications.html</p>
UNVENTED APPLIANCES			
	<p>Identify any unvented gas or kerosene space heaters or vent-free fireplaces.</p> <p>Determine whether any local or state laws prohibiting these devices apply.</p> <p>Recognize all unvented heaters as moisture sources.</p> <p>Assessment Guidance: N/A</p>	<ul style="list-style-type: none"> • Install carbon monoxide (CO) monitors/alarms if not present (one per floor level). • Verify that kitchen exhaust fan exhausts to outdoors. • Recommend removing all unvented combustion appliances. If the primary source of heat, replace with vented, code-compliant heating systems. • Red tag illegal unvented gas or kerosene space heaters according to local and state law and advise clients to remove them as appropriate. If the primary source of heat, replace with vented, code-compliant heating systems. • If occupant intends to disregard these recommendations, educate occupants about the hazards of operating illegal unvented space heaters or operating vent-free appliances inconsistently with manufacturer's directions. For example, some manufacturers' directions call for open windows, as use of the device requires additional ventilation to remove products of combustion such as NO₂, CO₂, ultrafine particles and water vapor. <p>Relevant Standard: BPI Home Energy Auditing Standard, Sections 3.2 and 7 NFPA 720 OR Consumer Product Safety Commission Carbon Monoxide Questions and Answers CPSC Document #466</p>	<p>This cell is intentionally blank.</p>

PRIORITY ISSUES	ASSESSMENT PROTOCOL	HEALTHY INDOOR ENVIRONMENTS	
		Minimum Actions	Expanded Actions
EXHAUST VENTILATION FOR LOCALIZED CONTAMINANT SOURCES INCLUDING KITCHENS, BATHS, DRYERS, ETC.			
	<p>Determine if home complies with local exhaust requirements of ASHRAE Standard 62.2-2010, using Appendix A - Existing Buildings.</p> <p>Determine if dryers vent to the outdoors (condensing dryers are exempt).</p> <p>Check for laundry room exhaust fans.</p> <p>Inspect/verify that kitchen/bath/dryer exhaust do not discharge into crawlspaces, attics or within walls.</p> <p>Assessment Standard: ASHRAE Standard 62.2-2010, “Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings,” including Normative Appendix A – Existing Buildings</p> <p>BPI Home Energy Auditing (EA) Standard, Section 8.2</p> <p>Also see: Sample Existing Homes Ventilation Worksheet (under development)</p>	<ul style="list-style-type: none"> • If bathroom, dryer and kitchen exhaust requirements or the alternative compliance method in Appendix A of ASHRAE Standard 62.2-2010 are not met, repair, replace or install exhaust ventilation that meets ASHRAE Standard 62.2-2010 requirements and ensure ducts are sized and installed and venting properly to outdoors OR install additional ventilation measures as necessary to meet ASHRAE Standard 62.2-2010 requirements, using Appendix A - Existing Buildings to account for existing fans and windows. • Ensure that all clothes dryers exhaust to the outdoors (condensing dryers are exempt). <p>Relevant Standards: ASHRAE Standard 62.2-2010, “Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings,” including Normative Appendix A - Existing Buildings</p> <p>BPI Home Energy Auditing (EA) Standard, Section 8.2</p>	<ul style="list-style-type: none"> • 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, per ASHRAE Standard 62.2-2010 requirements of Section 5, to improve pollutant source removal. <p>Relevant Standard: ASHRAE Standard 62.2-2010, “Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings,” including Normative Appendix A - Existing Buildings</p>
WHOLE HOUSE VENTILATION FOR DISTRIBUTED CONTAMINANT SOURCES, INCLUDING FORMALDEHYDE, OTHER VOCs, AND PARTICLES			
	<p>Determine if existing ventilation meets ASHRAE Standard 62.2-2010 requirements, using Appendix A - Existing Buildings. (This will require blower door testing and measuring fan flows—e.g., bathroom, kitchen exhaust). Determine if additional ventilation measures are needed to meet the ASHRAE Standard 62.2-2010 requirements.</p> <p>Assessment Standard: ASHRAE Standard 62.2-2010, “Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings,” including Normative Appendix A – Existing Buildings</p> <p>Also see: Sample Existing Homes Ventilation Worksheet (under development)</p>	<ul style="list-style-type: none"> • Install additional ventilation measures as necessary to meet ASHRAE Standard 62.2-2010 requirements, using Appendix A - Existing Buildings to account for existing fans and windows. <p>Relevant Standard: ASHRAE Standard 62.2-2010, “Ventilation and Acceptable Indoor Air Quality in Low-Rise Residential Buildings,” including Normative Appendix A - Existing Buildings</p>	<ul style="list-style-type: none"> • Ensure newly installed central forced-air HVAC systems have minimum MERV 8 filter, no filter bypass, and no air cleaners designed to produce ozone. • For existing systems, check with the manufacturer to determine if MERV 8 filters can be installed. • During remodeling/renovation activities, follow the guidance in EPA Indoor airPLUS Construction Specifications Sections 6.1 (structural plywood, oriented strand board (OSB), and composite wood products), 6.2 (interior paints and finishes), and 6.3 (carpets and carpet adhesives), where applicable. <p>Relevant Guidance: EPA Indoor airPLUS Construction Specifications 4.7, 6.1, 6.2 and 6.3</p> <p>http://www.epa.gov/indoorairplus/construction_specifications.html</p>

