

An Evaluation of Green Home Weatherization and Remodeling Programs: What is Being Done to Promote Occupant Health and Recommendations for Best Practices



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Agenda

- Introductory Statements
- Background
- Research Questions
- Objectives
- Project Scope
- Results
- General Observations
- Best Practice Recommendations
- Conclusion
- Future Directions

Introductory Statements

- The current paradigm for green remodeling and energy efficiency practices may not include stringent enough recommendations to protect and promote the health of occupants
- There is an opportunity to protect and promote optimal occupant health conditions when undergoing green remodeling and energy efficiency efforts

Background

- Recent consensus that global climate change is caused by human activities
 - Imperative to reduce use of fossil fuels
 - Increased energy efficiency in buildings = key

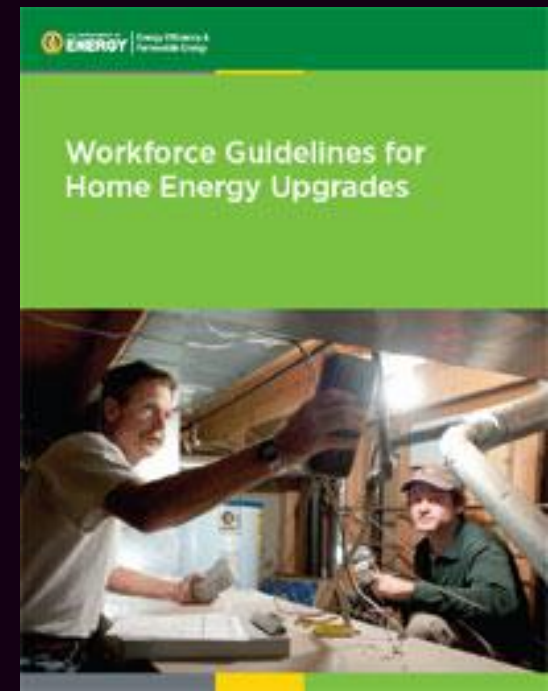
U.S. Homes generate >20% of national CO₂ emissions

Background

- Efforts underway to reduce residential energy usage
 - American Reinvestment and Recovery Act (ARRA) - \$16 billion for energy efficiency & renewable energy (ARRA, 2009)
 - Emphasis on home energy retrofits
 - Government incentives for weatherization
 - Developing infrastructure for residential energy efficiency & weatherization industry

Background

- DOE Workforce Guidelines for Home Energy Upgrades
 - http://www1.eere.energy.gov/wip/retrofit_guidelines.html
 - Was released for public comment in late 2010 (Was due 1/7/2011)
 - Projected to be model for U.S. residential energy efficiency and retrofit industry
 - 4 Components:
 - Job task Analyses
 - Essential Worker Knowledge, Skills & Abilities
 - Technical Standards Reference Guide
 - Standard Work Specifications for Energy Efficiency Residential Retrofits



*Good for energy efficiency, but also
good for occupant health?*

Background

- Earlier expedited efforts led to ill health effects
 - UFFI – used in late 70s & banned in 1982
 - Increase in indoor mold – 1980s, 1990s
 - Sharp increase in asthma (AQS, 2006)

Critical to avoid similar mistakes and health consequences

Research Questions

1. What is the current paradigm for considering occupant health when performing energy/resource efficiency and weatherization efforts for existing homes in the U.S.?
2. What recommendations for protecting and promoting occupant health should be included in green building and weatherization standards and rating systems that target existing homes?

Objectives

1. Evaluate 8 U.S. standards and/or rating systems that advocate green remodeling and weatherization efforts in existing residential buildings
2. Assess the extent to which occupant health is considered and promoted in the 8 evaluated programs
3. Provide recommendations for content that should be included in green remodeling and weatherization standards and rating systems to protect and promote occupant health

