Health@Home Rehabilitation Guidelines Webinar Series

Session 4

Bringing it Home: The Energy Plus Health Equation, Maintenance and Active Design

October 8, 2020

Connection Issues and Chats

Should you have any **technical** issues or concerns:

1. Use the Chat Box on the bottom right (or) make sure the "Chat" icon is lit blue on the top.
2. Submit your message to "Host and Presenters" so that all of us can see it.

For **Questions** related to the content:

1. Use the Q&A Panel (same area as the chat box)
2. Submit to all panel members and the host.

Agenda

1. Welcome and Logistics
   - Lael Holton, AECOM
2. Health@Home Overview
   - Michael Freedberg, U.S. Dept of Housing and Urban Development
3. Overview and Keep it Well Maintained
   - Ellen Tohn, Tohn Environmental Strategies
4. Keep it Thermally Controlled (and Energy Efficient)
   - Paul Francisco, Applied Research Institute, University of Illinois, Urbana-Champaign
5. Bonus Principle – Active Design
   - Mary Ayala, Enterprise Community Partners
6. Questions

Presenters

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Welcome

- Final session of our four-part series
- Participants who attend all four sessions will receive a **Health@Home Certificate of Completion**
- Importance of healthy housing has never been more clear:
  - Building more efficient homes, including passive house and zero-energy ready homes
  - Spending more time in our homes than ever due to COVID-19
  - Asthma and respiratory ailments impacted by indoor environment
- We need to be sure that when we rehab our homes, we maximize the indoor experience, minimize hazards

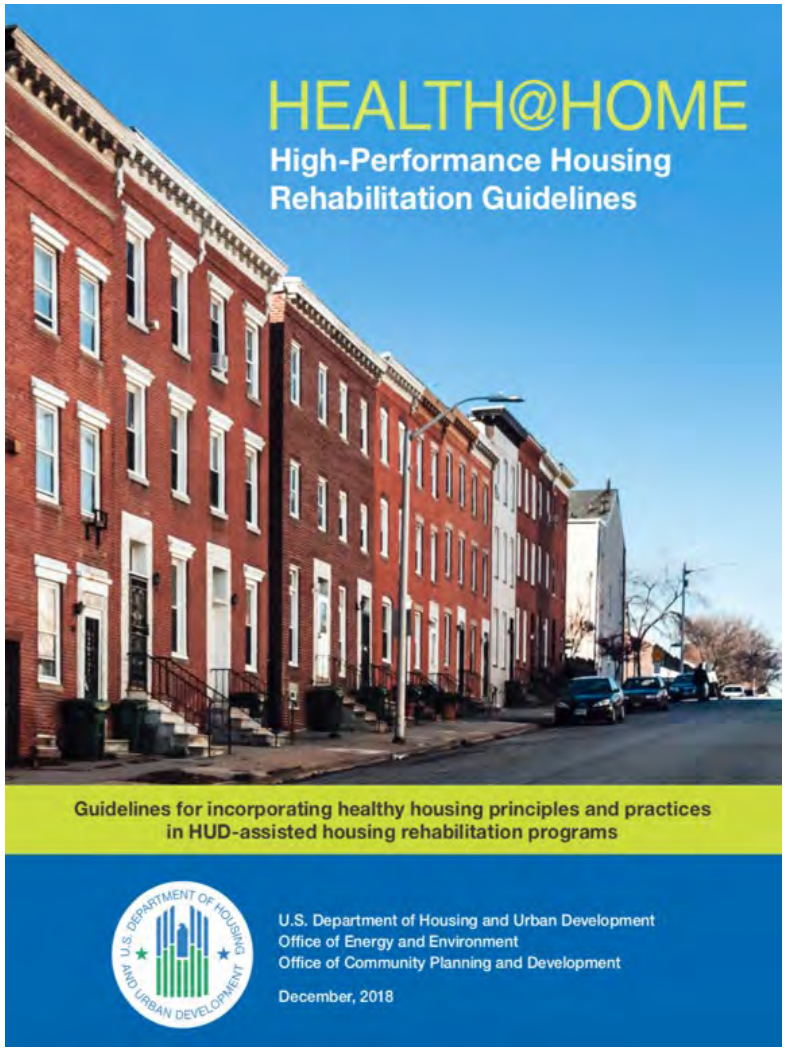
Health@Home – Training Series

Overview and Keep it Well Ventilated and Clean	June 18
Keep it Contaminant and Pest Free	July 23
Keep it Dry and Safe	Sept 10
The Energy + Health Equation, Maintenance and Active Design	**October 8**

Recordings of previous session may be found at:
https://www.hudexchange.info/news/health-at-home-webinar-series/

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
COMMUNITY PLANNING & DEVELOPMENT

Health@Home Guidelines



- Google HUD Exchange Health@Home https://www.hudexchange.info/resources/health-at-home/introduction/
- Rehab projects are an opportunity to address housing-based health issues
- Increased focus on indoor environment due to COVID-19

Context

- Focus is on moderate rehabilitation, home remodeling, or home repair programs
- Primarily single-family and low-rise multifamily housing
- For substantial or gut rehab consider a green building standard: Enterprise Green Communities, LEED, National Green Building Standard Earthcraft, Earth Advantage, Energy Star Indoor Airplus, WELL, or Fitwell
- For in-depth discussion, see EPA IAQ Protocols for Existing Buildings

Weatherization Plus Healthy Housing NOFA

- Proposals due **November 9, 2020**
- $5 million to implement energy and healthy housing upgrades in communities served by both HUD LHC/Healthy Housing and DOE weatherization programs.
- Demonstrate that coordination of healthy housing and weatherization achieves cost savings and better health, safety and quality of homes.
- Evaluate if improved healthy outcomes are achieved, and replicability and sustainability of models
- Reduce weatherization deferrals through coordination with LHC programs.
- Eligible applicants: non-profit organizations; city, county state governments; institutions of higher education.

www.hud.gov/program_offices/spm/gmomgmt/grantsinfo/fundingopps/fy20_healthyhomes_weatherization

Health@Home Guidelines and Health Benefits of Energy Efficiency

Ellen Tohn
Tohn Environmental Strategies

Email: etohn@tohnenvironmental.com

Home Conditions Impact Health

Studies show home conditions contribute to health:

A few examples

- **Asthma**: 8% adults and children have asthma AND 20-40% of asthma attacks can be linked to home conditions

- **Radon**: 21,000 annual deaths estimated, over 7 million homes with suspected risks

- **Falls**: 1 in 4 older adults fall each year, over 50% of falls occur in the home

Guidelines Organized by Healthy Housing Principles

Example: Principle 1 - Keep It Dry

1 KEEP IT DRY

Moisture and mold are linked to increased risk of asthma and other respiratory ailments, as well as allergic reactions in some individuals. Excessive moisture can also contribute to pest problems and deterioration of lead-based paint.

1.1 PREVENTION: STORMWATER MANAGEMENT

Ensure that stormwater management is adequate for the building site and climate.

- Size *gutters and downspouts* appropriately, either by increasing the dimensions of gutters and downspouts to the next size when the system is inadequate, or by sizing them per the manufacturer's recommendations.

1.2 PREVENTION: LEAKS

Identify and repair all roof leaks, building envelope leaks, and plumbing leaks. Assess affected areas for structural issues, deterioration of components, and mold, and take appropriate actions to address the issues.

1.3 PREVENTION: SURFACES

In high-moisture areas such as kitchens, bathrooms, and laundry rooms, use cleanable, durable, moisture-resistant materials, such as waterproof shower surrounds constructed of fiberglass or ceramic tile flooring that is impervious to water and sealed to adjoining bathing fixtures, countertops, and sinks.

Ensure all countertop materials adjoining sinks are water tight and well-sealed to the sink bowl to prevent leaks into cabinetry.

Crosswalk between principles and standards

Clicking on the link…..

