Healthy Housing: Quantifying the Non-Energy Benefits of Energy Efficiency Upgrades

Wednesday, July 10

3:30 – 5:00pm

Speakers and Moderator

- Speaker: Bruce Tonn, Three3
- Speaker: Marian Goebes, TRC
- Speaker: Nicole Rosenberg, NMR Group, Inc.
- Speaker: Rebecca Schaaf, Stewards of Affordable Housing for the Future (SAHF)
- Speaker: William Weber, Healthy Building Network (HBN)
- Moderator: Michael Freedberg, U.S. Department of Housing & Urban Development

Bruce Tonn

Three3

U.S. DEPARTMENT OF ENERGY

PRELIMINARY FINDINGS: NON-ENERGY IMPACTS (NEIS) OF WEATHERIZING AFFORDABLE MULTIFAMILY HOUSING

Better Buildings Summit
July 2019

Bruce Tonn
Three^3, Inc.

Three^3

slipstream
breakthrough energy solutions

NMR Group, Inc.

ACKNOWLEDGEMENTS

Sponsors

- The JPB Foundation & Utility Program Administrators in Massachusetts

Key Team Members

- Three^3 – Bruce Tonn, Beth Hawkins, Erin Rose, Michaela Marincic
- Slipstream – Claire Cowan, Scott Pigg, David Vigliotta & many others
- NMR Group – Greg Clendenning, Nicole Rosenberg, Christine Smaglia & many others
- University of Tennessee, Center for Applied Research and Evaluation – Linda Daugherty, Amy Melton

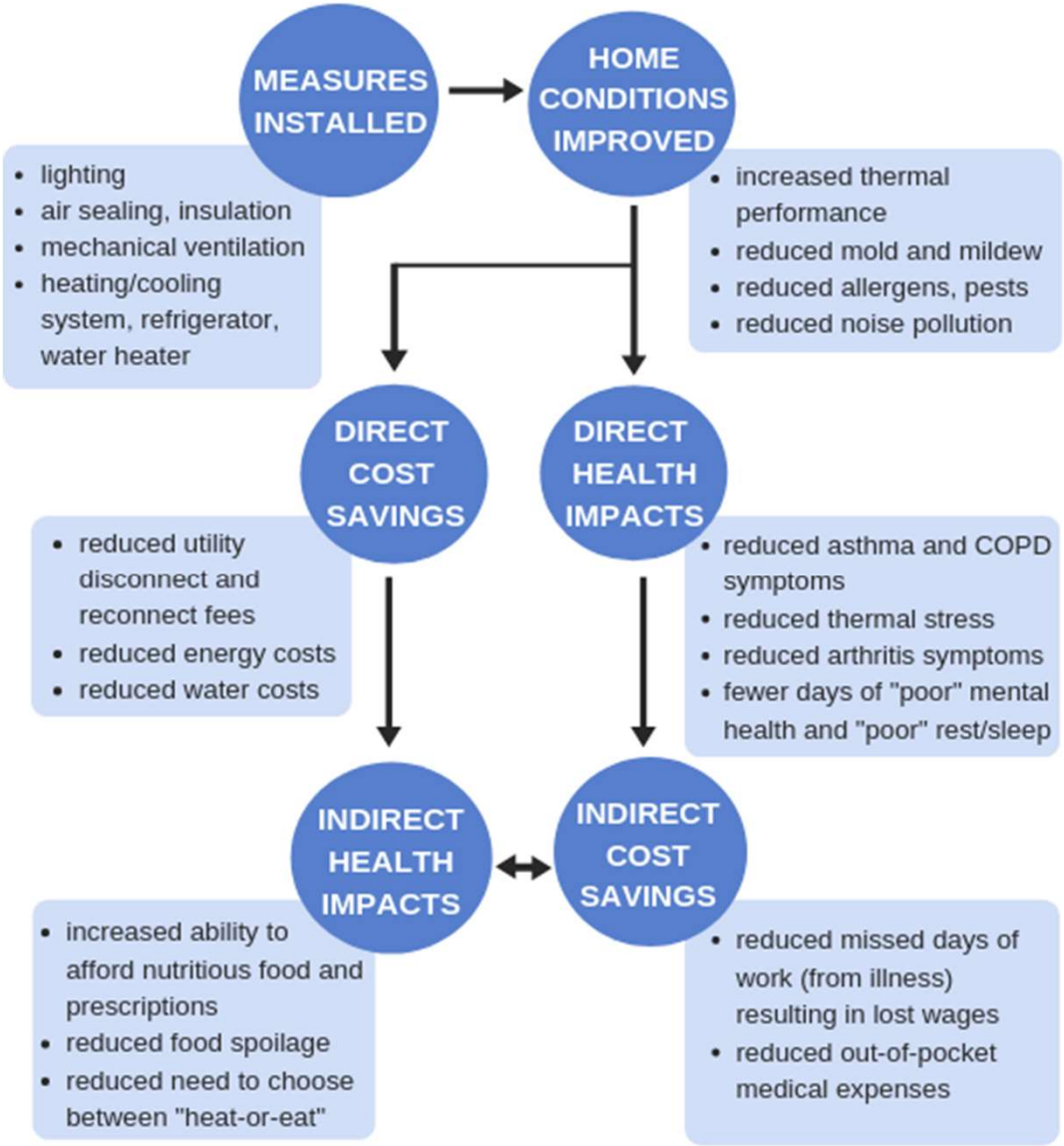
Contributors

- Weatherization Agencies (e.g., CEDA, La Casa, Project Home, Racine Kenosha CAA, AEA, NMIC, SPRC, ABCD, Action Inc., RISE, CEO, 3EThermal)
- Building Owners (e.g., LUCHA, Mercy Housing, Related Midwest)
- Utilities (e.g., National Grid, Eversource)
- State Weatherization Offices (e.g., WI, VT, NH)
- Energy Efficiency For All State Leads
- Participants of Planning Workshops in NYC, Chicago and Knoxville

OUTLINE

- Research Overview
- Research Design
- Selected Preliminary Survey Findings
  - Sample Characterization
  - Health Impacts
  - Budget Impacts
  - Building Systems Resilience

How Weatherization Can Yield Health Impacts

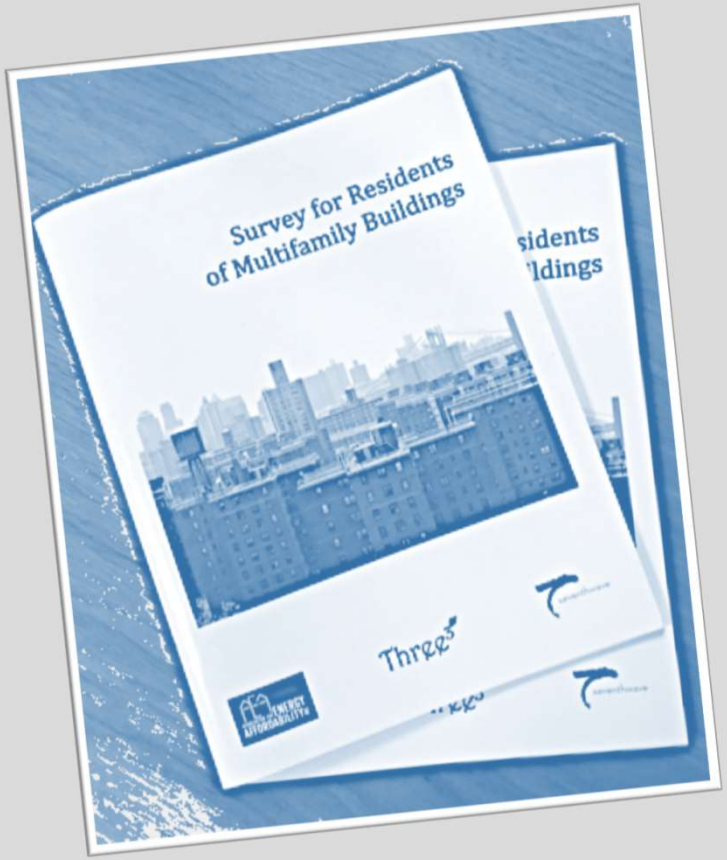


RESEARCH PROJECT ESSENTIALS

- **Goals:**
  - Estimate the health & household related NEIs attributable to weatherizing affordable multifamily (MF) buildings
  - Impact policy—increase funding allocations for income-eligible utility and/or weatherization programs providing services to our vulnerable populations
- **Hypothesis:** single-family **(**SF) weatherization NEI estimates cannot be generalized to the MF sector
  - Different demographics
  - Different measures installed
  - Building envelopes behave differently
- **Sample:** MF buildings with 5+ units located in MA, NYC, IL, WI, RI, VT, NH, PA
- **Recruiting buildings that:** have already been weatherized, will soon be weatherized, and will not be weatherized, referred to as:
  - CwT- Comparison with Treatment (Weatherized)
  - T - Treatment (Unweatherized)
  - C - Control (Unweatherized)