Project Scope - Evaluated Programs

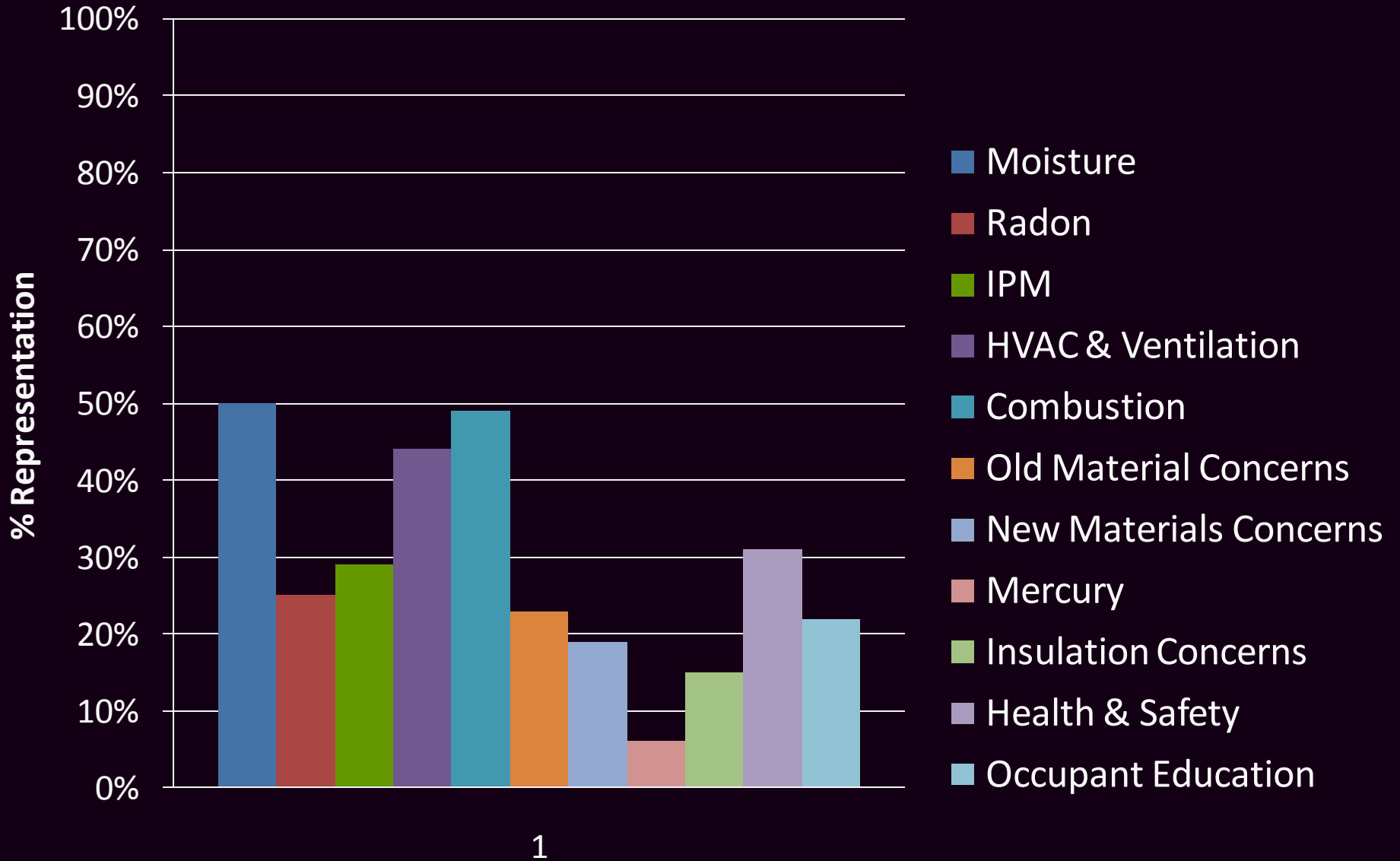
- Home Performance with ENERGY STAR®
- GreenPoint Rated Existing Homes Rating System
- Green Communities Green Single Family Rehabilitation Specifications
- EarthCraft House™ Renovation Guidelines
- Building Performance Institute (BPI) Standards
- Residential Energy Service Network (RESNET)
- Core Competencies for the Weatherization Assistance Program
- National Association of Home Builders (NAHB) National Green Building Standard™ ICC 700-2008

Project Scope

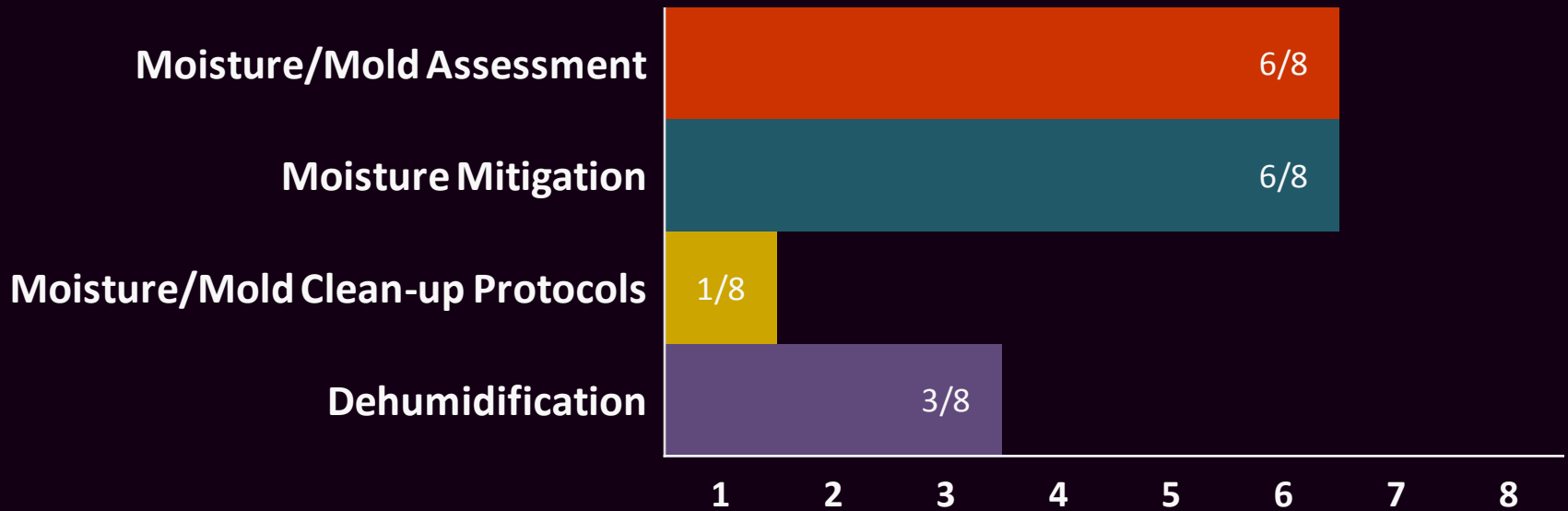
- Evaluate programs for content in 11 categories:
 - 65 subcategories
(or *Target Objectives*)

