

# Indoor airPLUS

Better Environments Inside and Out



# Integrating Health Protective Actions into Home Energy Retrofits

# Outline

1. The Opportunity
2. Related Federal Initiatives
3. EPA Healthy Indoor Environment  
Protocols for Home Energy Retrofits

# 1. The Opportunity: Integrating IAQ into Home Energy Retrofits



# 130 Million

**# of energy INefficient housing  
units in the U.S.**



# Let's Fix Some Houses!

Save Americans \$

Get Off Foreign Oil

Put Americans to Work



**GREEN  
JOBS**

# But What Can Go Wrong? Unintended Consequences:

- Combustion safety problems (house pressure changes: back-drafting, spillage, moisture, etc.)
- Moisture/mold problems (insufficient ventilation, improper vapor barrier/insulation installation, etc.)
- Increased exposure to:
  - Asthma triggers (mold, pests, VOC's, etc.)
  - Chronic health risks, including radon, lead, formaldehyde, etc.
- Comfort problems (loss of RH control)



Low-e/argon vinyl  
replacement  
windows installed,  
while peeling lead  
paint remains (lost  
opportunity and  
possibly unsafe  
work practices)





Condensation on replacement windows can be a sign of poor ventilation or poor humidity control

# 1 in 15

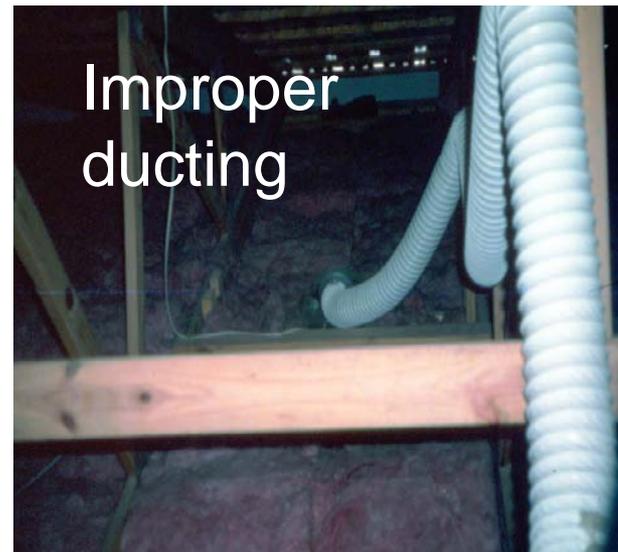
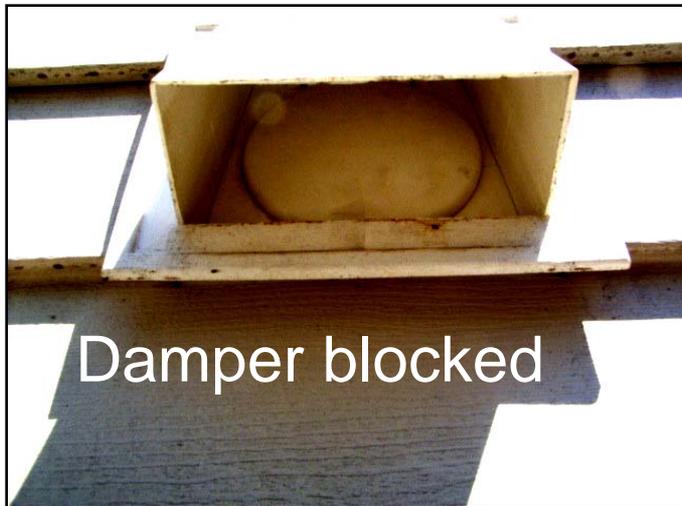
## Homes with radon above 4 pC/L



**Retrofits may increase radon levels –  
testing is the only way to find out.**



# And more ...









Insert Worker Safety  
Pictures Here

# What Else Can Go Wrong? Bad PR!

Saturday  
OCTOBER 5, 1996

# Star Tribune

Minneapolis  
Edition

NEWSPAPER OF THE TWIN CITIES

## Some noise-insulated homes unsafe

A Star Tribune investigation revealed flaws in the Metropolitan Airports Commission (MAC) sound insulation program and safety issues in some insulated houses. MAC was told about air quality and moisture problems four years ago. Now the MAC is proposing to fix the program and repair houses.

**By Karen Young and Donna Halverson**  
Star Tribune Staff Writers

A program to insulate thousands of homes near Minneapolis-St. Paul International Airport against airplane noise is making some of those homes unsafe, but their inhabitants, the Star Tribune has found.