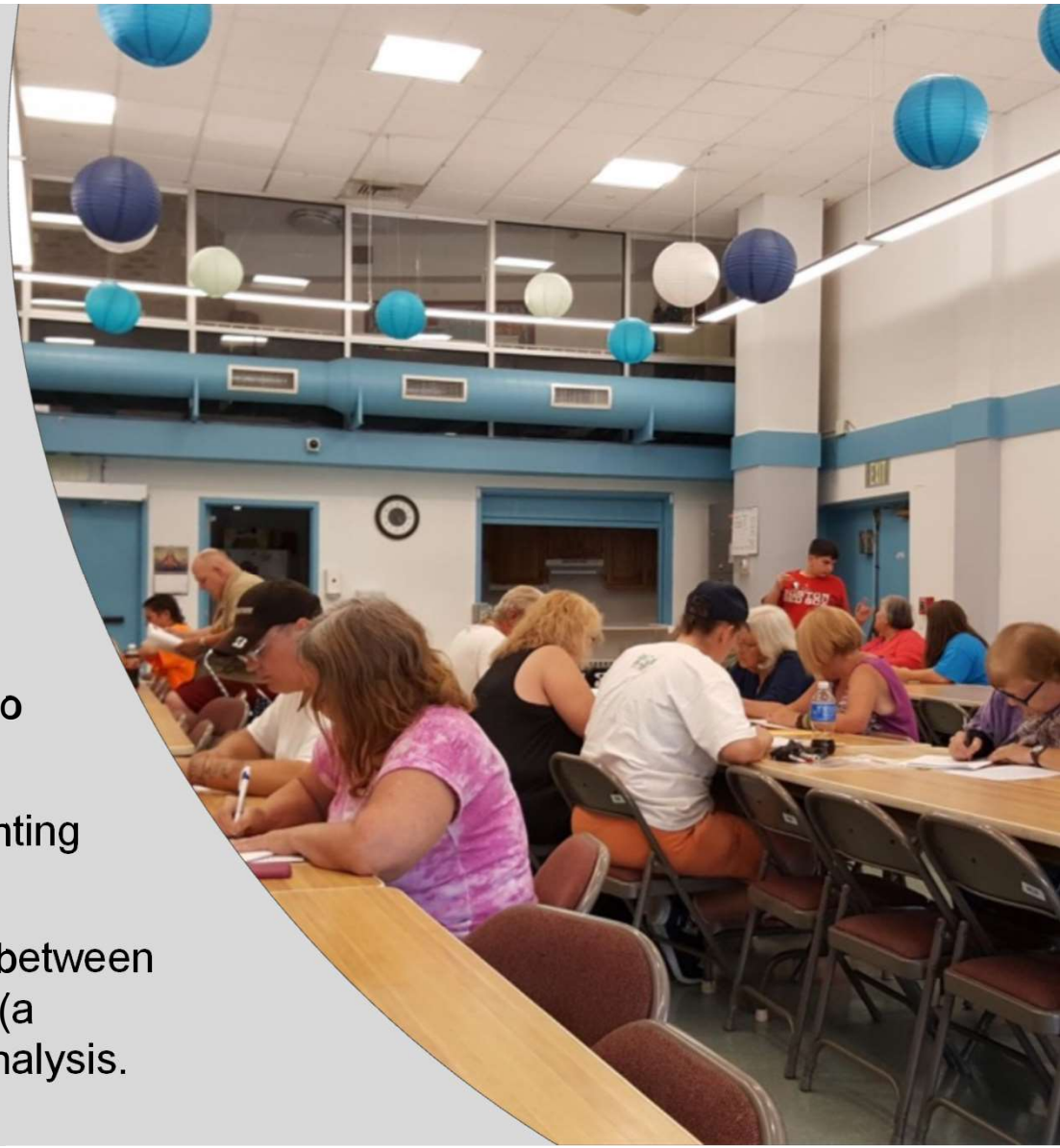
MAJOR STUDY COMPONENTS

- **RS (Resident Survey):** addresses health, budget, apartment conditions, social community resilience
- **PM (Property Manager) Survey:** addresses building systems resilience
- **PO (Property Owner) Interview:** discusses weatherization programs: process, strengths and weaknesses
- **Data With a Soul (DWaS):** documents personal experiences
- **Monetization of Non-Energy Impacts (NEIs):** health and household related NEIs, at the household and societal levels



PROJECT STATUS

- Phase I (baseline) survey data collection completed June 2019.
- Phase II (post-weatherization) data collection kicked off July 1, 2019.
- Through May 2019, surveys were distributed to 7,214 tenants in 361 buildings..
- Completed resident surveys = 1,660 (representing 2,660 persons).
- Statistical results presented are comparisons between weatherized (CwT) group and unweatherized (a combined T+ C) group for a cross-sectional analysis.



BUILDING THE SAMPLE FRAME

Challenge

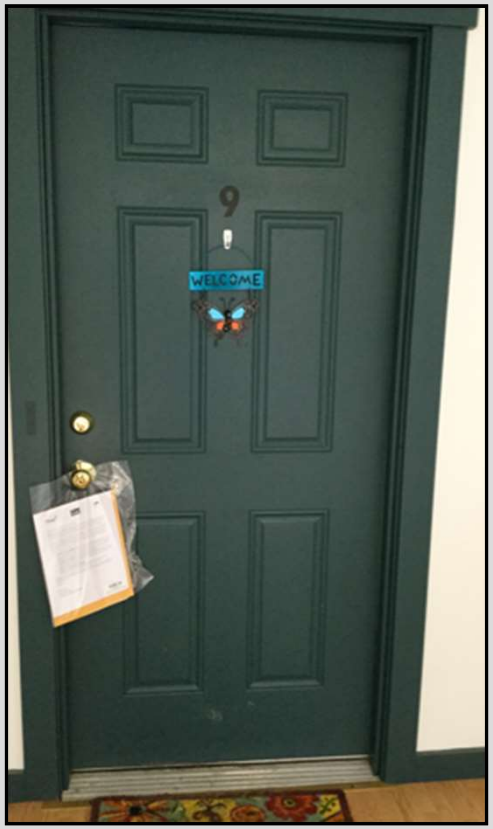
- No national or regional affordable MF building database
- No national or regional database of affordable MF buildings already or about to be weatherized

Research Approach

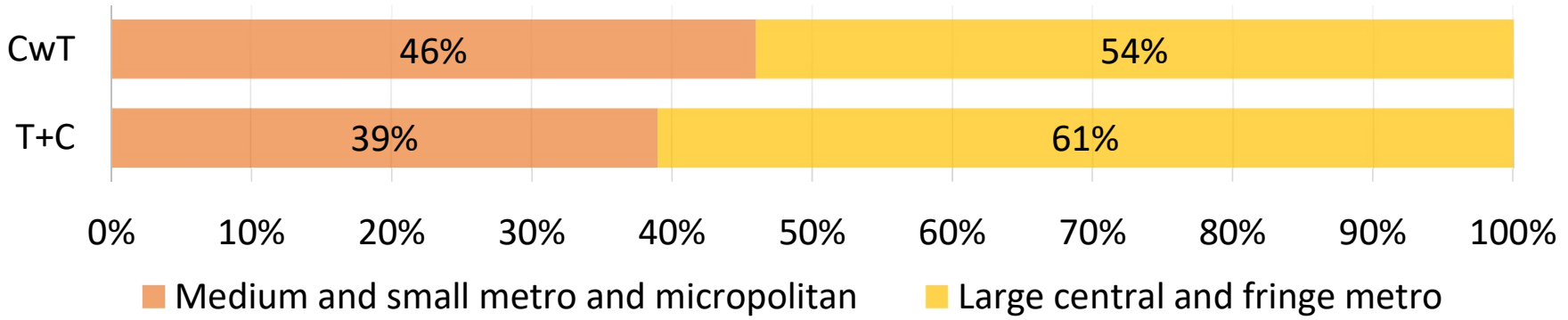
- Convenience sampling
- Reached out to over 100 organizations & individuals (Summer 2017 – present)
  - State and local weatherization agencies, utilities, building owners (non-profit and commercial), other interested parties (e.g., Energy Efficiency for All (EEFA) state leads)
- Recruiting property owners to participate in the study was much more difficult and time consuming than expected
- Number of buildings in the queue for weatherization was much lower than expected (we are not in the ARRA period anymore!)