- Moisture
- Radon
- IPM
- HVAC & Ventilation
- Combustion
- Old Material Concerns
- New Material Concerns
- Mercury
- Insulation Concerns
- Health & Safety
- Occupant Education

Results by Category

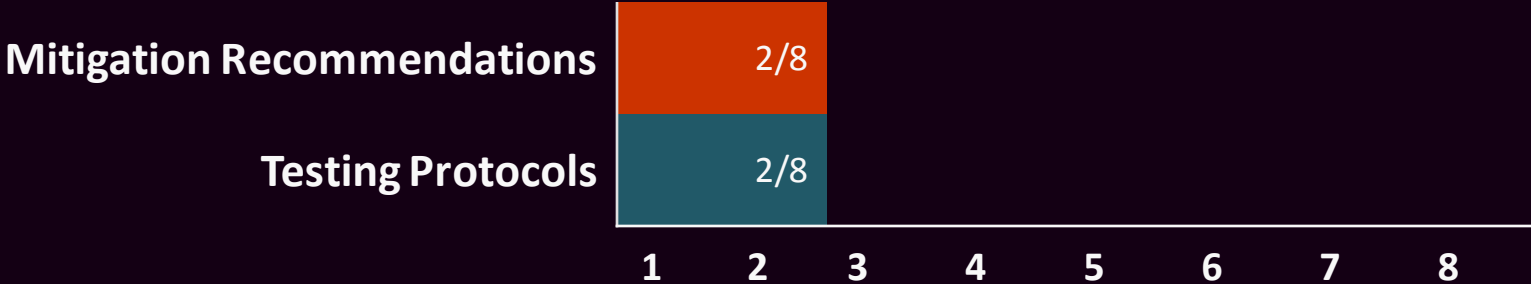


Moisture



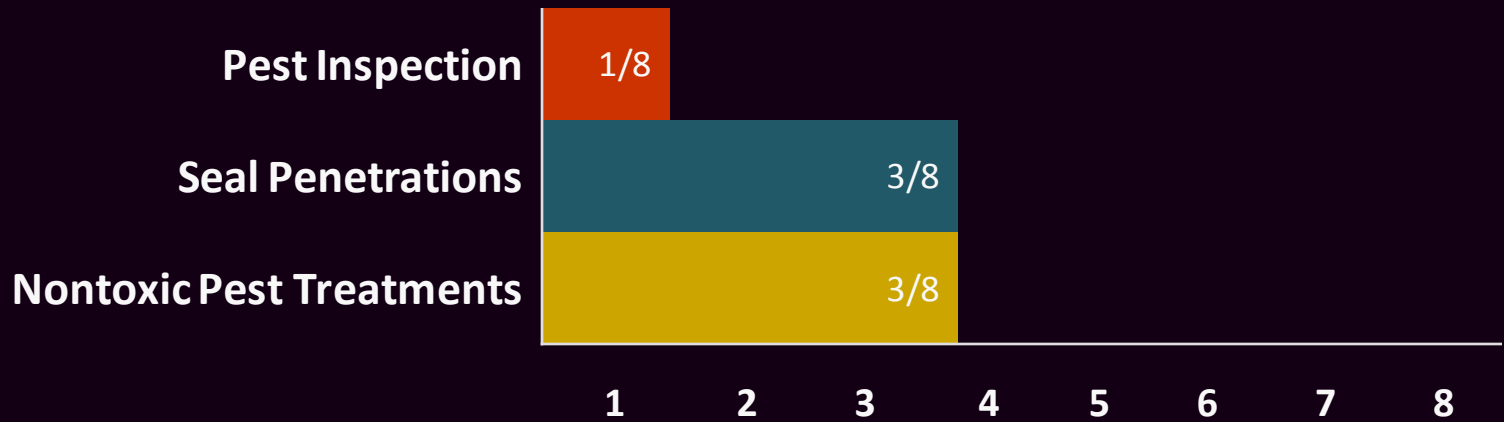