Principle: Keep it Dry

Principles (Section A)	Contaminants	Site	Roofing	Building Exterior	Foundations and Structure
A.1 Dry					
A.1.1 Stormwater Management		2.2 Grading	3.1 Flat and Low-Slope Roofing	4.3 Windows	5.2 Basement Floors
A.1.2 Leaks		2.3 Landscaping/ Trees and Shrubs	3.2 Pitched Roofs	4.2 Exterior Cladding; 4.3 Windows; 4.4 Ext Doors	5.3 Crawl Spaces
A.1.3 Surfaces		2.1 Paving/ Walkways; 2.2 Grading; 2.4 Lawn	3.3 Gutters and Down-spouts		5.4 Sump Pump Systems
A.1.3 Countertops	1.4 Mold/ Moisture; 1.7 VOCs				

… relevant rehab standard

Replacement Standard

Essential walks and driveways deemed beyond repair will be replaced with concrete per City specifications.

2.2 GRADING — **Key Principle: Dry**

Repair Standard — **Minimum Life: 5 years**

All grading adjacent to the building and for a distance of at least 10 feet away from the building should slope away from the structure at a pitch of at least 1 inch per foot. All bare earth should be reseeded, or sod should be installed per the "Lawn" repair standard (Section B.2.4).

Replacement Standard

NA

Easy to navigate from principles to rehab standards or Scopes of Work.

Example: Site Standards

2 SITE

Key concepts and relationships

- Well-constructed and maintained paving ensures safe passageway from the street to the house or from the driveway to the house.
- Positive grading is the simplest and most sustainable way to prevent stormwater intrusion into the structure and future moisture issues.
- Trees and shrubbery that are located too close to the house aid pest entry, create safety issues for the structure, and promote moisture problems.
- Bare soil may be contaminated with lead-based paint, which poses a hazard for children at play outdoors, as well as for vegetable gardening. Additionally, humans and pets can create a lead-based paint hazard indoors by tracking that contaminated soil into the home.
- Bare soil also leads to erosion, adding to and or creating grading problems, stormwater management issues, and possibly moisture problems.
- Enhanced lighting can make exterior areas safer by reducing the potential for injury, and possibly reducing the likelihood of intruders.

DRY
CONTAMINANT FREE
PEST FREE
SAFE

2.1 PAVING AND WALKS — Key Principle: Safe

Repair Standard — **Minimum Life: 10 years**

Essential paving, such as front sidewalks and driveways, with minor defects should be repaired; repairs should match the surrounding pavement. Tripping hazards greater than ¾ inch must be addressed. Non-essential, highly deteriorated paving, such as sidewalks that are unnecessary, should be removed and appropriately landscaped.

Replacement Standard

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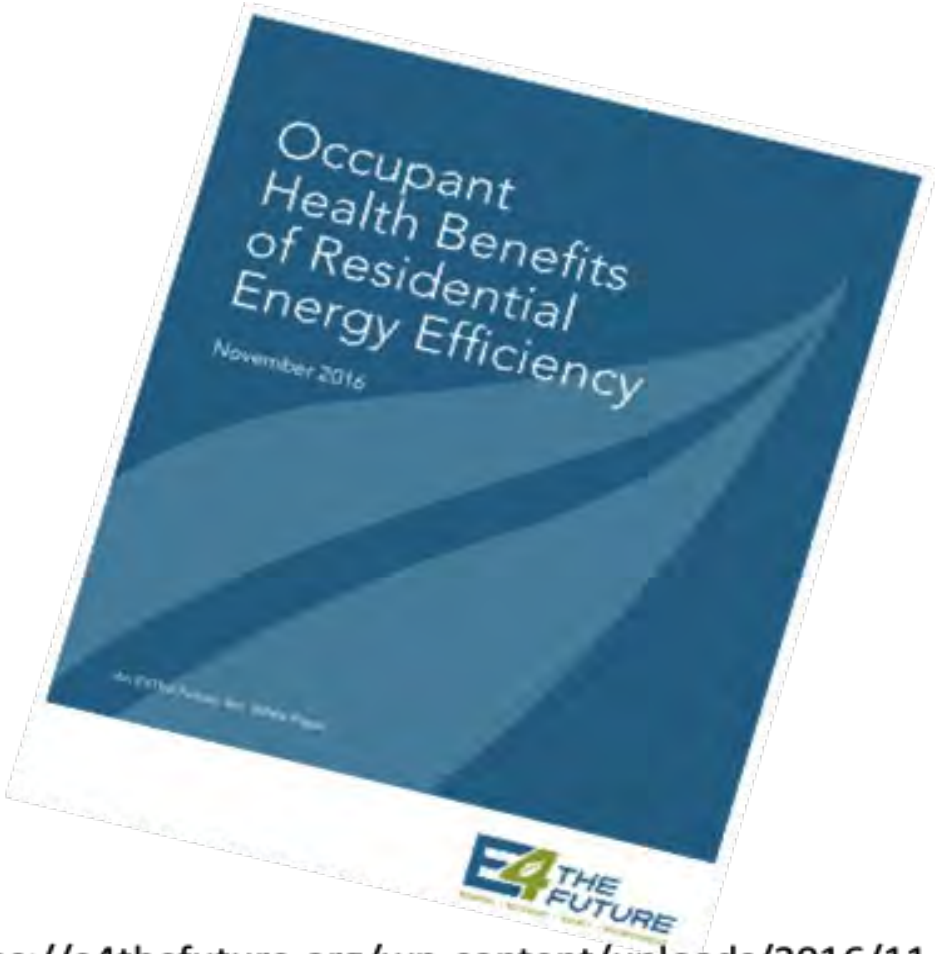
Replacement Standard

NA

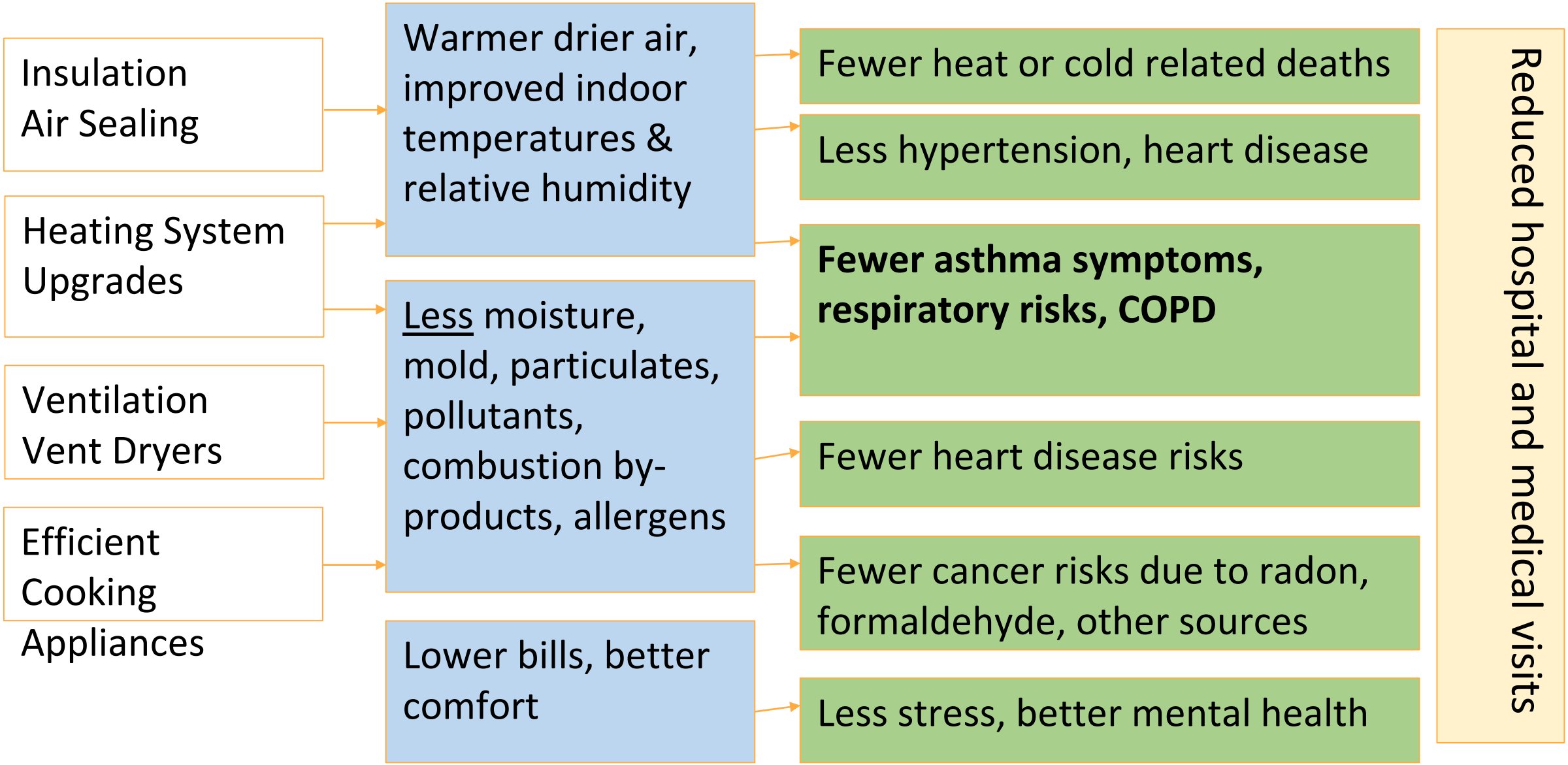
Energy Plus Health: Health Benefits of Energy Efficiency - Reports