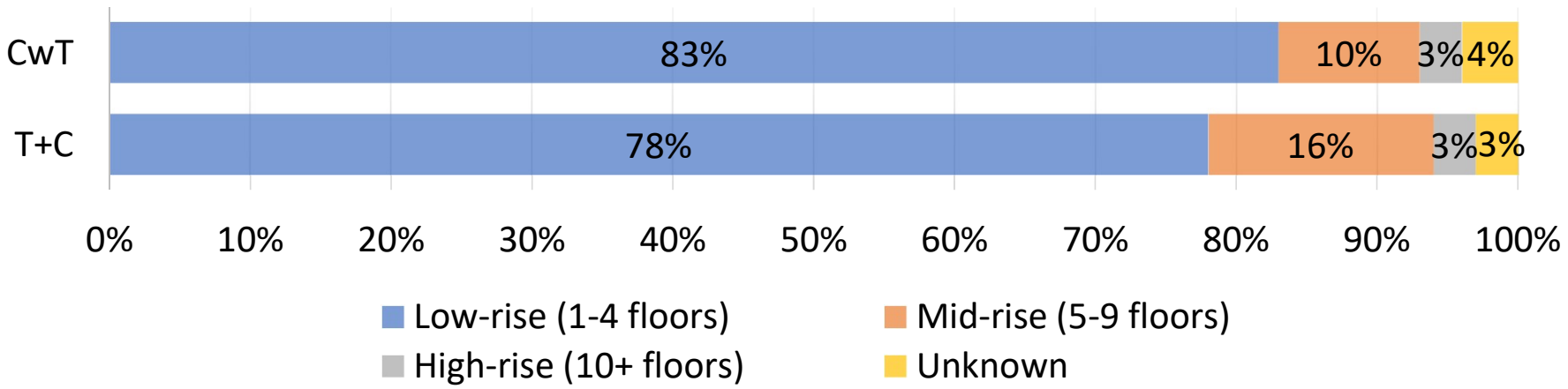
ADMINISTERING THE RESIDENT SURVEY

- **Challenge**
  - No contact information for occupants
- **Research Approach**
  - Send in-field staff to each sample building to:
    - Deliver survey packets with unique ID #s (3 models: leave on door, knock on door, or distribute surveys at resident meetings)
    - Utilize digital data collection tool to link each survey ID # with unit and building level data
  - Survey packets contain: survey booklet, cover letter, project description, informed consent and postage paid envelope
  - Multi-lingual surveys available: English, Spanish, Russian and Mandarin
  - Surveys also offered via phone and web
  - $25 Target/Kroger/Shaw's gift card as incentive
  - Actual response rate of 23%; anticipated response rate was 33%



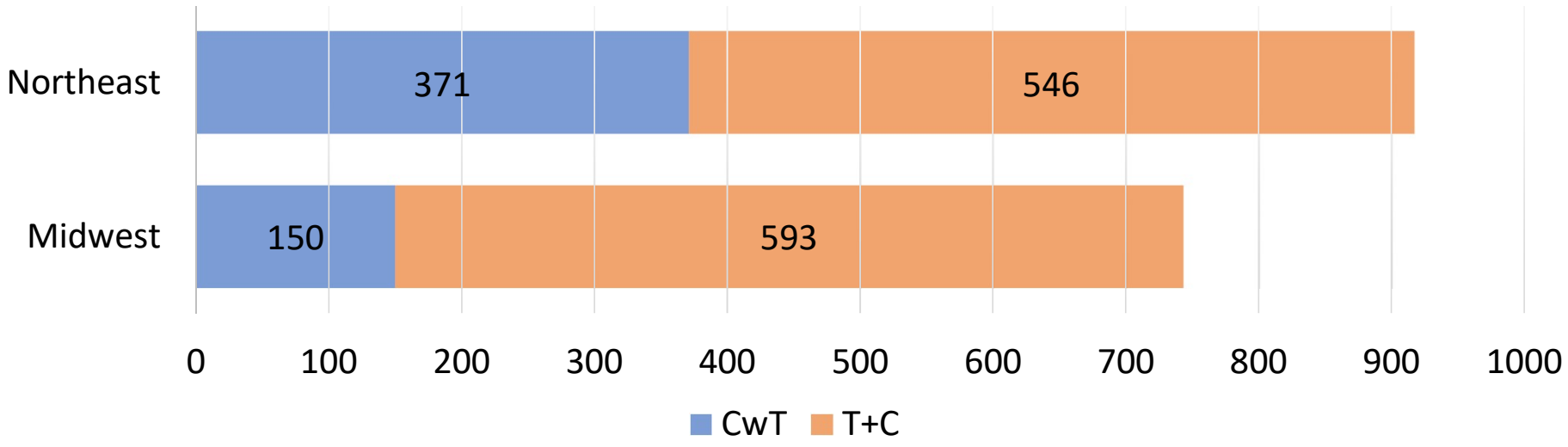
SITE CHARACTERISTICS OF SAMPLE*





* n=165 sites/properties; representing 361 buildings

COMPLETED RESIDENT SURVEYS –
(by region and sample group)



(n=1,660)

HEALTH IMPROVEMENTS

Resident Survey Question	Unweatherized (T+C)	Weatherized (CwT)	(+/-)
Asthma ED visits (mean)[1]	1.0 (n=172)	0.4 (n=70)	-0.6***
Doctor's office visits because apartment was too cold (mean)			-0.03**
Days of mental health not good in past 30 days (mean)	5.9 (n=826)	4.6 (n=394)	-1.3*
ED visit or hospitalization because of COPD, chronic bronchitis, or emphysema (% yes)	33.1% (n=160)	27.2% (n=81)	-5.9%

[1] Mean represents only those household members with the given illness

*p < .05 **p < .01 ***p < .001

DWELLING QUALITY AND SAFETY IMPROVEMENTS

Resident Survey Question	Unweatherized (T+C)	Weatherized (CwT)	(+/-)
Can hear a great deal of outdoor noise indoors when the windows are closed (% yes)	23.1% (n=1095)	14.7% (n=498)	
Extremely or very infested with rodents (% yes)	7.8% (n=1013)	3.6% (n=476)	-4.2%**
Apartment was at an unsafe or unhealthy temperature almost every month or some months in past year (% yes)			

*p < .05 **p < .01 ***p < .001

IMPROVEMENTS IN ENERGY AFFORDABILITY AND TRADE-OFFS

Resident Survey Question	Unweatherized (T+C)	Weatherized (CwT)	(+/-)
How hard is it to pay energy bills? (Very hard or hard)	37.8% (n=511)	26.7% (n=311)	
Household did not purchase food in order to pay energy bill every month, every other month (% yes)	8.3% (n=557)	3.6% (n=333)	-4.7%**
Household members needed prescription medicines but didn't get them because you couldn't afford it? (% yes)			

*p < .05 **p < .01 ***p < .001

COMMUNITY RESILIENCE IMPROVEMENTS

Resident Survey Question	Unweatherized (T+C)	Weatherized (CwT)	(+/-)
How safe do you feel on the property? (Somewhat unsafe, very unsafe)	12.9% (n=1091)	7.2% (n=500)	-5.7%*
People in my building are committed to the well-being of the community (Strongly agree or agree)	48.5% (n=980)	58.5% (n=455)	+10.0%***

*p < .05 **p < .01 ***p < .001

IMPROVEMENTS IN BUILDING SYSTEMS RESILIENCE
(from the Property Manager Survey, n=164)

	Extreme hot	Extreme cold	Very high winds	Heavy Snow	Heavy Rain	Flooding	Drought	Wildfire	Earth-quake	Power Outage
% Likely										
% Wx Improves										

[2] How likely are the following types of events in the area where this property is located? (extremely likely, very likely, likely)

[3] How has Wx affected this property's ability to withstand extreme events? (greatly improved, improved)

CONCLUDING THOUGHTS

- Initial analysis does suggest that there are substantial demographic differences between recipients of weatherization who live in SF homes versus MF buildings.
- Numerous challenges conducting research in the affordable MF building sector have been successfully managed.
- Preliminary results support the general hypothesis that weatherization can improve the health and well being of occupants.
- The biggest uncertainty in Phase II pertains to the response rate for the Resident Survey.