An expert who tested five sound-insulated houses for the Star Tribune found that three are unsafe. He found the other two have serious ventilation problems that are damaging the houses' structural integrity or making them dangerous under certain circumstances. In all cases, the homeowners whose houses were tested were unaware of the extent of the problems.

In response to the Star Tribune investigation, program administrators will recommend to a Metropolitan Airports Commission (MAC) committee Tuesday that MAC conduct safety tests in the more than 2,000 houses it has insulated and make repairs where necessary. A plan to conduct safety tests in every house insulated in the future already has been approved, MAC officials said.

"I want to leave the home knowing that everything is operating properly," said Tom Brown, MAC's construction manager for the program.

Program administrators also said they will recommend to MAC that carbon monoxide detectors be delivered to every sound-insulated home.

The remedial work, including testing, repairs and the addition of carbon monoxide detectors, is projected to cost about \$2.25 million.

In October 1995, MAC began testing the air quality in 20 percent of the houses it was insulating. The MAC gave test results to the Star Tribune this week showing that 4.7 percent were too tight. That is, they failed to meet national standards for safe indoor air quality, which means the houses don't get enough fresh air to replace stale air tainted by indoor pollutants.

Residents of the southwest side of Lake Nokomis in Minneapolis and others who live near Minneapolis-St. Paul International Airport are part of a Metropolitan Airports Commission program to insulate about 9,000 homes against jet noise.

*Star Tribune Photo by Peter Hirschman*

**Inside:**

- Some homeowners are satisfied with the sound insulation job; others are concerned about the quality of air in their homes. It's real scary to think that we did this to change noise pollution, and now we've changed air quality," said one owner. **Turn to A14.**
- Contractors' homeowners sign tell them that the insulation will reduce the flow of fresh air into the home and that it is up to them to correct ventilation problems. **Turn to A15.**
- When there is carbon monoxide present in your home and when fuel-burning appliances are not operating as intended, your home is unsafe. **Turn to A15.**

**Turn to MAC on A14**

# 2. Related Federal Initiatives

# Related Federal “Healthy Homes” Initiatives

# Why Does the Integration of Health and Energy Make Sense?

- **Double Benefit:** Make commercial buildings healthier (increases worker productivity, attendance rates, etc.) **and** more energy efficient with a single visit/transaction
- **Holistic Solution/Better Social Service:** Solve occupants' problems fully, as opposed to solving health **or** energy needs
- **Cost and Efficiency of Labor:** Use workers' time more efficiently and cost-effectively by sending them into a home **once**, as opposed to making separate trips (potentially w/separate workers) to address health and energy
- **Acknowledge Inter-Related Effects:** Energy retrofits can affect healthiness of a building negatively or positively (e.g., indoor air quality, health and comfort of occupants, etc.)
- **Successfully Spur Development of a Private Market:** Commercial and residential property owners have shown a greater willingness to invest in improvements to health and comfort than energy efficiency

## What Are some examples of “Healthy Homes” measures?

- Proper ventilation systems, sometimes exceeding what is required by Weatherization Assistance Program statute (e.g., ASHRAE 62.2 standard)
- Removal/remediation of mold and moisture issues
- Repair (e.g., roof repairs) or replacement (e.g., furnace replacement) that may not always be eligible, or may exceed funding caps, of WAP
- Installation of fall prevention measures (e.g., stair rails, traction strips on stairs, sidewalk repairs, shower hand rails)
- Installation of CO and smoke detectors
- Installation of A/C units where elderly live and are susceptible to heat-related death or illness

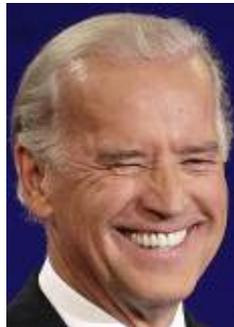
## What Is Missing:

• An **integrated protocol for conducting a home audit that addresses opportunities for retrofits that have health-improving benefits**

- Integrated programs that permit the addressing of health and energy related improvements with streamlined, pooled, or integrated funding streams

## Recovery Through Retrofit

*May, 2009: Vice President Biden called on the Council of Environmental Quality to **develop a plan for Federal action to lay the architecture for a self-sustaining home energy efficiency retrofit industry.***



## Recovery through Retrofit

### **Consumer Information**

Consumers do not have access to straightforward and reliable information.

### **Worker Certification & Training**

Consumers and industry want access to consistent workforce standards and a national certification.

### **Financing**

Homeowners need access to financing to pursue investments in energy efficiency.