https://energy.gov/eere/buildings/downloads/home-rx-health-benefits-home-performance-review-current-evidence



https://e4thefuture.org/wp-content/uploads/2016/11/Occupant-Health-Benefits-Residential-EE.pdf

How energy efficiency can reduce health risks



Health & Environmental Benefits of Energy Efficiency

Reduced Respiratory & Allergy Symptoms	Other Health Improvements	Reduced Emergency Dept. Visits or Hospitalizations	Indoor Environmental Conditions
Allergies	Headaches	Asthma	Moisture
*Asthma**	Hypertension	Other respiratory	Condensation
Colds	Thermal stress		VOCs
Sinusitis	Overall health		*Formaldehyde*
Throat irritation	Mental health		*Radon*
Wheeze			

Italics: some negative outcomes VOCs: Volatile Organic Compounds

* The majority of studies reported asthma improvements; one study documented mixed results

Note: Subsequent studies show no radon increases if energy work is done with ASHRAE 62.2 ventilation

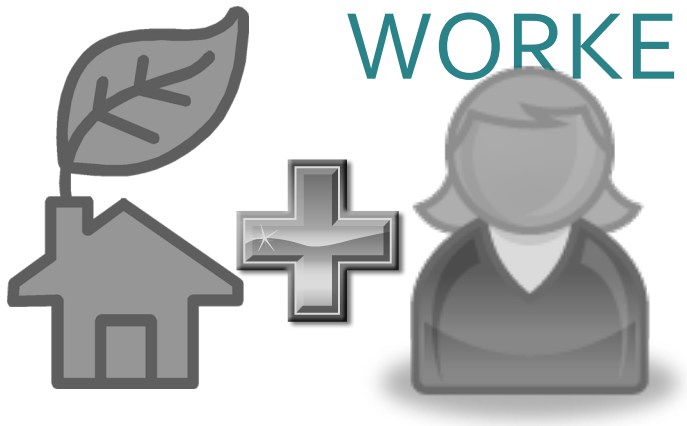
Occupant Health Benefits of Energy Efficiency

- Fewer respiratory-related Emergency Room visits after energy efficiency (National WAP Evaluation)
- Better control of asthma (Breysse)
- Better physical and mental health after energy upgrades (multiple studies)

Weatherization "Plus"

Highline Communities, King County, WA

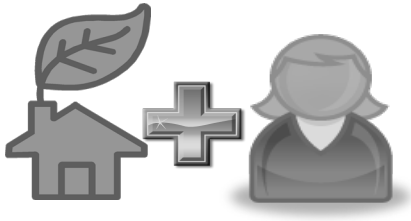
STUDY GROUP:
WEATHERIZATION PLUS
COMMUNITY HEALTH
WORKER



COMPARISON GROUP:
COMMUNITY HEALTH
WORKER ONLY

Examples of Services Provided

- **Standard weatherization** +
  - 61% new bath fans - most with timer
  - 61% carpets removed
  - 26% vapor barriers in crawl space
  - 24% kitchen range fans
  - Other measures as needed
- $4,200/apartments (11)
  $6,300/duplex or homes (23)