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THANK YOU!!

Marian Goebes

TRC

U.S. DEPARTMENT OF ENERGY

Energy

Multifamily Ventilation and IAQ

A Market-level Assessment of Standard and Best Practices

Marian D. Goebes, PhD

TRC – Research and Technology Commercialization Group

July 10, 2019

Overview

Multifamily ventilation and IAQ needs

1. Dwelling unit ventilation
2. Compartmentalization
3. Filtration

For each, discuss:

- What is it and why is it needed?
- Standard and best practices, including requirements in:
  - International Energy Conservation Code (IECC), adopted in most states
  - Am. Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) Standard 62.2, adopted by many programs and CA

For time constraints: Focus on new construction, but briefly discuss retrofit options

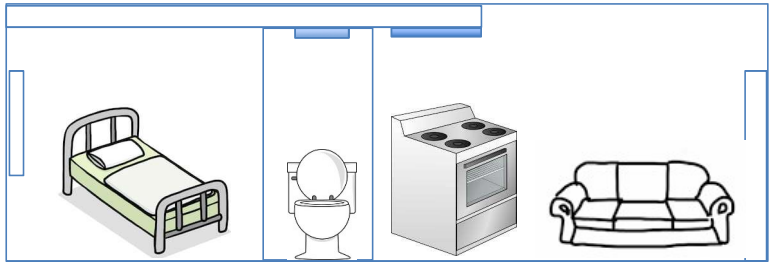
Dwelling Unit Ventilation: Why?

- Dwelling unit ventilation = providing outdoor air to each unit to dilute indoor pollutants
- Historically, MF units ventilated with infiltration and operable windows
- In past decade, codes moved to requiring mechanical ventilation
  - Buildings being constructed more tightly, so less infiltration
  - Offerman (2010) study of 108 homes found occupants don't open windows regularly

Dwelling Unit Ventilation: How?

Most codes, including IECC and ASHRAE 62.2, allow 3 strategies

- Exhaust-only
  - Local exhaust fan(s) runs continuously
  - Make-up (supply air) theoretically comes from infiltration or passive vents



- Supply-only:
  - Fan provides supply air into unit
- Balanced:
  - Fan provides supply air into unit, and exhaust fan removes air from unit at same rate

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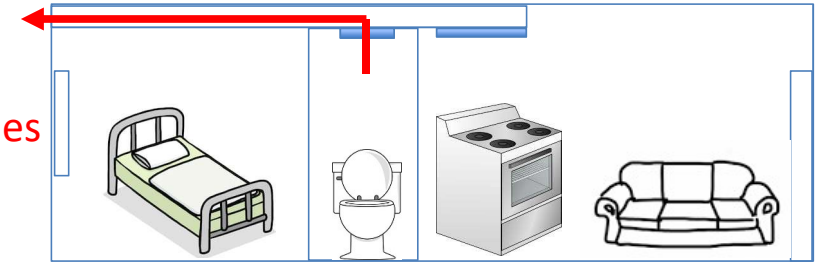

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Dwelling Unit Ventilation: How?

Most codes, including IECC and ASHRAE 62.2, allow 3 strategies

- Exhaust-only:
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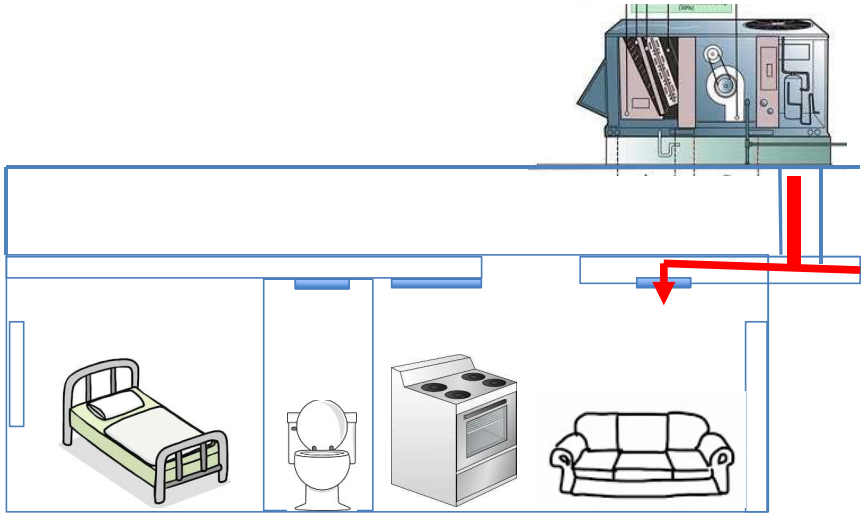

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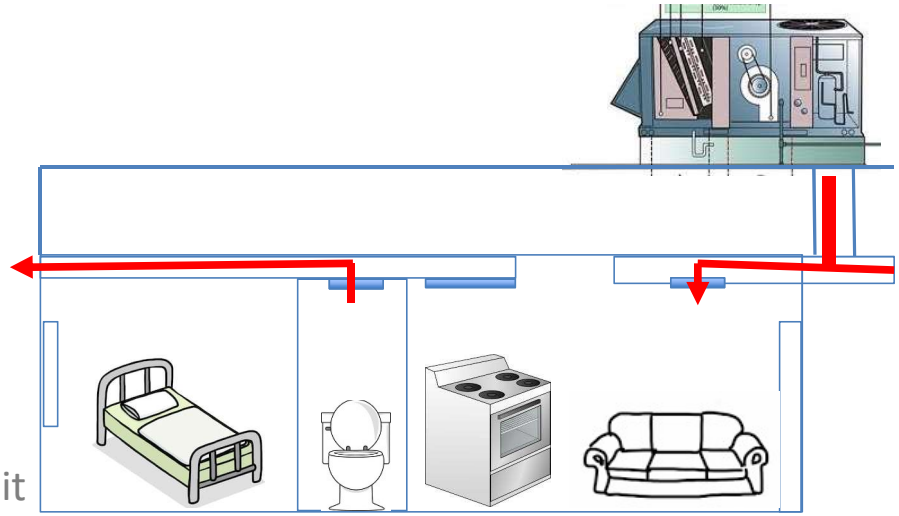
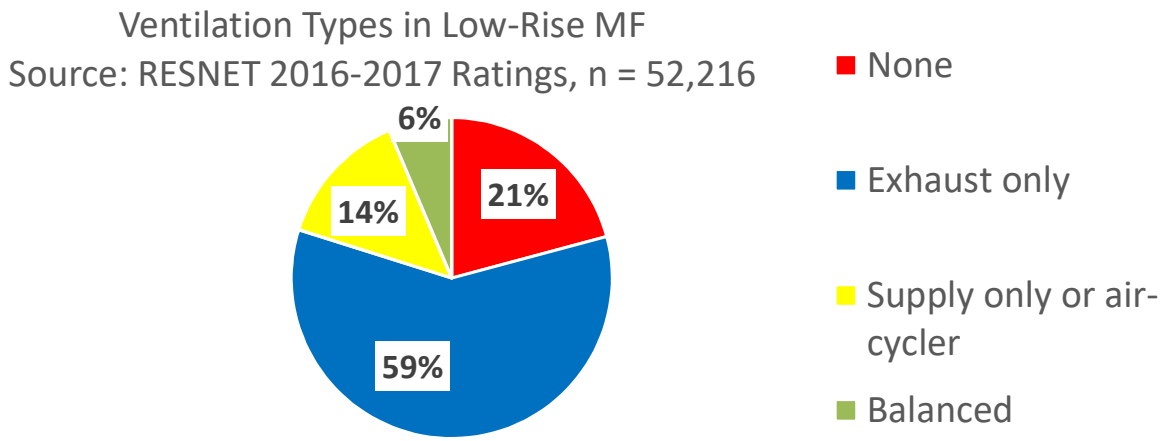