PRIORITY ISSUES	ASSESSMENT PROTOCOL	HEALTHY INDOOR ENVIRONMENTS											
		Minimum Actions	Expanded Actions										
SAFETY													
HOME SAFETY													
	<p>Determine if there are working CO monitors/alarms and smoke detectors.</p> <p>Identify knob and tube electrical wiring.</p> <p>Identify harmful chemicals in accessible locations.</p> <p>Assessment Guidance: N/A</p>	<ul style="list-style-type: none"> • Test/install working CO and smoke alarms. If new batteries are needed, install a 10-year lithium battery. • Do not bury unsafe wiring in attic insulation. <p>Relevant Standard: BPI Home Energy Auditing Standard, Section 7</p> <p>NFPA 720 OR Consumer Product Safety Commission Carbon Monoxide Questions and Answers CPSC Document #466</p> <p>Occupant Education: Hot water heater set-back rationale; instructions on how to test smoke and CO alarms; other safety measures for young children, elderly, etc.; referral to other local programs</p>	<ul style="list-style-type: none"> • Recommend safe storage of harmful household chemicals (e.g., remove from accessible locations). • For households with small children and/or elderly occupants, discuss scald prevention with clients and adjust hot water heater setpoint to 120 degrees Fahrenheit to prevent scalding. • For households with small children, recommend installation of gates at top of stairs. • In homes with elderly persons, install grab bars, handrails and lighting as appropriate. • Recommend replacement of knob and tube wiring following applicable electrical codes using qualified personnel. <p>Relevant Guidance: N/A</p>										
OCCUPANT AND WORKER SAFETY													
	<p>Occupants and workers need to be protected from unsafe exposures during retrofit and renovation activities. By law, employers and supervisors are required to ensure that workers are working with an OSHA written Safety and Health Plan.</p> <p>Typical OSHA Construction Plan Includes:</p> <table border="0"> <tr> <td>Falls</td> <td>29 CFR 1926.501</td> </tr> <tr> <td>Ladders</td> <td>29 CFR 1926.1053</td> </tr> <tr> <td>Electrical</td> <td>29 CFR 1926 Subpart K</td> </tr> <tr> <td>Chemicals</td> <td>29 CFR 1926.59</td> </tr> <tr> <td>Confined Space</td> <td>29 CFR 1926.21 (b)(6)(i)</td> </tr> </table> <p>Free help with developing these plans is often available from state or federal training (consulting) programs.</p> <p>Assessment Guidance: OSHA 1926 Safety and Health Regulations for Construction</p> <p>Safety and Health Plans shall address multiple construction issues, including the following:</p>	Falls	29 CFR 1926.501	Ladders	29 CFR 1926.1053	Electrical	29 CFR 1926 Subpart K	Chemicals	29 CFR 1926.59	Confined Space	29 CFR 1926.21 (b)(6)(i)	<ul style="list-style-type: none"> • When known pollutants are being produced or disturbed during retrofit activities, follow appropriate standards to minimize worker and occupant exposure, including EPA lead safe, BPI, OSHA, NIOSH, etc. (see below). • Ensure proper ventilation and adequate worker hazard protection during these types of activities. <p>Additional Resources: OSHA website http://www.osha.gov/</p> <p>National Institute for Occupational Safety and Health (NIOSH) website http://www.cdc.gov/niosh</p>	<p>When possible, choose construction products with manufacturers that disclose all ingredients and verify that they are free of formaldehyde, mercury, and other known toxic substances.</p> <p>Additional Resource: Healthy Building Network PHAROS Tool http://pharosproject.net</p>
Falls	29 CFR 1926.501												
Ladders	29 CFR 1926.1053												
Electrical	29 CFR 1926 Subpart K												
Chemicals	29 CFR 1926.59												
Confined Space	29 CFR 1926.21 (b)(6)(i)												