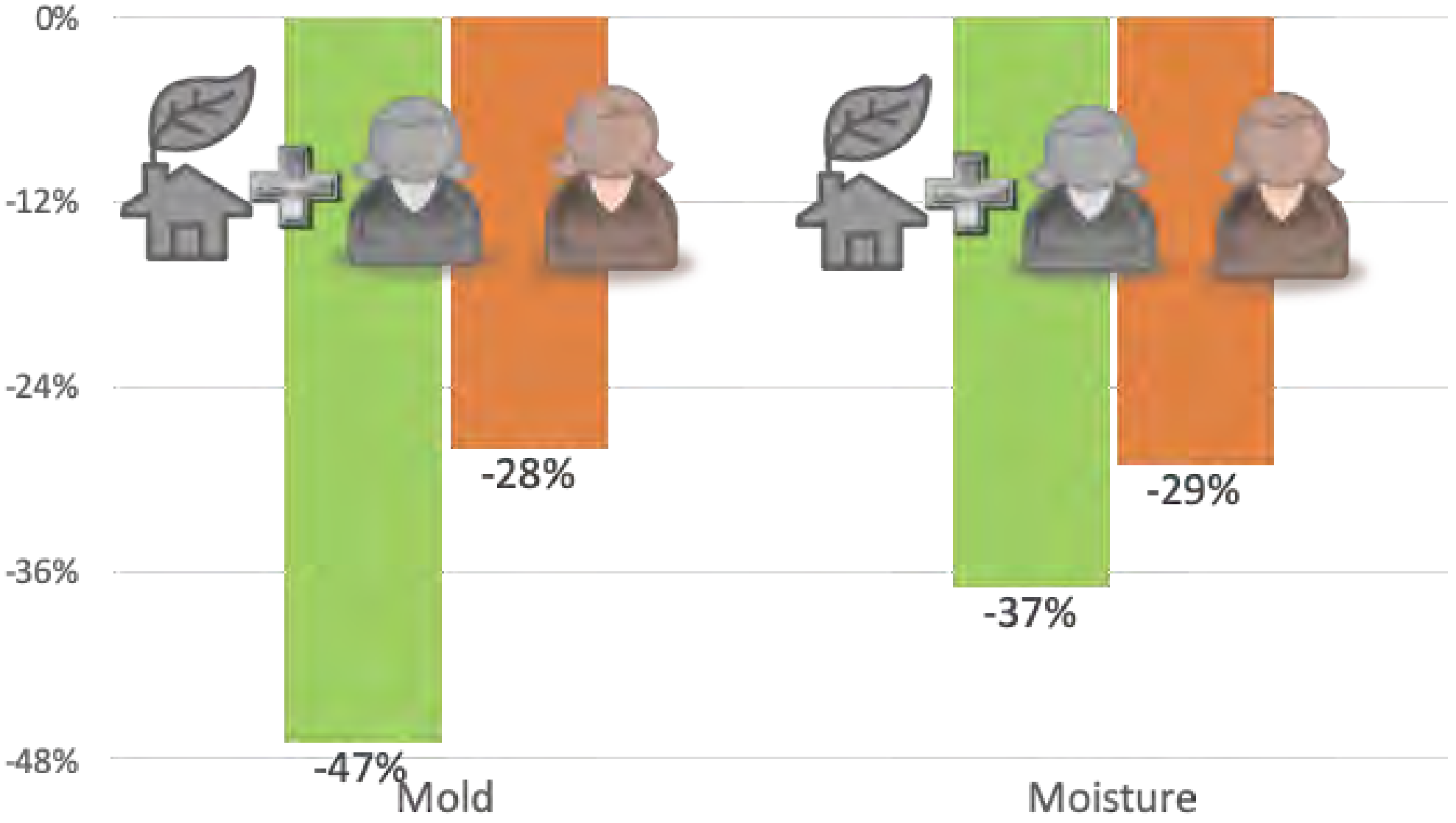


Education only
- **4 home education visits**

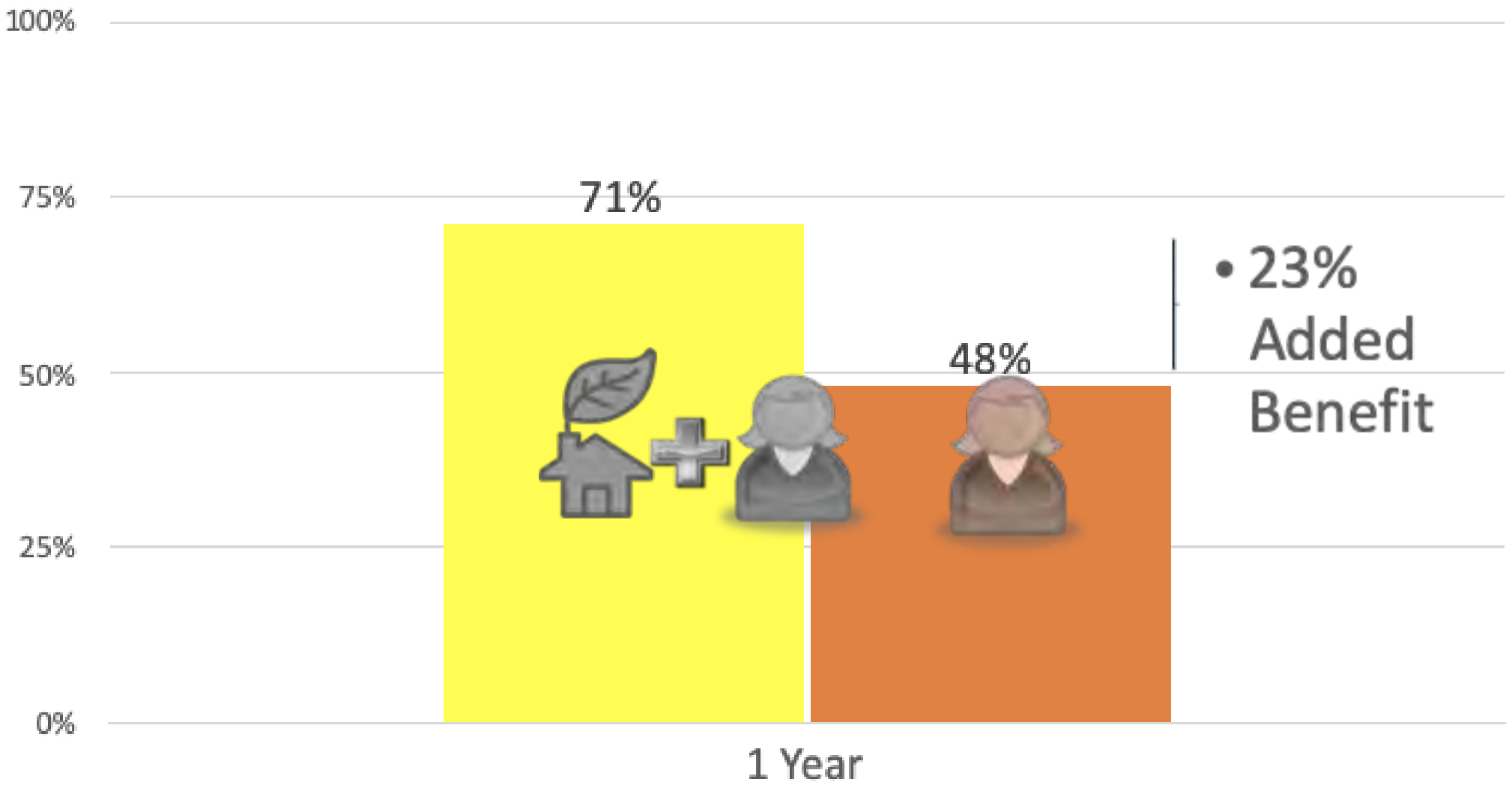
- Wx+ Education
  - **4 home education visits**
  - **Weatherization**
  - **Moisture controls**
  - **Carpet removal**

Source: Breysse J, Dixon S, Gregory J, Philby M, Jacobs DE, Krieger J. (2014). Effect of weatherization combined with community health worker in-home education on asthma control. *American Journal of Public Health*, 104(1), 57.

Less Moisture and Mold After Weatherization



Better Controlled Asthma After WeatherizationPlus



Healthy Housing Principle #8:

Keep it Thermally Controlled

Paul W. Francisco
Associate Director for Building Science
University of Illinois at Urbana-Champaign

Why does it matter?

- Extreme heat
  - Kills 600 people each year (CDC 2017)
  - More than all other weather events combined (Walker 2018)
    - Hurricanes, tornadoes, etc.
  - About 40% are older adults

Why does it matter?

- Cold: 63% of temperature-related deaths from cold (CDC)
- Not necessarily ***extreme*** cold, but stressing the body

Why does it matter?

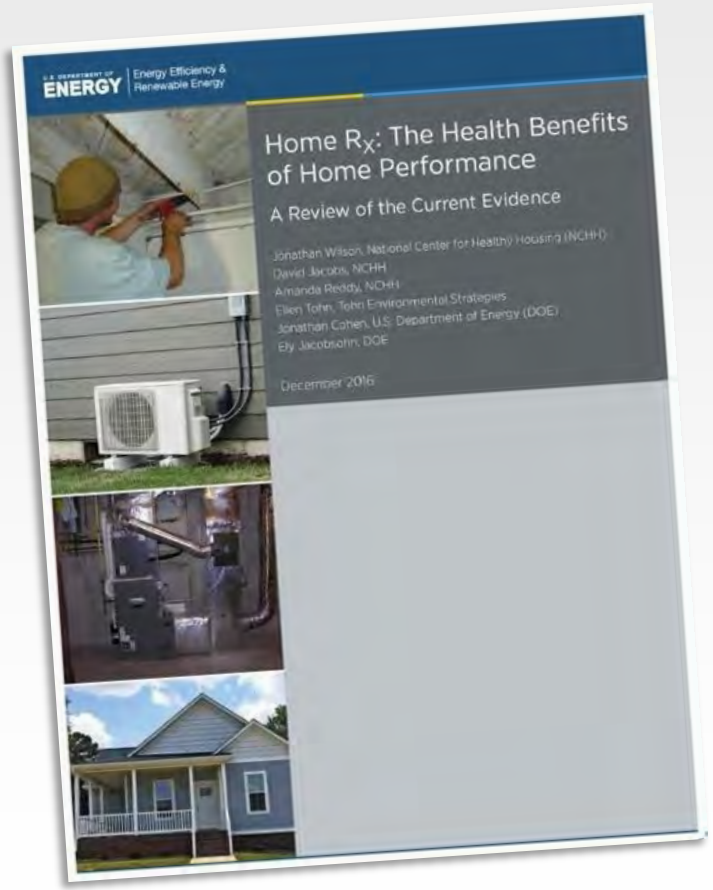
- Thermal stress linked to reduced productivity (Cheung et al 2016)
  - Dexterity, balance
  - Reduced cognitive function, decision-making
- Thermal stress linked to reduced learning (Goodman et al 2018)
- Thermal stress may increase susceptibility to other illnesses

Why does it matter?

- Evidence that home performance has benefits for health
  - "House as a system" approach can directly help

    Keep it DRY
    Keep it VENTILATED
    Keep it CONTAMINANT-FREE

- Home performance focuses on providing thermal control



Concept

- Reduce demand as much as possible
  - Air sealing and insulation
  - Makes it easier to thermally-control the building

- Supply what is needed as efficiently as possible
  - Efficient space conditioning
  - Good controls

Health@Home Guidelines

8 KEEP IT THERMALLY CONTROLLED

Houses that do not maintain adequate temperatures may place the safety of residents at increased risk from exposure to extreme cold or heat.

8.1 SUFFICIENT HEATING AND COOLING

Ensure that heating and cooling systems are adequately sized, properly maintained, and correctly operated to maintain safe interior temperatures during seasonal extremes for heat and cold.

8.2 CAULK WINDOWS

Caulk windows and exterior door frames.

8.3 SEAL DUCTS

Seal heating and cooling ducts.

8.4 INSTALL THERMOSTATS

Install programmable thermostats and ensure residents can operate them.