Dwelling Unit Ventilation: Standard Practice

- Exhaust-only most common in MF

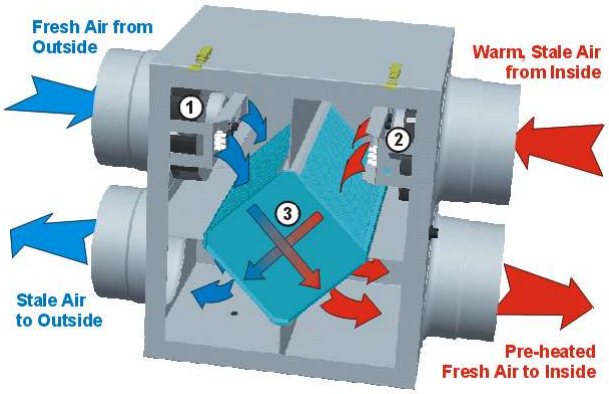


- Concerns with exhaust-only
  - Insufficient outdoor air (CARB 2015: 13-36% through passive vents)
  - Some “fresh air” likely transfer air from neighboring units

Dwelling Unit Ventilation: Best Practice

- Require balanced or supply-only
- Example code: Minnesota requires balanced ventilation for all new MF
- Designs include:
  - Central ventilation, ducted to each unit
  - Heat or Energy Recovery Ventilator (HRV or ERV)
- Additional cost: ~$1,000/unit (based on individual ERV)

HRV



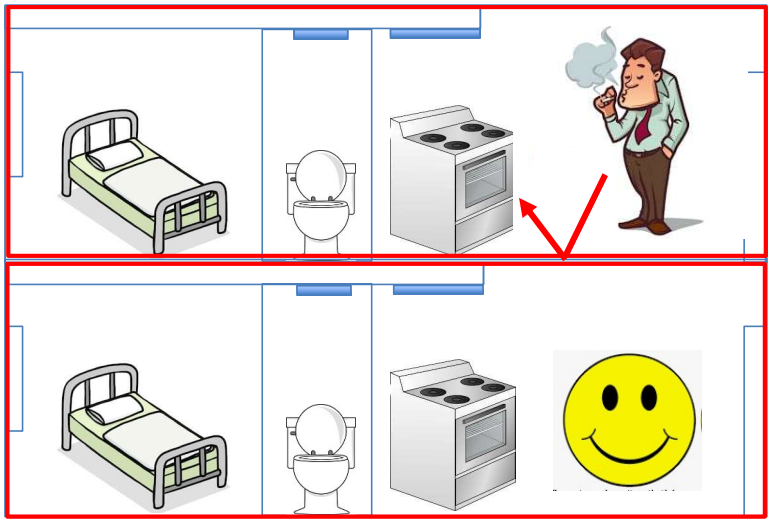
Retrofit Ventilation Options

- Sometimes exhaust-only is only option
  - If central exhaust shaft exists: add rooftop fan
  - Or add through-wall exhaust for bathroom and kitchen
- Add ventilation supply fan along exterior wall
  - Put supply fan in accessible location: e.g., under balcony or stairwell
  - Run short duct into apartment

QuFresh Fresh Air Solution
http://www.airkinglimited.com

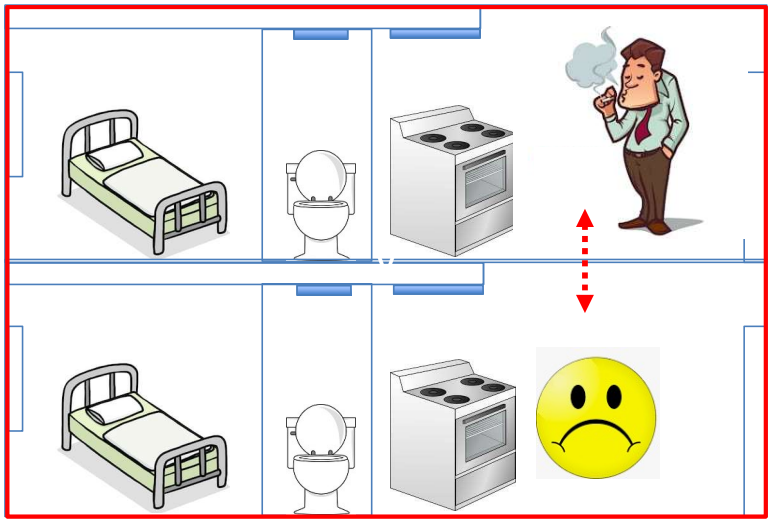
Compartmentalization: Why?

- Compartmentalization = sealing each dwelling unit from exterior, neighboring units, and all other interior spaces
- Reduce pollutant transfer between units



Compartmentalization: Standard Practices

- IECC-2018 has tightness requirement, but can be met at whole building or individual unit level
  - Exterior envelope could be tight, with little sealing between units -> air transfer



Compartmentalization: Better Practice

- ASHRAE Standard 62.2-2019: compartmentalize and test that dwelling unit ≤**0.30** cfm50/sf
- Best practice implementation:
  - Careful job with traditional caulking and sealing
  - Aerosolization:
    - Pressurize unit
    - Release small particles of sealant
    - Sealant particles build up, sealing cracks
  - ~$300/unit for sealing to 0.30 cfm50/sf and testing

Sealed Air Leaks using Aerosolization (Source: Western Cooling Efficiency Center

Retrofit Compartmentalization Opportunities

- Seal all readily accessible penetrations in the dwelling unit air barrier, including:
  - Around penetrations from ductwork, pipes, electrical sockets
  - Around window and door frames
  - See new sealing requirements in ASHRAE 62.2-2019 Appendix A (Existing Buildings)

Filtration: Why, and Standard Practice

- Filter supply air through HVAC system
- Why?
  - Remove particulate matter (PM), especially smaller particles (PM2.5)
  - PM2.5 causes asthma, respiratory problems, and cardiovascular disease
- Filters with higher Minimum Effectiveness Reporting Value (MERV) remove larger fraction of PM2.5
- Standard practice
  - MERV 6-8, required in IECC and ASHRAE 62.2
  - Removes very little PM2.5

Filtration: Best Practice

- Best practice: MERV 13
  - Removes ~70-85% of PM2.5
  - Direct incremental cost ~$80, but accounting for limitations in equipment choices and increased maintenance: ~$400
- Best practice implementation
  - Thicker filters (≥ 2”) to reduce static pressure
  - Educate maintenance staff or tenants on replacing filters often

Best Practice: San Francisco Article 38

- People living within 500 feet of a freeway suffer higher rates of asthma, heart attacks, and pre-term births (Barboza, 2017)
- Residential new construction in high PM2.5 zones must use balanced or supply-only ventilation, and MERV 13 filtration
- Market has adapted: "I knew the engineering community in the Bay Area was creative, but I didn't realize how creative." Jonathan Piakis, SF Dept of Public Health

Estimated Benefits ($) from *Weatherization*

- E4theFuture estimated non-energy impacts (NEIs) from MA low income weatherization

NEI Value	Annual Per Unit Benefit*				
	Household W/ Avoided Death Benefit	Household W/O Avoided Death Benefit	Societal	Total w/ Avoided Death Benefit	Total W/O Avoided Death Benefit
Tier 1	A	B	C	A+C	B+C
Reduced asthma symptoms	$9.99	$9.99	$322.01	$332.00	$332.00
Reduced cold-related thermal stress	$463.21	$4.67	$33.73	$496.94	$38.40
Reduced heat-related thermal stress	$145.93	$8.28	$27.00	$172.93	$35.28
Fewer missed work days	$149.45	$149.45	$37.36	$186.81	$186.81
Tier 2					
Reduced use of short-term, high-interest loans	$4.72	$4.72	$0	$4.72	$4.72
Reduced CO poisoning (5-year life)	$36.98	$0.25	$1.87	$38.85	$2.12
Tier 3					
Increased home productivity	$37.75	$37.75	$0	$37.75	$37.75
Reduced home fires	$93.84	$9.77	$17.87**	$111.71	$27.37***
Annual Total—per weatherized home	$941.87	$224.88	$439.84	$1,381.71	$664.45

Measures I recommended should provide similar benefits (climate dependent)

- Reduced asthma from ventilation and filtration
- Reduced cold and heat-related stress from compartmentalization

~$619 annually in household benefits

Source: E4theFuture (2016), "Occupant Health Benefits of Residential Energy Efficiency"

Summary of Recommendations

MF IAQ Need	Why?	Best Practice	Approx. Incremental Cost /unit
Dwelling unit ventilation	Buildings getting tighter	Balanced or supply-only	~$1,000
Compart-mentalization	Reduce pollutant transfer	0.30 cfm50/sf, individual unit level	~$300
Filtration	Reduce indoor PM2.5	MERV 13	~$400
Total			**~$1,700**

Relatively small cost: $1,700 (~$2 per sf) with big benefits!