Develop a National Home Energy Performance Measure and Audit Tool

Develop Energy Performance Scale & Label for Homes

Support Municipal Energy Finance Programs

Improve Energy Efficiency Mortgages

Expand State Energy Revolving Loan Funds

**Establish Voluntary National Standards for Workforce Certification and Training Program Accreditation**

## Workforce Guidelines for Home Energy Retrofits will:

- Enable retrofit program administrators to **strengthen field guides and other work manuals** by incorporating the high quality Standard Work Specifications
- Assist training providers in developing **course content** consistent with industry-recognized guidelines
- Build **confidence** in retrofit work quality & results amongst **consumers** and energy efficiency **finance** community
- Lay the foundation for a **more robust worker certification and training program accreditation**

National Residential Retrofit Guidelines



Worker Certification Architecture

1. Learn more [http://www1.eere.energy.gov/wip/retrofit\\_guidelines.html](http://www1.eere.energy.gov/wip/retrofit_guidelines.html)
2. Submit feedback/questions via email ([retrofit.guidelines@nrel.gov](mailto:retrofit.guidelines@nrel.gov))
3. Propose implementation opportunities
4. Attend the Workforce Summit in DC (TBD)

# 3. EPA Healthy Indoor Environment Protocols for Home Energy Retrofits

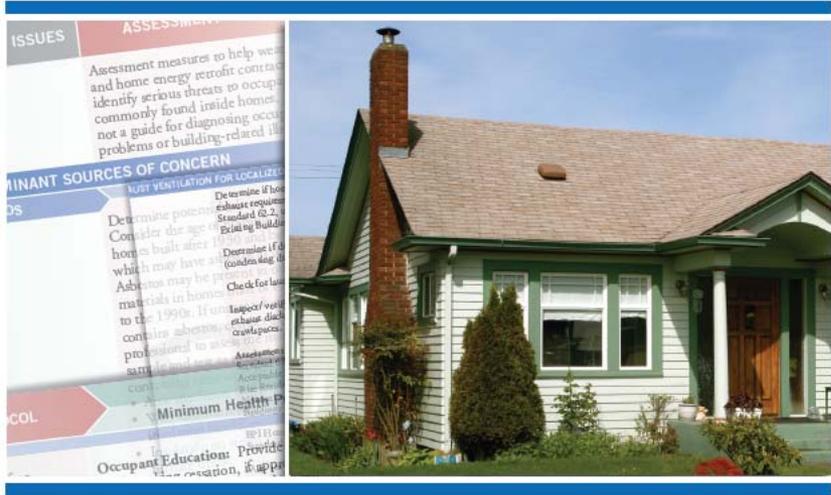


Coming Soon...

Public Comment  
expected to begin in  
November 2010

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**HEALTHY INDOOR  
ENVIRONMENT PROTOCOLS  
FOR HOME ENERGY  
RETROFITS**



**Indoor Air Quality (IAQ)**

# Development Criteria

1. Reduce potential for indoor health risks that may result from retrofits (“Do No Harm”)
2. Improve IAQ for minimal additional cost
3. Compatible w/ existing program processes
4. Practical to implement
5. Applicable nationally

# Intended Uses / Audiences

① Guidance ② Training ③ Demonstration ④ Standards

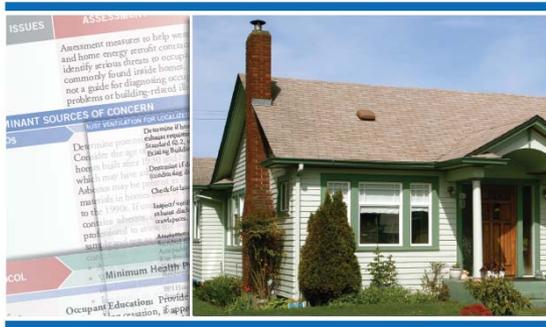
- DOE Weatherization Assistance Programs
- Energy Retrofit Industry Standards
  - Workforce Guidelines for Home Energy Retrofits (RTR)
  - BPI Home Energy Audit Standard
- HUD Funded & Private “Green” Housing Programs
- EPA Home Performance with ENERGY STAR
- Home Star (proposed)