8.5 EFFICIENT HVAC EQUIPMENT

When replacing HVAC equipment, specify systems that are as efficient as possible within the budget. Also ensure that they are properly sized; use Air Conditioning Contractors of America (ACCA) Manual J, Residential Load Calculation, to properly size furnaces and boilers.

8.6 INSULATE WALLS

Insulate walls or other portions of the building envelope that are exposed for repair or replacement.

8.7 "KEEP IT THERMALLY CONTROLLED" RELATED RESIDENT ACTIONS

- Use programmable thermostats to reduce energy use.
- In owner-occupied homes, ensure HVAC systems are inspected annually.

The matrix below shows the relationships among the Keep It Thermally Controlled principle-based standard and the component-based standards in Section B.

Reducing Demand – Air Sealing (8.2+)

- Frequently considered
  - Windows
  - Doors
- Most important
  - Chases
  - Soffits

Leakage Levels in Homes

- New homes: 3-5 ACH50
- Average Illinois Weatherization Client: ~20 ACH50
  - Corresponds to about 4000 CFM@50
  - Some homes are double that
- Average Weatherization Client from 2010 National Evaluation: ~20 ACH50

Leakage in Homes

- 1000 CFM@50 corresponds to about 100 in^2 of opening
  - Comparable to a 2-foot-wide window being open 4”
- Average weatherization home would have leakage areas comparable to a 2-foot-wide window being open 16”
  - Simply doing windows and doors won’t make a leaky home tight
  - Need to find the big leaks
- Weatherization typically reduces leakage by about **30-40%**

Reducing Demand – Air Sealing (8.2+)

- Doesn't mean ignore windows and doors
  - Caulk may help reduce drafts and can help Keep it Dry
  - Sash locks may not work well
  - Weatherstripping and door sweeps can shut off drafts

- Not all "drafts" at windows are leaks from outside – can be convective currents along the window

Reducing Demand – Insulation (8.6)

- Also improves ability to condition the home
- More than just air temperature – also improves radiant temperature of surfaces AND reduces chances for mold growth
- Key – insulation must actually be in contact with the surface or performance is lost

Reducing Demand – Insulation

- Both of these have big air gaps – will NOT provide expected benefit

Reducing Demand – Insulation

- In retrofit applications, loose fill for attics and walls
  - Dense pack cellulose in walls – also provides air sealing
  - Blown-in insulation in attics – can fill corners and gaps

Reducing Demand – Insulation

- Open walls (knee walls, crawl space, basement), finished attic roofs will generally get batts or foam
  - Batts must be have some facing, e.g. paper or vinyl

Crawl spaces

- NEVER combine crawl space wall insulation with vents
  - Defeats the entire purpose – energy loss and cold floors
- If you have vents – batt insulation under the floor
- If you use perimeter insulation – no vents

Supply – Space Conditioning Systems (8.1)

- Properly sized
  - Avoid going larger “just to make sure”*
  - Oversizing leads to increased cycling and efficiency losses
  - Oversizing especially a problem for air conditioning in humid climates – poor dehumidification

- * Oversizing less of a problem for heat pumps, **IF** the heat pump is controlled to use the compressor as much as possible

Ducts – When Supply Met Demand (8.3)

- Duct leakage
  - Ducts outside the conditioned space (e.g. attics, crawl spaces, garages) often have 10% or larger leakage
  - Leads to 20-40% energy penalty – worse for heat pumps
  - Should be sealed properly – mechanical fasteners and mastic
    - NO DUCT TAPE!!

Do it Efficiently

- Programmable thermostats (8.4)
- Energy Star Appliances (8.5)

Summary

- Thermal comfort is important for health, performance, and learning

- Air sealing and insulation can reduce need for space conditioning
- Air sealing and insulation can improve ability to maintain comfort throughout the home

- Properly sized space conditioning optimizes ability to deliver comfort
- Duct leakage can represent major losses for both comfort and energy

Healthy Housing Principle #9:
Active Design

October 8, 2020

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Enterprise Community Partners

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Healthy Housing Guidelines: Active Design

9 HEALTHY LIVING AND ACTIVE DESIGN

Consider incorporating strategies to increase opportunities for resident physical activity or increased mobility both outside and inside the home, as well as strategies that help create healthier environments in and around the home. These measures can help address rising obesity rates that put Americans at risk for a range of chronic diseases, including heart disease, stroke, Type 2 diabetes, and some cancers.[7]

When possible, consider the following as part of your program:

9.1 SUPPORT STRATEGIES TO INCREASE PHYSICAL ACTIVITY

- Highlight convenient/accessible pedestrian routes.
- Dedicate space for bicycle parking.

9.2 OUTDOOR SPACES TO PROVIDE SAFE AND HEALTHIER ENVIRONMENTS

- Provide or enhance outdoor space accessible to all occupants, including gardens, and opportunities for intergenerational play and relaxation.
- Extend a tobacco-free policy to outdoor spaces.
- Install fences to enhance safety for children.
- Increase safety by installing secure and appropriate lighting.
- Ensure soil in garden and play areas is free of lead contamination.

9.3 ENTRANCES TO ENCOURAGE PHYSICAL ACTIVITY AND PROVIDE SAFETY

- Maintain multifamily entryways and orient them toward pedestrian routes.
- In multifamily buildings, implement active design strategies in stairwell design, such as improved lighting, clear signage to direct residents to stairways, and signage to affirm health benefits of physical activity. See, for example, Center for Active Design, Active Design Guidelines.[8]

Engage Residents or Community Stakeholders

Engaging Residents at 14th & Union

- Develop Seattle's first LGBTQ-affirming affordable senior housing on a site adjacent.
- Create a new 7-story building that will include 82 apartments affordable to seniors making less than $33,000 a year (based on early design).
- Incorporate design, programming and health interventions affirming of LGBTQ seniors and responsive to community needs.
- Include commercial space on the ground floor for local businesses or community organizations that support the overall vision of the project.

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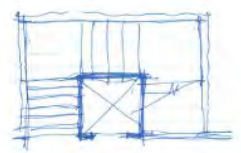
Engage Residents