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PRIORITY ISSUES	ASSESSMENT PROTOCOL	HEALTHY INDOOR ENVIRONMENTS	
		Minimum Actions	Expanded Actions
OCCUPANT AND WORKER SAFETY <i>(continued)</i>			
	Lead: Determine if retrofitting/renovation activities will expose workers to lead dust (paint) (e.g., pre-1978 buildings).	Lead: If the facility was built before 1978, retrofitting/renovation activities involving existing paint are assumed to contain lead and require compliance with EPA 40 CFR 745 RRP. OSHA's Lead Standard for the Construction Industry at 29 CFR 1926.62, covers hazards from lead.	OSHA publication "Lead in Construction" which can be found at http://www.osha.gov/Publications/osh3142.pdf , provides information on OSHA requirements to protect workers from lead hazards in the construction industry.
	Asbestos: Determine if workers will be exposed to asbestos containing material (e.g., pre-1980 buildings).	Asbestos: If the facility was built before 1980, retrofitting/renovation activities may expose workers to asbestos containing material and require compliance with 29 CFR 1926.1101, which provides the required protection measures. See page 1 for more guidance.	
	Falls: Determine if workers will be exposed to heights of 6 feet or greater.	Falls: If work is required at heights of 6 feet or greater, then the workers must be protected with guard rails or tied off to prevent falling, Refer to OSHA rule at 29 CFR 1926.501.	Additional information on protecting the workers from fall hazards can be found at: http://www.osha.gov/SLTC/etools/construction/falls/mainpage.html .
	Ladders: Determine if workers will be using ladders.	Ladders: If ladders are used, portable ladders must be able to support at least four times the maximum intended load. Ladders that must lean against a wall are to be positioned at a 4:1 angle. Ladders are to be kept free of oil, grease, wet paint and other slipping hazards. The area around the top and bottom of the ladder must be kept clear. Ladders must not be tied or fastened together to provide longer sections. Metal ladders must not be used while working on electrical equipment and electrical wiring. Additional information available at: OSHA's 29 CFR 1926.1053.	Additional resources on ladder safety can be found on OSHA's website at: http://www.osha.gov/Publications/osh3124.pdf .
	Electrical: Determine if workers will be exposed to electrical hazards.	Electrical: Exposure to electrical hazards is a leading cause of death and injuries for construction work. 29 CFR 1926 Subpart K contains requirements in protecting workers from electrical hazards. Employers must make sure that all non-double-insulated electric equipment is equipped with a grounding conductor (three-wire type). Worn or frayed electric cords must not be used. Employers must provide either ground-fault circuit interrupters or an assured equipment grounding conductor program (which includes the regular testing of all equipment grounding conductors) to protect employees from ground faults.	Additional information on electrical safety available at: http://www.osha.gov/SLTC/etools/construction/electrical_incidents/mainpage.html .

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PRIORITY ISSUES	ASSESSMENT PROTOCOL	HEALTHY INDOOR ENVIRONMENTS	
		Minimum Actions	Expanded Actions
OCCUPANT AND WORKER SAFETY <i>(continued)</i>			
	Mold: Determine if workers will be exposed to mold.	Mold: Mold is found in damp, humid environments that have poor air exchange. Most molds do not harm healthy people but can cause allergies and asthma in others. If mold is suspected to be disturbed during activities, refer to the CDC Mold Prevention Strategies, NIOSH Interim Recommendations for Cleaning and remediation, or EPA's publication, A Brief Guide to Mold, Moisture and Your Home for guidance.	Mold Guidance Documents can be found at http://www.epa.gov/mold/ and http://www.cdc.gov/mold/cleanup.htm . All suspect moldy areas should be remediated by properly trained individuals. The moisture source needs to be identified (http://www.epa.gov/mold/) or mold will return.
	Hazard communication: Determine whether workers will be exposed to chemicals.	Hazard communication: If renovation/retrofitting activities will require the handling of chemical substances, compliance with 29 CFR 1926.59 is necessary. It requires that chemical safety information be made available for all chemicals in use, containers are properly labeled, and workers handling them are properly trained.	
	Confined space: Determine if workers are exposed to confined space hazards.	Confined space: Ensure work space has breathable air (i.e., ventilate the work space if necessary). Section 5(a)(1) of OSH ACT requires employers to protect workers from workplace hazards that are serious in nature. 29 CFR 1926.21 (b)(6)(i) requires that all employees required to enter into confined or enclosed spaces shall be instructed as to the nature of the hazards involved, the necessary precautions to be taken, and the use of protective and emergency equipment required.	Additional resources on confined space hazards in the General Industry may be found on OSHA's website at: http://www.osha.gov/SLTC/confinedspaces/recognition.html .