Overall Average = 50%

Radon



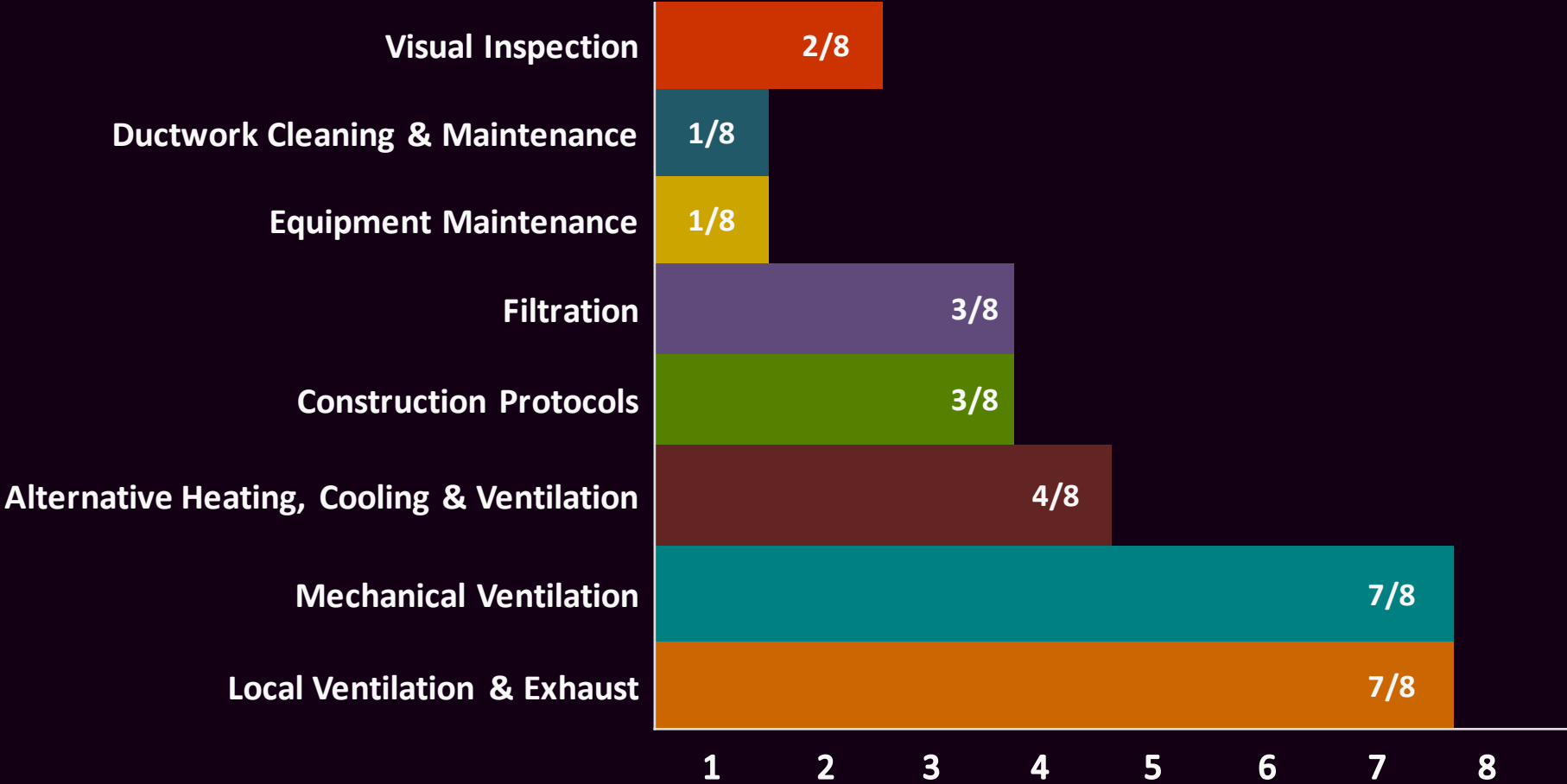
Overall Average = 25%

IPM



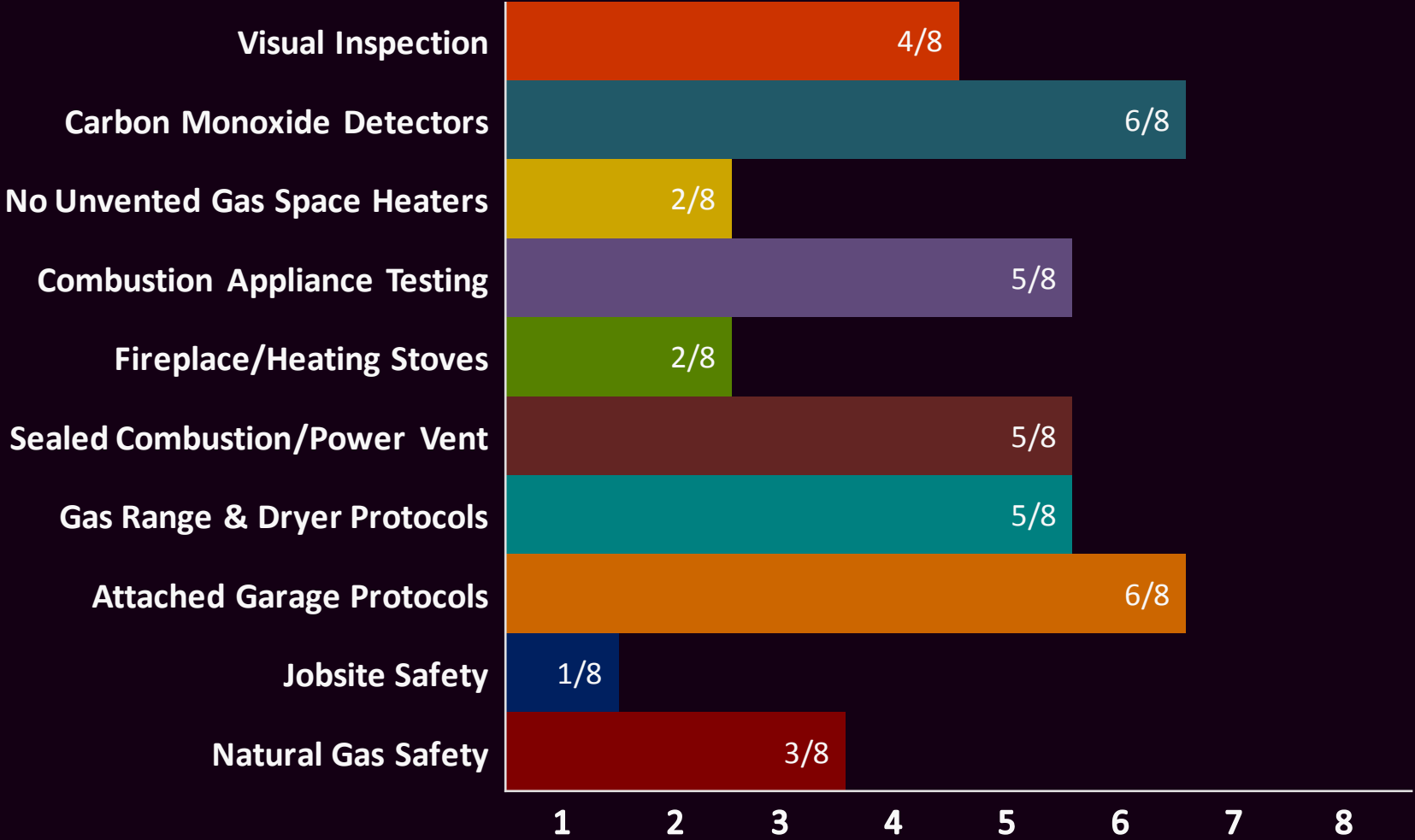
Overall Average = 29%

HVAC & Ventilation



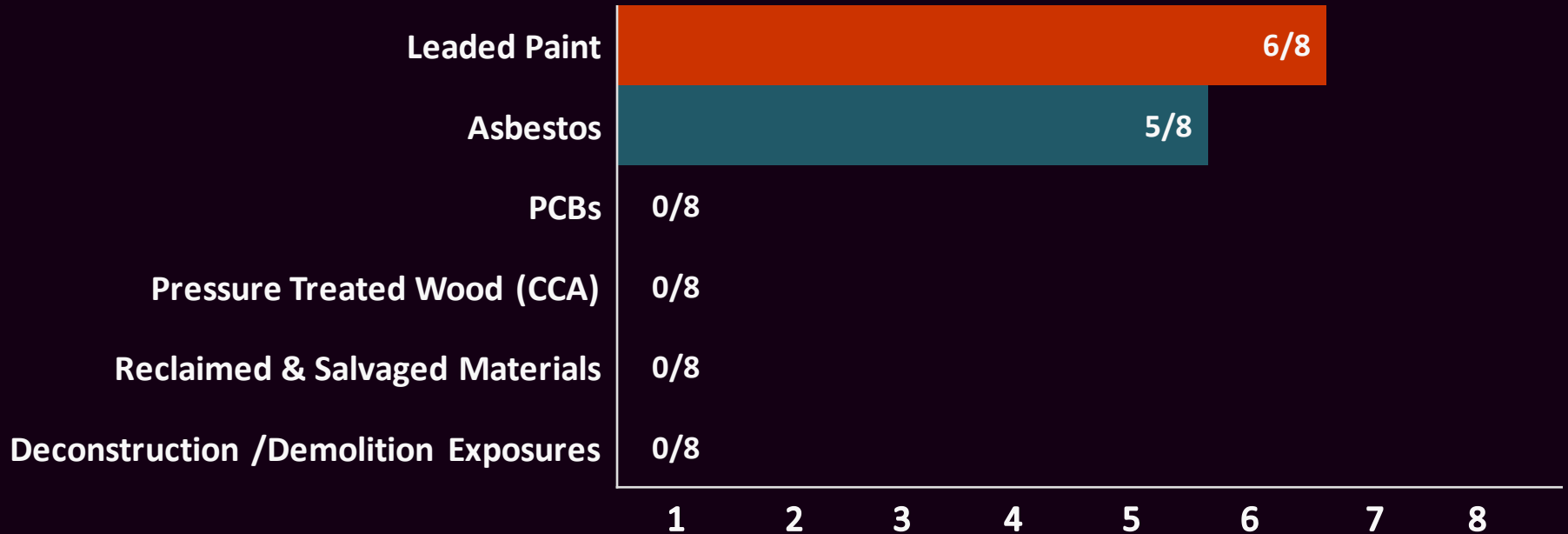
Overall Average = 44%

Combustion