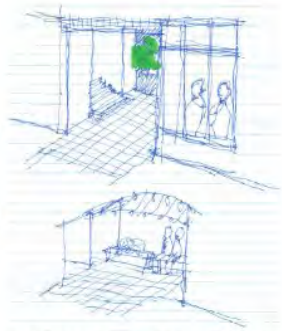
- Universal Design

Active Charrette Community Sketches

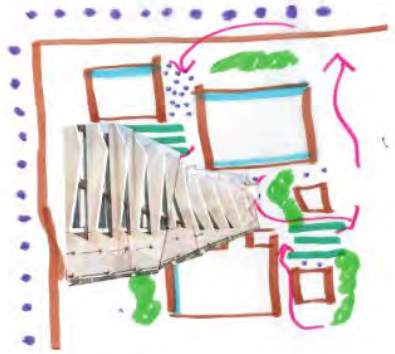
- Communal Living Concept



- Stair Landing Concept



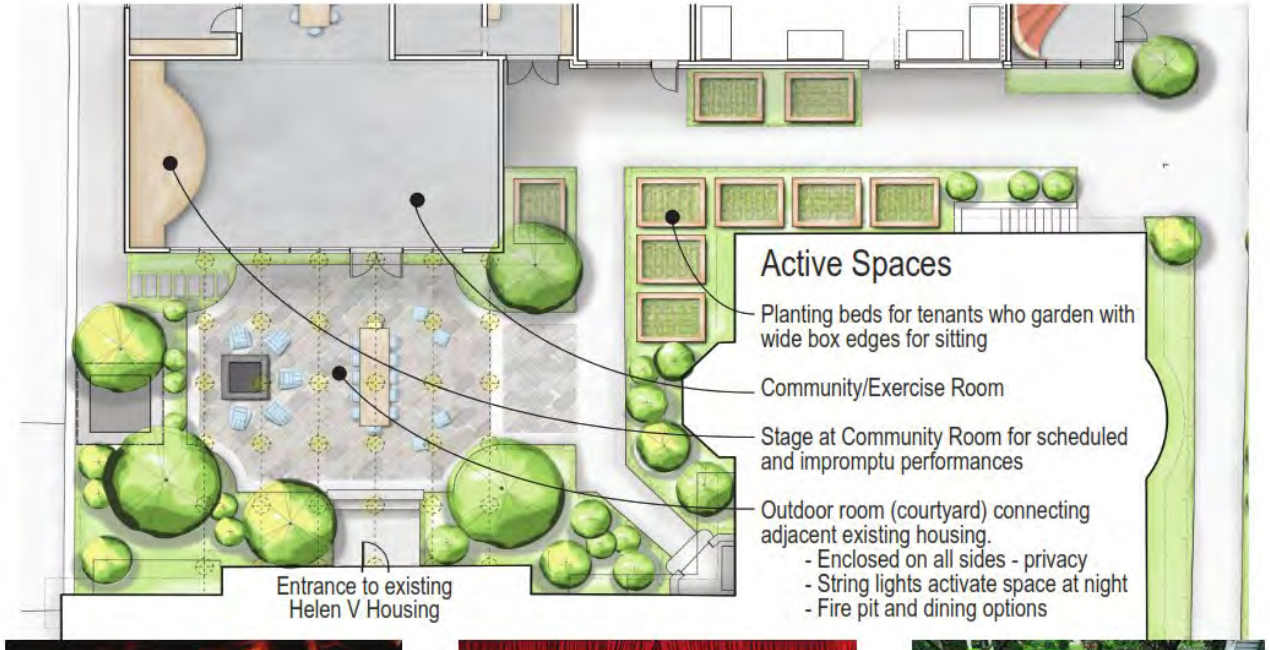
- Connection to the outdoors



- Staircase, Open Plan Concept

- Courtyard Concept Sketch

Results: Project Renderings & Drawings




Courtyard


Stage


Planting Beds

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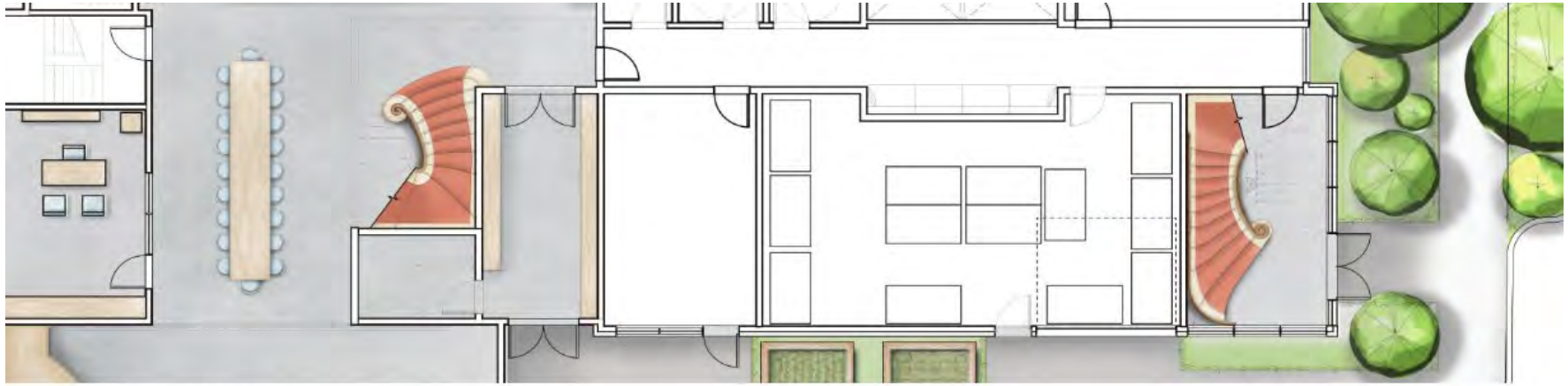
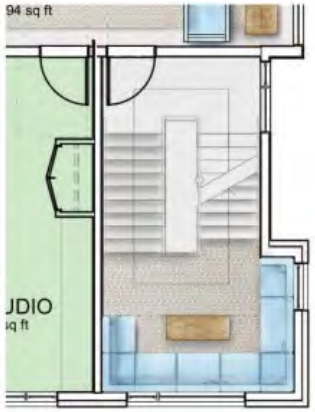
Results: Project Renderings & Drawings



Feature Stairs

- for making a graceful entrance
- for being announced
- inspiring exaggerated behavior
- creating intrigue to encourage movement
- potential to be used as stage/runway for performances, impromptu and scheduled
- for making an entrance to the interior and to the street
- a striking visual building feature from the street and sidewalk
- sitting, gathering, resting, reading spaces at upper floor intermediary landings
- employ universal design strategies



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Activate Existing Resources, Community & Site Spaces, and Local Partners

Activate: Artspace, Hastings, Minneapolis

- Located in North Minneapolis – in a disinvested area on a contaminated lot, near trails and Mississippi River
- New construction, 6-story building with below-grade parking
- 100 units of affordable live work housing for artists and their families at 60% AMI and below
- 3,500 SF of commercial space - 3 artist work studios, classroom/event space for Juxtaposition Arts, a community & project partner

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Vision of Success

The Issue:

- No intentional design for physical activity

- Past project active design elements:
  - Central, visible stairs
  - Play equipment
  - Walkable environment

- Challenges: constrained budgets & focus on artist amenities – not a lot of room for additional amenities

- **Strategies for Active Design**: incorporate art elements through the site, locate community gardening and playground equipment near areas of activity to encourage participation

Artspace
Hastings River
Lofts –
Hastings, MN

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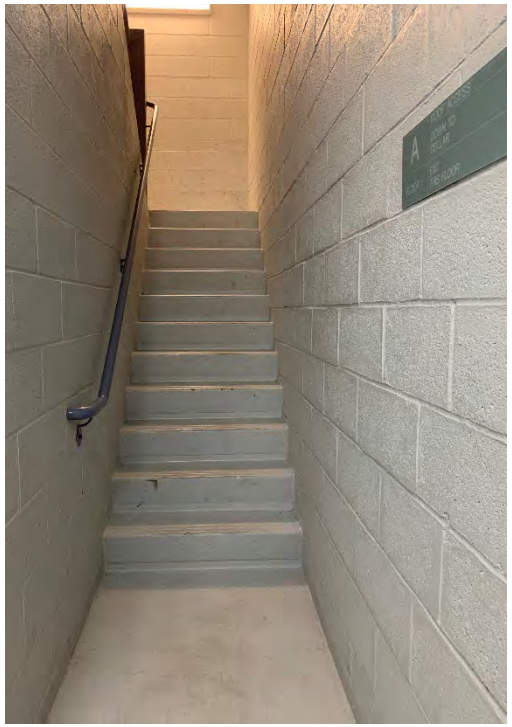
Activate: Ruby's Place Wellness Murals

Rehab of existing stairway – 10 stories – basement to 9th floor
Target resident population: formerly homeless individuals with mental and physical health diagnoses
Timeline – 6-month cycles



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Applications in Single Family

Encourage or Extend Use, Reduce Barriers, and Promote Safety

Encouraging use of outdoor spaces

Design for barriers faced by older adults

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Lessons Learned

- **One piece of advice…**is to conduct a charrette with community partners at the beginning of the design process to generate more ideas at a time when incorporating those ideas is more likely.

- **What I know now…**is that active design can be simple in the execution and is not necessarily costly. The key is to make it a part of the design from the start.

- **The most valuable part of the process…**has been sharing of ideas and hearing about the thought processes.