- Payback of ~3 years in improved household health
- Minnesota and San Francisco show best practice can be "norm"

Nicole Rosenberg

NMR Group, Inc.

U.S. DEPARTMENT OF ENERGY

Massachusetts Low-Income Multifamily Weatherization: Health & Safety Impacts

Presented at the Better Buildings Summit
July 2019

Presenter: Nicole Rosenberg, NMR Group
NMR Team: Greg Clendenning, Nicole Rosenberg, Christine Smaglia
Three3 Team: Bruce Tonn, Beth Hawkins, Erin Rose, Michaela Marincic

July 10, 2019

NMR Group, Inc. Three3

Landscape in Massachusetts

Scenario to apply results

Massachusetts electric and gas distribution companies and municipal aggregators must offer energy-efficiency programs.

Programs provide incentives and other support to customers.

"PAs" earn incentives if they meet savings goals.

Program Overview

We joined JPB's nationwide study to address MA's Low-income Multifamily (LIMF) Program NEIs.

The LIMF Program offers,

- Air sealing
- Heating equipment
- Water heaters
- Insulation
- Lighting
- Refrigerators & freezers

Cost-Effectiveness Testing in Massachusetts

All programs must be cost-effective

Net Savings Benefits
Inputs

Benefits are a product of net savings and avoided supply costs

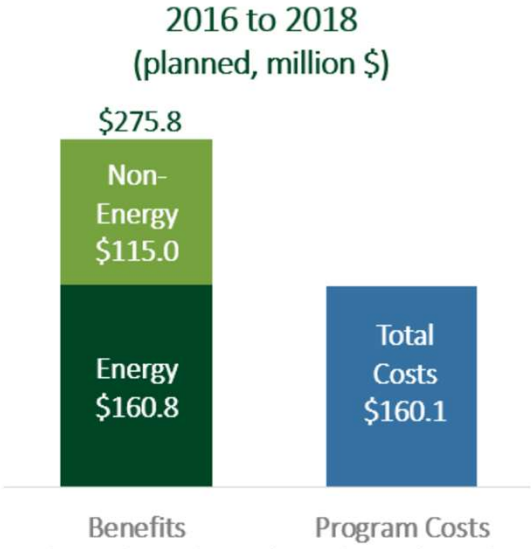
Net savings include,

- Electric energy and capacity
- Natural gas
- Fuel oil, propane, & water
- Non-resources

Non-Energy Impacts (NEIs)

MA LIMF Program Benefit-Cost Ratio

NEIs accounted for 42% of benefits!



BCR was 1.72.

Without NEIs, requirements would just barely be met (BCR = 1.0).

This study's recommendations will likely increase BCR in 2019 through 2021.

Currently Claimed NEIs (non-H&S)

PAs not only count H&S impacts for LIMF, but also...

RESIDENTS

- Noise reduction
- Light quality and lifetime
- Thermal comfort

P. MANAGERS

- Marketability
- Durability
- Maintenance
- Complaints

PAs

- Bad debt write-offs
- Price hedging
- Arrearages
- Rate discounts
- Terminations and reconnections
- Notices
- Safety/Emergency calls
- Customer calls and collections

Health and Safety Reexamined

We reassessed and broadened H&S impacts in MA

HEALTH

- Asthma
- Missed days of work
- Heat-related thermal stress
- Cold-related thermal stress
- Home productivity

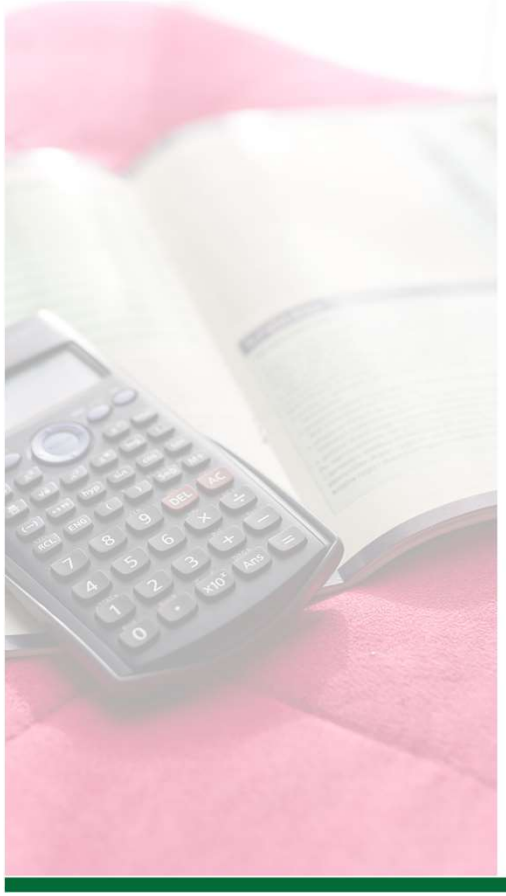
SAFETY

- Trips and falls
- Carbon monoxide poisoning
- Reduced fire risk

Exclusions in Massachusetts

Some JPB NEIs cannot be counted in MA due to "double counting" of energy bill savings, or they are societal only.

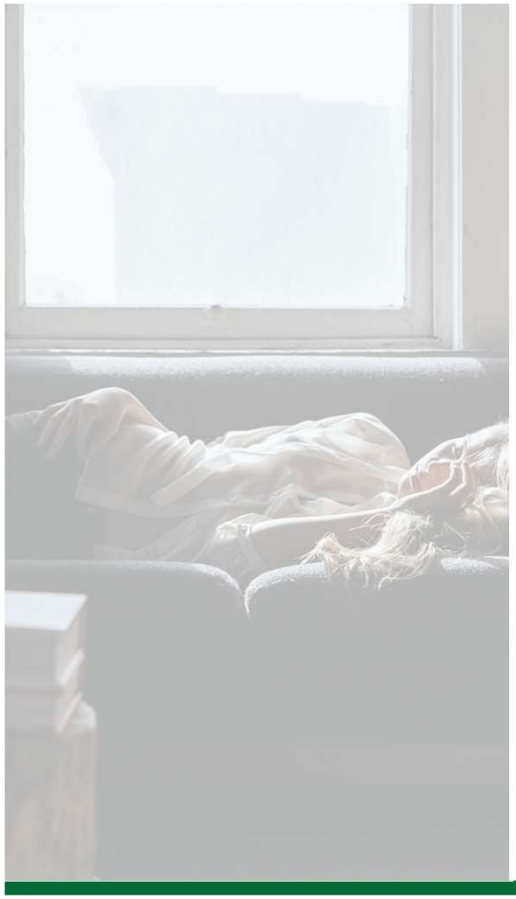
- Prescription adherence
- Low-birth-weight
- Short-term high-interest loans
- Food assistance
- Work productivity



Monetizing NEIs

Wicked easy! Just put a dollar value on your lungs.

- Difference between JPB comparison and control/treatment group respondents
- Secondary resources and literature
- Existing NEI values from past MA studies (leveraged by many states)



Key Survey Questions

MA updates relied on numerous parameters from resident survey.

- Urgent care and ED visits and hospital stays because of asthma
- Urgent care and ED visits and hospital stays because home was too hot or cold
- Missed days of work due to illness or injury
- Days without enough rest or sleep

Example:
Missed Days of Work

In the past 12 months, about how many days of work did the primary wage earner miss because of their or another household member's illness or injury?

	Comparison	Control/Treatment	Difference
Self	3.92	6.07	-2.15
Another	0.12	1.0	-0.88
		Total	**-3.03**

Monetization:
Missed Days of Work

How avoiding sick days makes a difference

	Percentage employed	20.9%
x	Days missed per year	3.03
x	Hours per day	8
x	Wage ($ per hour)	$12.45
x	Percentage without sick leave	77%
	NEI ($ per year per household)	**$48.61**

Difference between respondents

Example: Asthma

In the past 12 months, how many times did you visit urgent care/stay overnight in the hospital/visit an emergency department because of asthma?