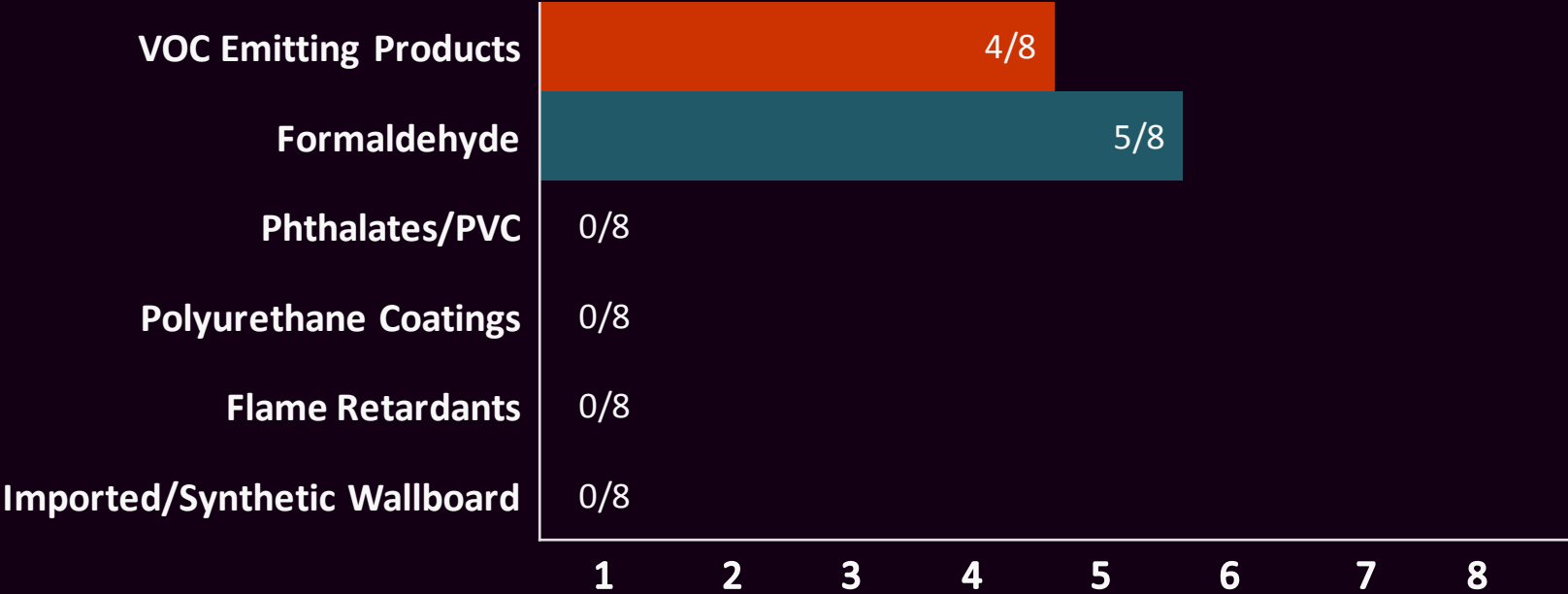
Overall Average = 49%

Old Material Concerns



Overall Average = 23%

New Material Concerns



Overall Average = 19%

Mercury

Install Low Mercury Lamps

1/8

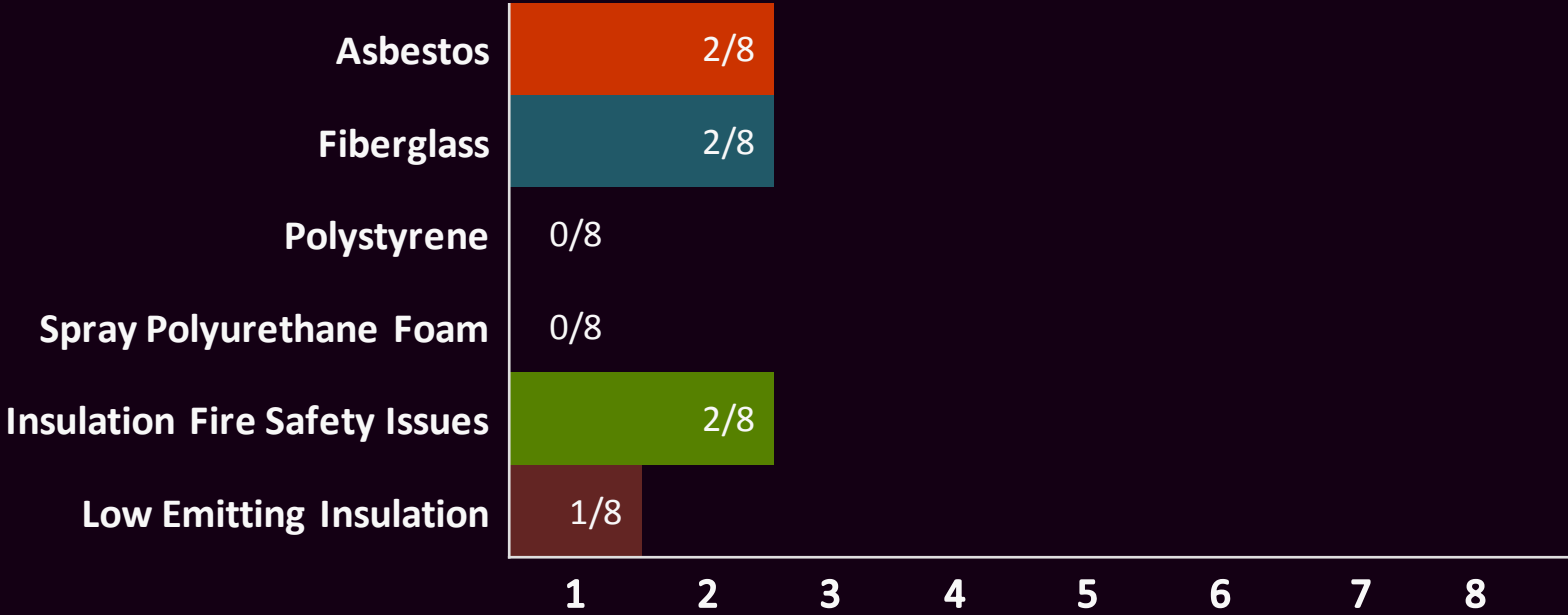
Safe Handling & Disposal