JXTA Parklet

JXTA custom bike racks

JXTA Campus (paint and collage)

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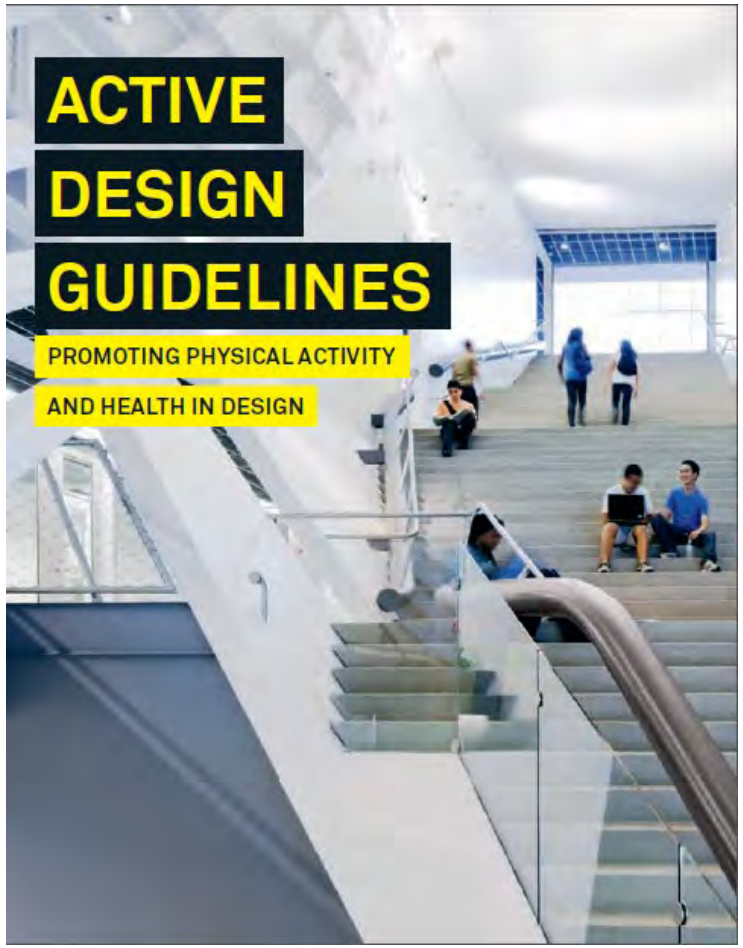
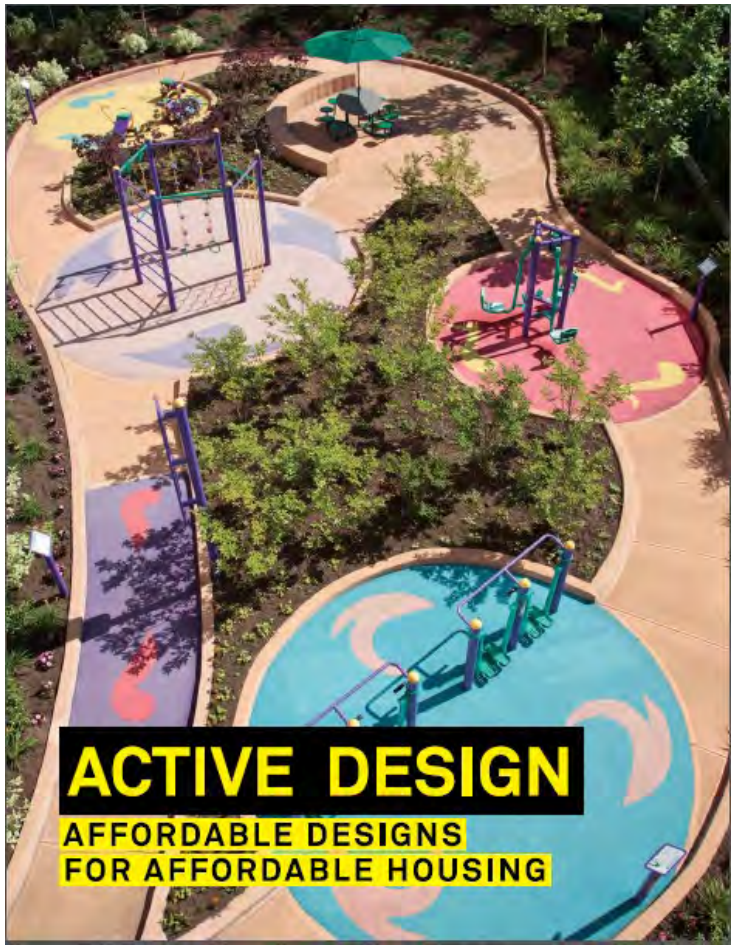
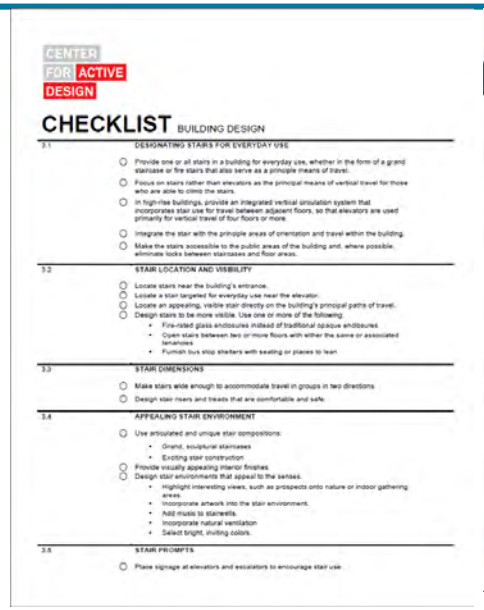
Resources


ACTIVE
DESIGN
GUIDELINES
PROMOTING PHYSICAL ACTIVITY
AND HEALTH IN DESIGN


ACTIVE DESIGN
AFFORDABLE DESIGNS
FOR AFFORDABLE HOUSING


CENTER
FOR ACTIVE
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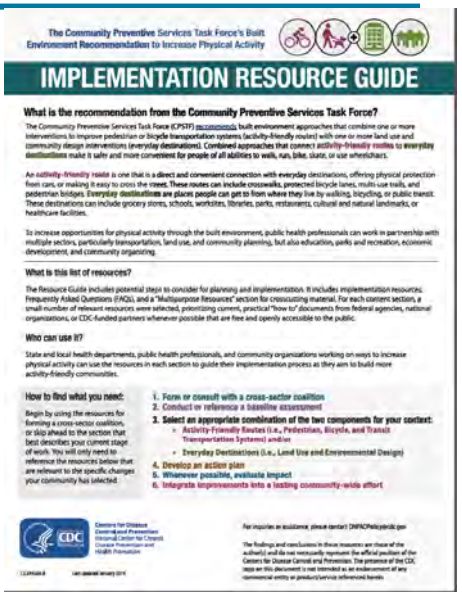
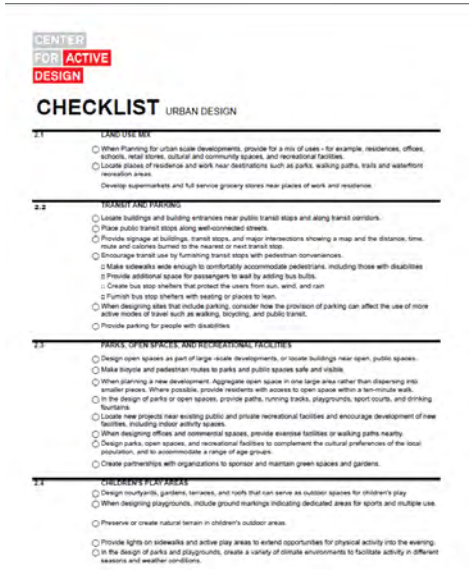
CHECKLIST BUILDING DESIGN