	Comparison	Control/ Treatment	Difference	Cost	Cost* -Difference
Urgent care	0.97	1.20	-0.23	$1,268	$292
Hospital overnight	0.27	0.69	-0.42	$9,250	$3,885
Emergency department	0.22	1.21	-0.99	$1,659	$1,642
				Total	**$5,819**

Monetization: Asthma

How reducing asthma care makes a difference

	Percentage with asthma	20.3%
x	Cost of care	$5,819
x	Percentage of asthma population with insurance	43%
x	Percentage paid out-of-pocket for asthma population	7%
	NEI ($ per year per household)	**$35.55**

Not Recommended to Update in Massachusetts

Some NEIs gave reason to pause

Safety remains the same.

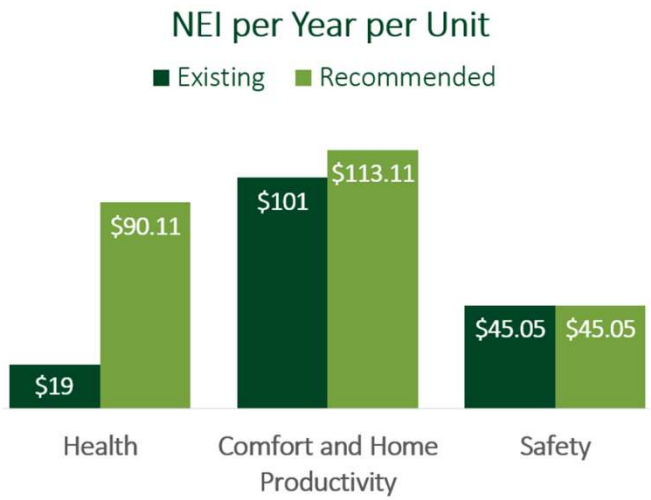
- Trips and falls worsened (due to age differences across respondent groups).
- CO and smoke detectors already installed in control/treatment homes.

Exclude Heat-related Thermal Stress.

- No changes in heat-related thermal stress.

Changes In Massachusetts

Large increase for Health, slight increase for Comfort and Home Productivity, and no change for Safety



Health and Safety Interim Values (Not Adopted)

HEALTH

$90.11

Asthma
$35.55

Cold-related thermal stress
$5.95

Missed days of work
$48.61

COMFORT and HOME PRODUCTIVITY

$113.11

Home productivity
$12.11

Pre-existing thermal comfort
$101

More to come in Phase 2!

Nicole Rosenberg
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NMR Group, Inc.

Three5

Rebecca Schaaf

Stewards of Affordable Housing for the Future (SAHF)

U.S. DEPARTMENT OF ENERGY

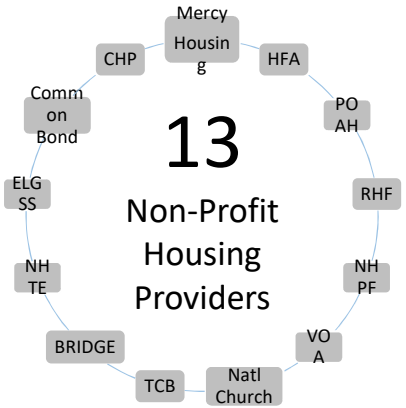
SAHF
STEWARDS OF AFFORDABLE HOUSING FOR THE FUTURE

Improving Resident Health through Efficiency Upgrades

Better Buildings Summit– July 10, 2019

contact@sahfnet.org

SAHF Portfolio: By the Numbers



140,000+

Rental Homes for Families, Seniors, and Special Needs Populations

250,000+

People Served by SAHF Members

STEWARDS OF AFFORDABLE HOUSING FOR THE FUTURE

Bringing Sustainability Home

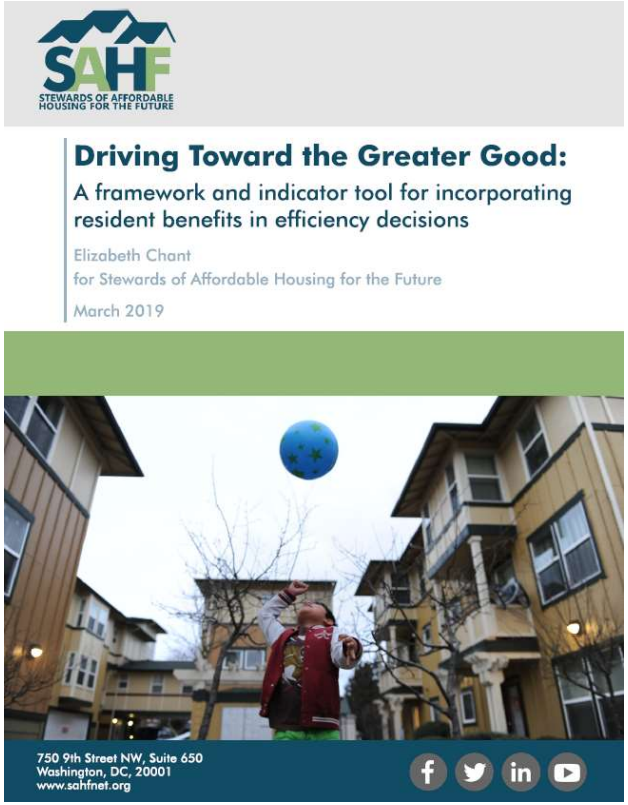
- Objectives: Increase affordable housing's participation in utility programs that promote energy and water efficiency as well as a variety of programs promoting healthy building practices.
- SAHF members + other affordable housing providers
- Two program areas:
  - Utility rebates and incentives
  - Healthy building practices

- Strategic Approaches:
  - On-the-ground implementation
  - Program/policy recommendations and revisions
  - Integrating best practices into management systems

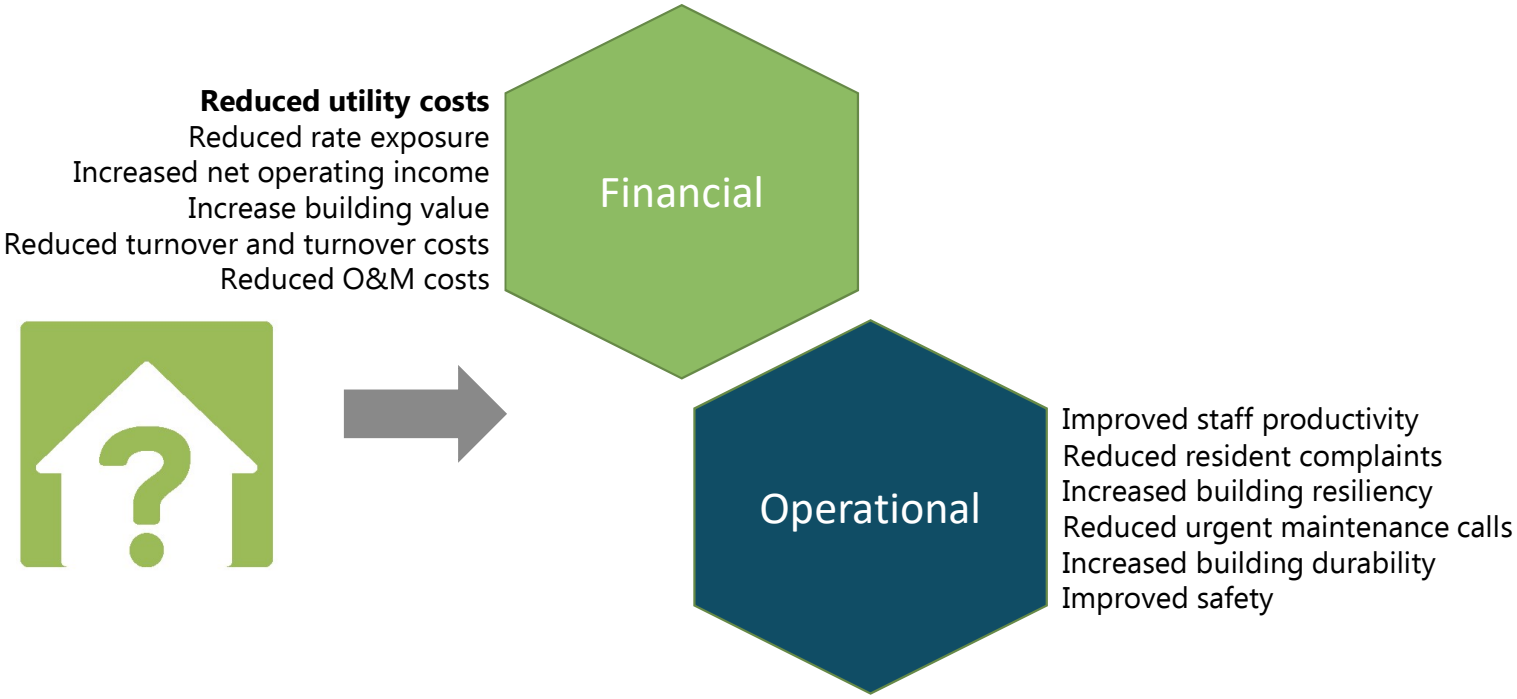
Elevating Resident Benefits in Your Work

- Background – How can owners increase resident agency in efficiency decisions?