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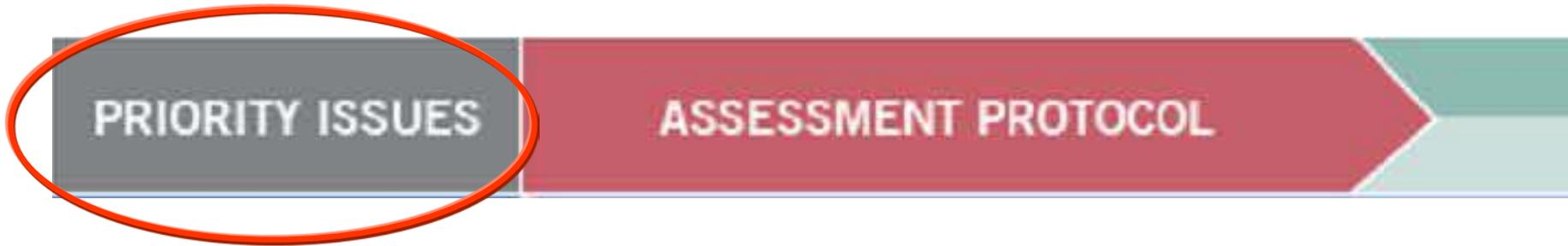
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## HEALTHY INDOOR ENVIRONMENT PROTOCOLS FOR HOME ENERGY RETROFITS



The thumbnail shows a document page with a blue header. On the left, there are sections titled 'ISSUES', 'DOMINANT SOURCES OF CONCERN', and 'COL'. The main text discusses assessment measures for home energy audits, listing common indoor air quality issues like mold, radon, and asbestos. A photograph of a two-story house with a brick chimney and green shutters is on the right. At the bottom, there is a blue bar with the text 'Indoor Air Quality (IAQ)'.

# Sneak Preview ...



***Priority Health  
Issues*** related  
to Home Energy  
Retrofits

# Priority Health Issues

## Contaminant Sources

- **Asbestos**
- **Environmental Tobacco Smoke**
- **Garage Pollutants**
- **Lead**
- **Moisture/Mold, other biologicals**
- **Ozone**
- **Pests: e.g. rodents, insects**
- **Radon**
- **Vapor Intrusion: soils, groundwater**
- **Emerging Issues: e.g. PCB's in caulk, Spray polyurethane foam**

## Critical Building Systems

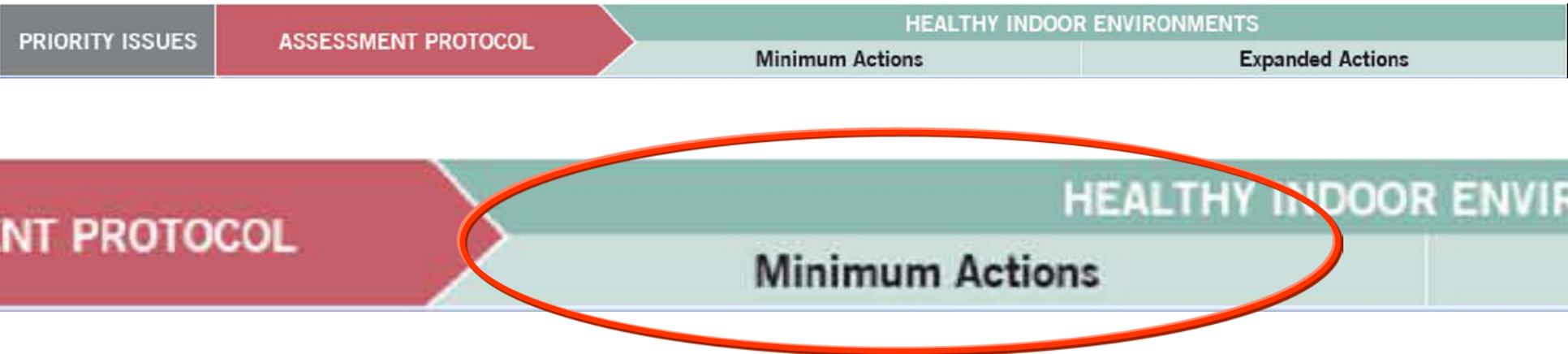
- **Combustion Safety: CO, VOC's, Particulates**
  - **Vented Appliances**
  - **Un-vented Appliances**
- **Exhaust Ventilation for Localized Contaminant Sources**
- **Whole House Ventilation for Distributed Contaminant Sources**

## Safety

- **Home Safety, Occupant & Worker Safety**



***Assessment  
Protocols:*** What to  
look for during the  
Home Energy Audit



***Minimum Actions*** to  
ensure the Home  
Energy Retrofits “Don’t  
Make it Worse”



***Expanded Actions***  
to further improve  
IAQ in Home  
Energy Retrofits  
(funds permitting)

# Example Protocol: Safety

## OCCUPANT AND WORKER SAFETY *(continued)*

### **Assessment Guidance:**

OSHA 1926 Safety and Health  
Regulations for Construction

### **Additional Resources:**

OSHA Web site  
<http://www.osha.gov/>

### **Typical OSHA Construction Plan**

Includes:

Falls	1926.501
Ladders	1926.1053
Electrical	1926 SP k
Chemicals	1926.59
Confined Space	5(A)1&c 1910.124

Free help with developing these plans  
is often available from state or federal  
training (consulting) programs.