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1 2 3 4 5 6 7 8

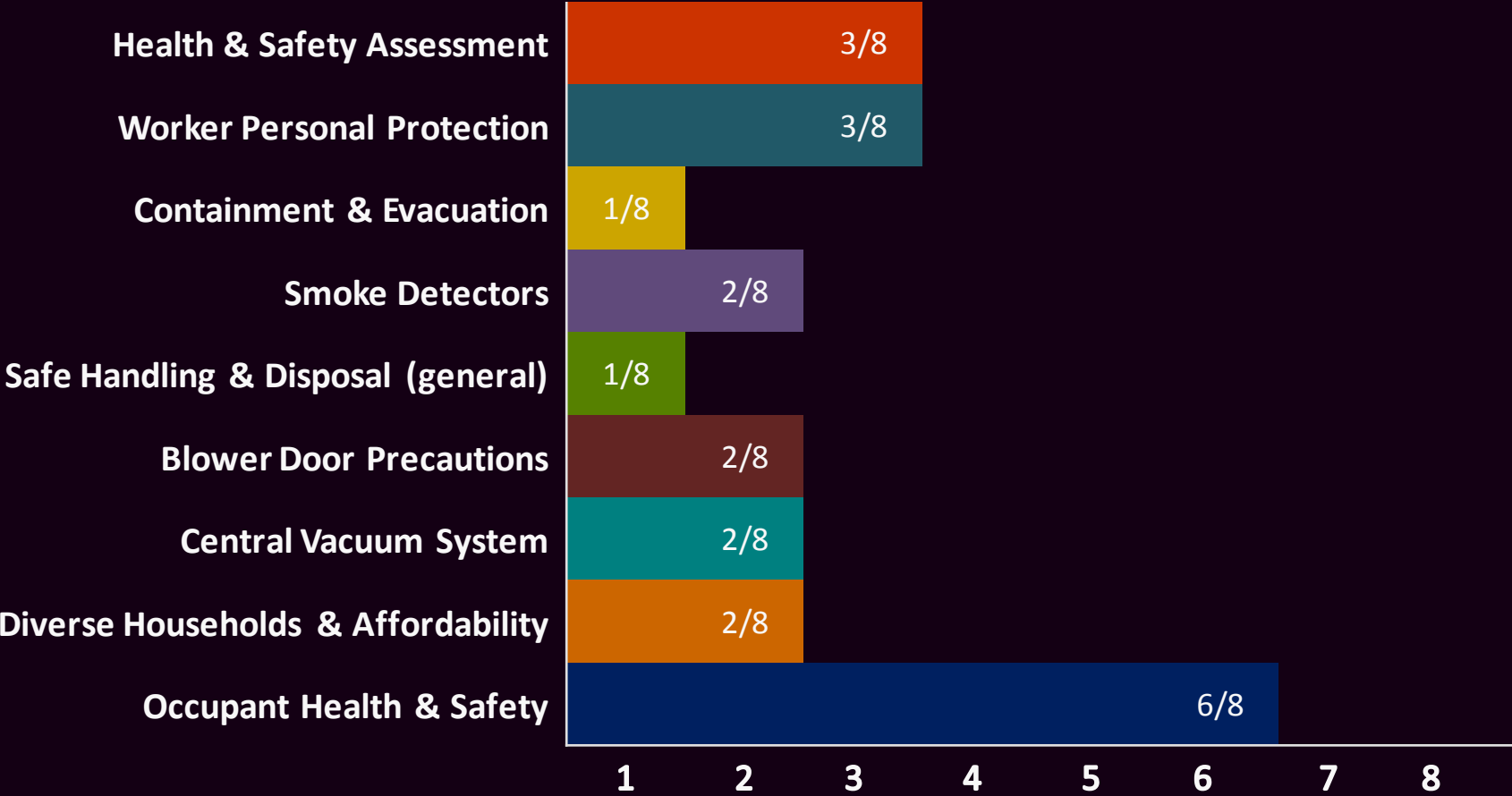
Overall Average = 6%

Insulation Concerns



Overall Average = 15%

Health & Safety



Overall Average = 31%

Occupant Education



Overall Average = 22%

General Observations

- Topics *most* often represented:
 - Moisture mitigation
 - Mechanical & local ventilation
 - Combustion testing and safety
 - Carbon monoxide detectors
 - Attached garage protocols
 - Combustion Appliance Zone (CAZ) testing
 - Lead exposures & safety
 - Asbestos exposures
 - Occupant Health & Safety (misc.)