The Community Preventive Services Task Force's Built Environment Recommendation to Increase Physical Activity
IMPLEMENTATION RESOURCE GUIDE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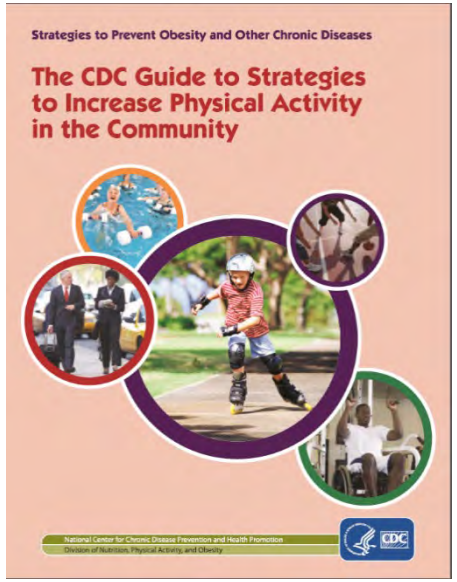
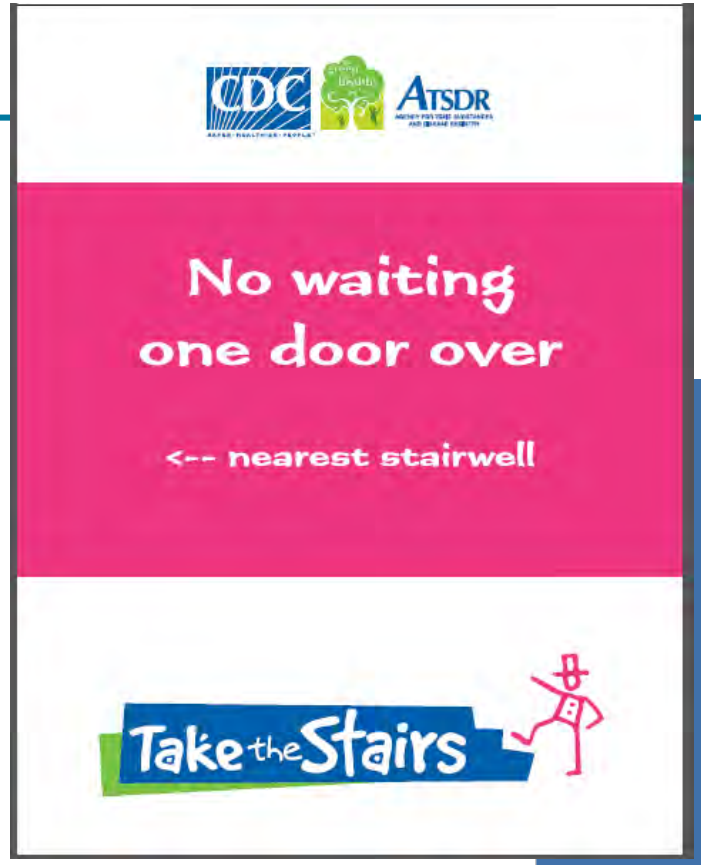
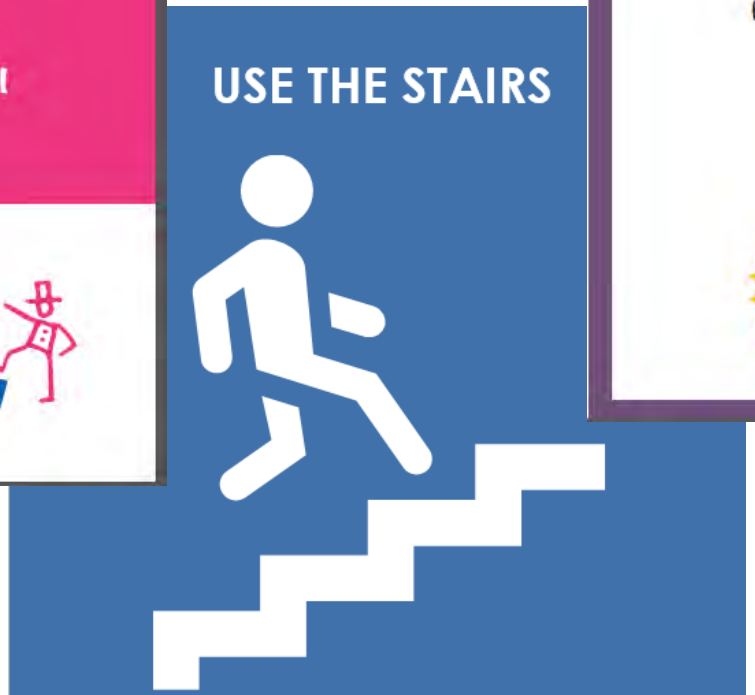

Strategies to Prevent Obesity and Other Chronic Diseases
The CDC Guide to Strategies to Increase Physical Activity in the Community

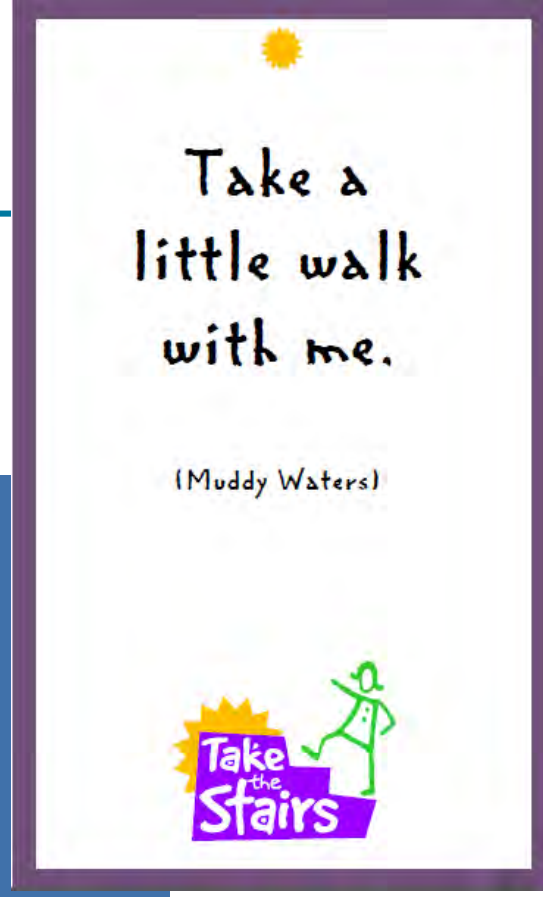
Resources

StairWELL to Better Health (CDC)

- Stairwell Appearance
- Motivational Signs
- Installing Music
- Other Ideas to Consider
- Tracking Stair Usage
- Project Checklist
- Related Resources







Healthy Housing Principle #7:
Keep It Well Maintained

Healthy Homes Maintenance Checklist

The following checklist was developed for the National Center for Healthy Housing (NCHH) as a tool for healthy home maintenance. A healthy home is one that is constructed, maintained, and rehabilitated in a manner that is conducive to good occupant health.

To maintain a healthy home, occupants should keep it dry, clean, safe, well-ventilated, free from contaminants and pests, well-maintained, and thermally controlled.

Good home maintenance can act to reduce allergens, prevent illness, and prevent accidental injuries. This checklist provides basic guidelines; items may need to be checked more often depending on local conditions and manufacturer recommendations.

Developed by Terry Brennan and Ellen Tohn, technical advisors to NCHH. Revised by NCHH staff, May 2018.

Icon indicates O&M in the component based standards

Source: https://nchh.org/resource-library/healthy-homes-maintenance-checklist_english.pdf

Home Maintenance Checklist

YARD AND EXTERIOR	Spring	Fall	Annual	As Needed	Pro Needed
Direct water drains away from house	●				
No hazards for tripping/falls, choking, or sharp-edges	●	●			
Verify that the pool fence is intact	●	●			
Check for signs of rodents, bats, roaches, or termites	●	●			
Drain outdoor faucets and hoses	●	●			
Clean window wells and check for drainage	●	●			
Clean gutters and downspouts	●	●			

EXTERIOR ROOF, WALLS, AND WINDOWS	Spring	Fall	Annual	As Needed	Pro Needed
Ensure that the shingles are in good condition	●				
Inspect the chimney, valley, plumbing vent, and skylight flashing for damage or leaks	●				
Inspect the chimney and clean if needed		●			
Ensure that gutters discharge water away from building	●				
Inspect the attic vents		●			
Inspect attic for signs of roof leaks	●				
Inspect for icicles and ice dams				●	
Look for peeling paint	●				

U.S. AND URBAN DEVELOPMENT

COMMUNITY PLANNING & DEVELOPMENT

Questions?

For any questions, please type them into the "Q&A" box in the lower right

We will answer as many as we have time to answer

Technical Assistance Available

- On-call TA is available to incorporate Health@Home standards into current rehab standards
- Limited to 3-5 HUD grant recipients/partners
- Please submit TA Request to energyaction@hud.gov by October 31, 2020

Health@Home Website and Resources

A recording of this webinar (and all other presentations) will be available on the Health@Home series website:
https://www.hudexchange.info/news/health-at-home-webinar-series/

Certificates of Completion available to those who attend all trainings, including archived trainings. In order to receive credit for off-line viewings, please email us at the address shown below, no later than **November 15, 2020**.

Main Health@Home website on HUD Exchange:
https://www.hudexchange.info/resources/health-at-home/introduction/

For questions or information contact:
Lael Holton at communitycompasstraining@aecom.com

Thank you!