PRIORITY ISSUES	ASSESSMENT PROTOCOL	HEALTHY INDOOR ENVIRONMENTS	
		Minimum Actions	Expanded Actions
OCCUPANT AND WORKER SAFETY			
	<p>Occupants and workers need to be protected from unsafe exposures during weatherization and renovation activities.</p> <p>By law, workers should be working with an OSHA written Safety and Health Plan that addresses multiple construction issues, including the following:</p> <p>Lead - Determine if retrofitting/renovation activities will expose workers to lead dust (paint), e.g., pre-1978 buildings.</p> <p>Asbestos - Determine if workers will be exposed to asbestos containing material, e.g., pre-1980 buildings.</p> <p>Falls - Determine if workers will be exposed to heights of 6ft or greater.</p> <p>Ladders - Determine if workers will be using ladders.</p> <p>Electrical - Determine if workers will be exposed to recognized electrical energy hazards.</p> <p>Mold - Determine if workers will be exposed to mold.</p> <p>Hazard communication - Determine whether workers will be exposed to chemicals.</p> <p>Confined space - Determine if workers will be working in confined spaces with limited entry/ exits and potential for hazardous atmospheres.</p> <p>Spray foam polyurethane - Determine whether workers will be using spray polyurethane foam.</p> <p>Drywall with impurities - Determine whether drywall has been imported from China.</p>	<ul style="list-style-type: none"> <li>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.</li> <li>Ensure proper ventilation during these types of activities, and adequate worker hazard protection.</li> </ul> <p>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 75 RRP/OSHA 1926.62. These rules provide protection against hazards from disturbing lead-based paint.</p> <p>Asbestos - If the facility was built before 1980, retrofitting/renovation activities may expose workers to asbestos containing material and require compliance with OSHA 1926.1101, which provides the required protection measures. In most homes, the concern is with heating and insulation material.</p> <p>Falls - If work is required at heights of 6 ft or greater, then the workers must be protected with guard rails or tied off to prevent falling to a lower level. Refer to OSHA rule 1926.501.</p> <p>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. OSHA 1926.1053 provides ladder safety requirements.</p> <p>Electrical - Exposure to electrical hazards is a leading cause of death and injuries for construction work. OSHA 1926 Subpart K provides required control measures for the variety of ways that electricity becomes a hazard.</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><b>Relevant Guidance:</b> N/A</p>

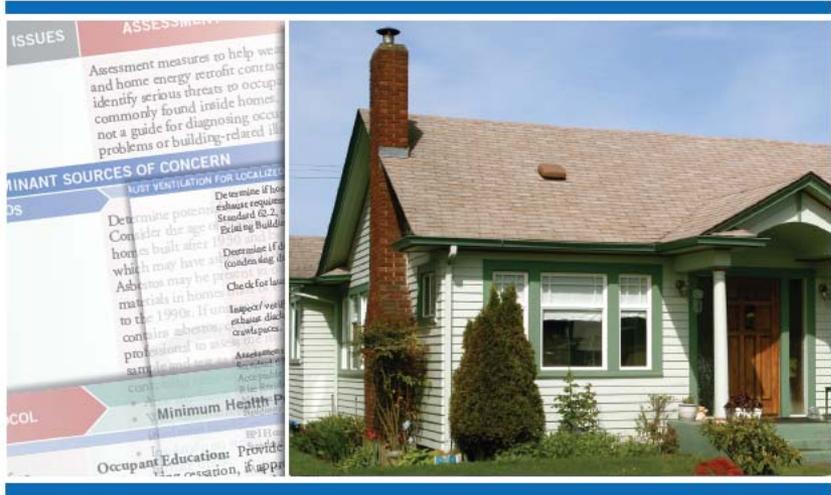


# Plan to Comment

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**HEALTHY INDOOR ENVIRONMENT PROTOCOLS FOR HOME ENERGY RETROFITS**



**Indoor Air Quality (IAQ)**

**Thank you for your time!**

**QUESTIONS??**

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**Indoor airPLUS Coordinator**

**U.S. Environmental Protection Agency**

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