General Observations

- Topics with *weak* representation:
 - Radon mitigation
 - Insulation concerns
 - Safe handling and disposal
 - Mercury exposure avoidance
 - IPM recommendations
 - Occupant education

General Observations

- Topics *absent* from evaluated programs:
 - Spray polyurethane foam safety
 - Exposures from old materials
 - PCBs, CCA, mercury
 - Demolition & deconstruction safety
 - Hazardous substances in reclaimed materials
 - Flame retardants
 - Phthalates & PVC
 - Synthetic & imported wallboard

Best Practice Recommendations

- Provide current, comprehensive strategies to protect and promote occupant health when undergoing green remodeling, weatherization and energy efficiency efforts

Best Practice Recommendations

- Compiled from current research data & recognized standards
- General guidelines for existing homes
- Comprehensive menu of topics
- Includes BPR for 11 categories and 65 target objectives
 - 3 additional topics included
 - Antimicrobials & biocides
 - Stain treatments
 - Artificial turf

Best Practice Recommendations

- Partial List of Resources for BPR Information:
 - **US Environmental Protection Agency**
 - **California Air Resources Board**
 - **Healthy Building Network**
 - **National Center for Healthy Housing**
 - **BuildingGreen.com**
 - **National Institute for Environmental Health Sciences**
 - **Environmental Health Perspectives (NIEHS)**
 - **Air Quality Sciences**
 - **8 Programs Evaluated**

USEPA

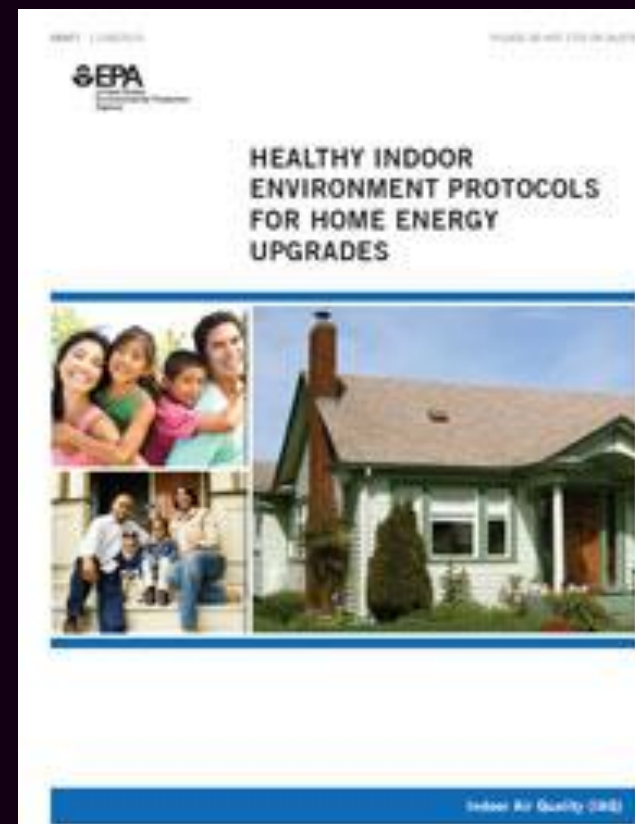


- EPA Resources:
 - IAQ and Climate Readiness
<http://www.epa.gov/iaq/climate/readiness/weatherization.html>
 - Healthy Indoor Environment Protocols for Home Energy Upgrades (downloadable .pdf document)
<http://www.epa.gov/iaq/homes/retrofits.html>
 - Indoor airPLUS Construction Specifications (downloadable .pdf document)
http://www.epa.gov/indoorairplus/pdfs/construction_specifications.pdf

EPA Healthy Indoor Environment Protocols for Home Energy Upgrades

- **Voluntary recommendations & best practices**
- **Designed to promote the integration of health and energy efficiency**
- **Includes:**
 - **Assessment Protocols**
 - **Minimum Actions**
 - **Expanded Actions**

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



EPA indoor airPLUS (IAP)

- **ENERGY STAR qualified homes eligible (new construction only)**
- **Promote good IAQ along with energy efficiency**
- **Optional certification**
- **7 categories**
 - **Moisture control**
 - **Radon**
 - **Pests**
 - **HVAC**
 - **Combustion Pollutants**
 - **Materials**
 - **Final inspection**

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



National Center for Healthy Housing (NCHH)

- **“Call to Action” = Minimum Actions**
- **3 Key Recommendations:**
 - Identify Your State Weatherization Director:
http://apps1.eere.energy.gov/weatherization/state_contacts.cfm
 - Ask which health and safety efforts are being carried out in conjunction with weatherization in your state
 - Encourage the inclusion of efforts listed in Attachment A of “Call to Action” document
http://www.nchh.org/Portals/0/Contents/Call_to_Action_Energy_Efficiency_and_Healthy_Homes.pdf



**National Center for
Healthy Housing**

Healthy Building Network

- www.healthybuilding.net
 - PVC, Bisphenol-A, formaldehyde, others
 - Pharos Project <http://www.pharosproject.net/>
 - • 3rd Party, 'transparent' tool
 - Building Product Library
 - Chemical and Material Library



HEALTHY BUILDING NETWORK

BuildingGreen.com

- www.buildinggreen.com
- Green building news
- Product reviews & information
- Wealth of information



BuildingGreen.com

Conclusion

“Based on the shared burden and mutual benefits, there is a natural opportunity to connect efficiency upgrades and health”

(Kuholski et. al, 2010 p.4)

Future Directions

- Engage green remodeling and weatherization contractors in activities that protect and promote occupant health
- Promote the co-benefits of green building/energy efficiency and increased health
- Advocate for occupant health content to be integrated into local and state green building/weatherization programs
 - Standards and rating systems
 - Building codes
 - Industry educational programs

Collaboration between
design, construction and
environmental health
professions



Understanding of the
interrelationship
between green
remodeling and
weatherization practices
and occupant health



Healthy conditions for
occupants and workers, now
and in the future

Thank you

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