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PRIORITY ISSUES	ASSESSMENT PROTOCOL	HEALTHY INDOOR ENVIRONMENTS	
		Minimum Actions	Expanded Actions
OCCUPANT AND WORKER SAFETY <i>(continued)</i>			
	<p>Spray polyurethane foam: Determine if workers are using spray polyurethane foam.</p>	<p>Spray polyurethane foam: Spray polyurethane foam (SPF) is extremely hazardous, and if it is going to be used, the NIOSH Alert “Preventing Asthma and Death from MDI” provides best safe practices for SPF use. SPF should only be applied with full face supplied air respirators and protective clothing. The work area should be ventilated for hours before reentry is allowed. OSHA’s standard for MDI in general industry is 29 CFR 1910.1000 Subpart K and for construction is 29 CFR 1926.55 Appendix A.</p>	<p>For Spray Polyurethane Foam, follow recommendations provided on EPA’s website: http://www.epa.gov/dfe/pubs/projects/spf/spray_polyurethane_foam.html</p> <p>SPF is a widely used and highly-effective insulator and sealant; however, eye, skin, and inhalation exposures to its key ingredient, isocyanates, and other chemicals in SPF products of concern in vapors, aerosols and dusts during SPF installation can cause: asthma, lung damage, respiratory problems and other breathing difficulties, skin and eye irritation, and potentially other adverse health effects.</p> <p>Minimum Health Protections include:</p> <ul style="list-style-type: none"> • Building occupants and other trade workers not involved in the SPF installation should vacate the premises. • Review product ingredients and use information, such as material safety data sheets (MSDSs). • Isolate the work site. • Wear prescribed personal protective equipment: chemical resistant (nitrile) gloves, appropriate respirator, and chemical resistant clothing. • Ventilate the work site. • Clean the area thoroughly before re-entry of unprotected workers or occupants. <p>NIOSH Protective Clothing and Ensembles Safety and Health Topic website</p> <p>http://www.cdc.gov/niosh/topics/protclothing</p>
	<p>Drywall with impurities: Determine whether drywall has been imported from China.</p>	<p>Drywall with impurities: if drywall suspected to contain sulfur/mercury impurities is used, immediately reassess and substitute with a less hazardous alternative. There is no known abatement for Chinese drywall containing sulfur/mercury.</p>	

End Notes:

¹ *DISCLAIMER*: Tightening a building is essential for energy efficiency, but may have the unintended consequence of allowing contaminants that would otherwise be diluted to build up to unhealthy levels, including secondhand smoke in homes of smokers or in attached multi-family dwellings adjacent to smokers.

² Smoking by residents in single-family dwellings is an occupant behavior that is beyond the scope of this document.

³ This is not a complete summary of the regulatory requirements. The full requirements can be found at: <http://www.epa.gov/lead/pubs/renovation.htm>. The intent of this DRAFT protocol is to promote the most health protective steps that are feasible and practical. The minimum action recommended in this DRAFT protocol is to comply with whatever the most current version of the RRP Rule prescribes. The current version of the RRP Rule does not require dust wipe testing and passage of clearance standards after demolition, removal of greater than 6 ft² of plaster, or use of machines that disturb paint through high-speed operation; or dust wipe testing after use of heat gun at temperatures below 1,100 degrees Fahrenheit; removal or replacement of windows or doors; scraping greater than 60ft² of painted surfaces; or removing greater than 40ft² of trim or molding. However, a subsequent final rulemaking may include these more stringent requirements.

⁴ Reference EPA website to find accredited training programs: http://cfpub.epa.gov/flpp/searchrrp_training.htm.

⁵ More stringent requirements apply for HUD projects that use over \$5,000 of federal assistance.

⁶ Dust clearance testing includes measuring for lead dust on floors, windowsills and window troughs. See http://www.nchh.org/Portals/0/Contents/factsheet_lead_dust.pdf.

⁷ This assessment is designed to help contractors and assessors identify existing or potential moisture problems.

⁸ Replacing an atmospherically-vented combustion device with a high-efficiency, fan-powered exhaust or sealed combustion device can lower the ventilation rate and affect indoor humidity levels. If an atmospherically-vented combustion device is causing an indoor humidity problem, it should be repaired in accordance with the Combustion Safety section of this Protocol.



<http://www.epa.gov/iaq/homes/retrofits.html>