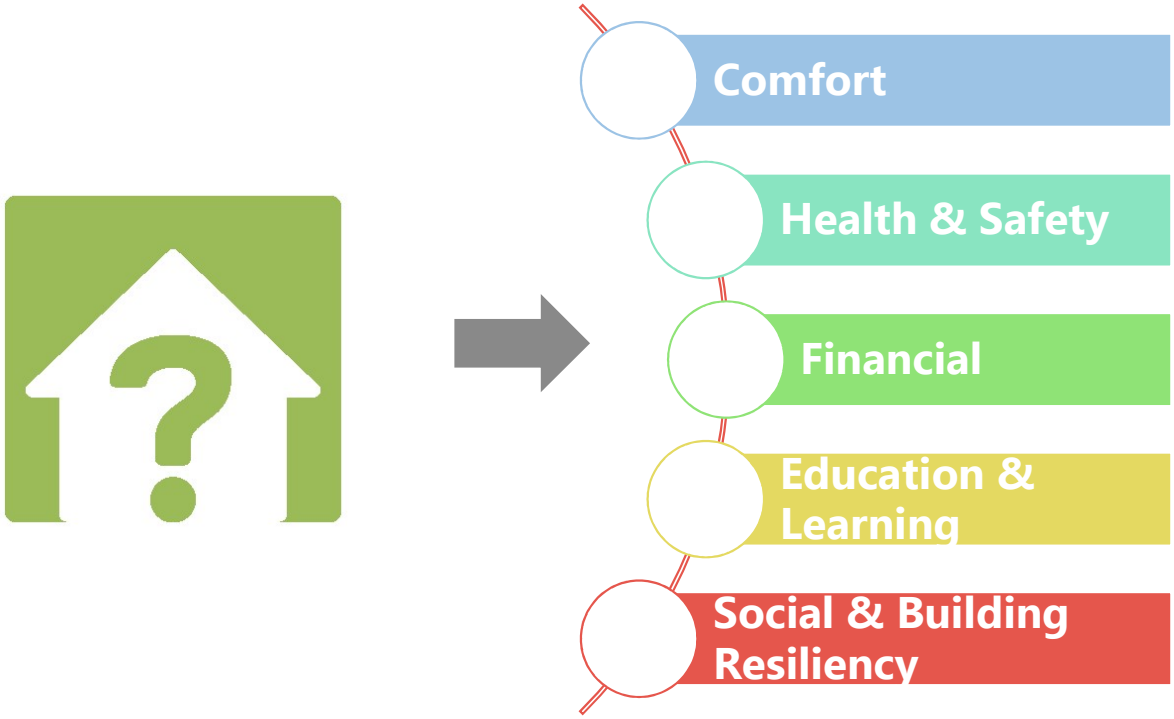
- SAHF's *Driving Toward the Greater Good: A framework and indicator tool for incorporating resident benefits in efficiency decisions* report



Owner Benefits



Resident Benefits



Elevating Resident Benefits in Your Work

Let's look at lighting…

Comfort

- **Better lighting distribution and quality**
- Improved comfort; more consistent operation
- Reduced resident disruption for repairs
- Improved control

Health & Safety

- Reduced headaches
- **Improved safety and security**
- Reduced trips and falls
- Reduced emergency room visits
- Reduced fire risk, injuries, death

Financial

- Reduced out-of-work days
- Reduced utility costs
- Increased energy security
- Reduced medical expenses
- Increased alertness or productivity at work

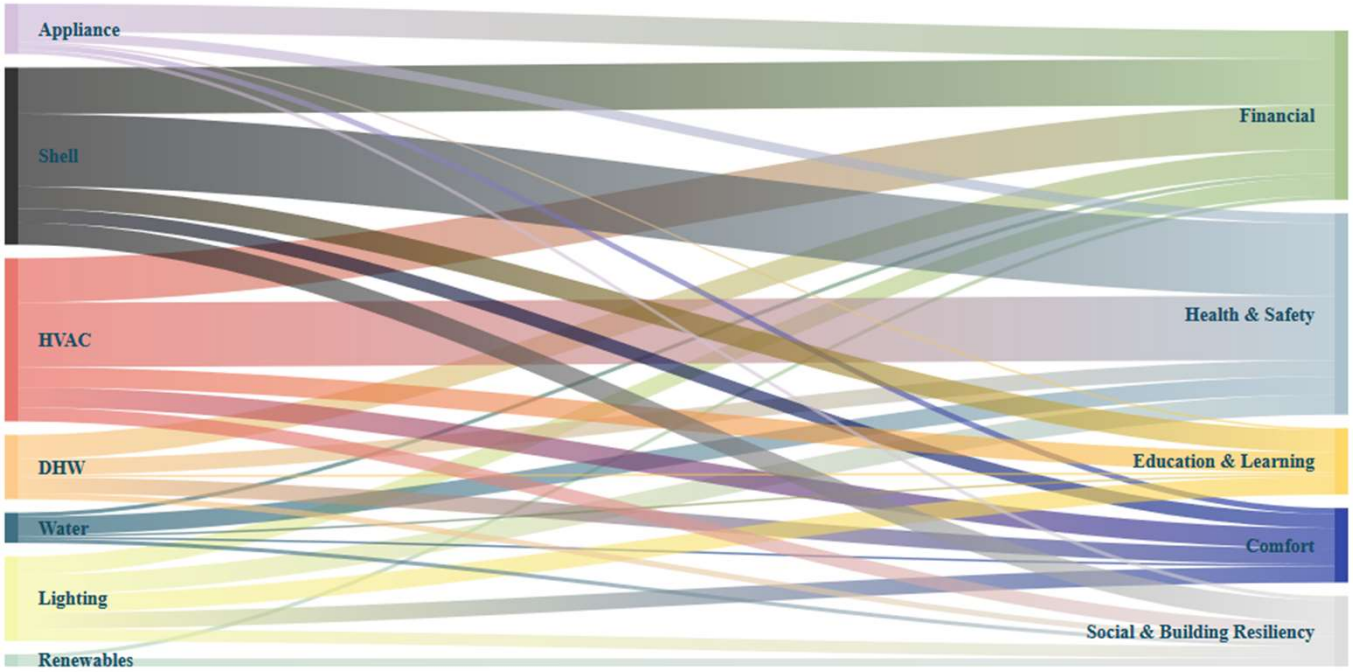
Education & Learning

- **Improved reading or homework**
- Reduced days out of school for children
- Increased productivity
- Improved behavior at school
- Improved test scores

Social & Building Resiliency

- Reduced crime
- Improved resiliency of housing
- Improved resiliency of household members
- Increase in social contact and connection

Elevating Resident Benefits in Your Work



STEWARDS OF AFFORDABLE HOUSING FOR THE FUTURE

Elevating Resident Benefits in Your Work

Shell upgrades offer 34 unique benefits to residents!

Comfort

- Reduced noise levels
- Improved comfort; more consistent operation
- **Reduced resident disruption for repairs**

Health & Safety

- **Reduced headaches**
- Improved safety and security
- Reduced trips and falls
- Reduced emergency room visits
- Reduced fire risk, injuries, death

Financial

- **Reduced out-of-work days**
- Reduced utility costs
- Increased energy security
- Reduced medical expenses
- Increased alertness or productivity at work

Education & Learning

- **Improved reading or homework**
- Improved test scores
- Reduced days out of school for children
- **Improved behavior at school**

Social & Building Resiliency

- Increase energy security
- **Improved resiliency of household members**
- Increase in social contact and connection
- Improved resiliency of housing

SAHF
STEWARDS OF AFFORDABLE HOUSING FOR THE FUTURE

From Unintended to Intended

Alternative Decision Criteria

- Maximize resident benefit within the bounds of cost-effectiveness
- Prioritize measures that have no natural life cycle
- Encourage resident-led upgrades and beneficial use of systems

Implementation Strategies

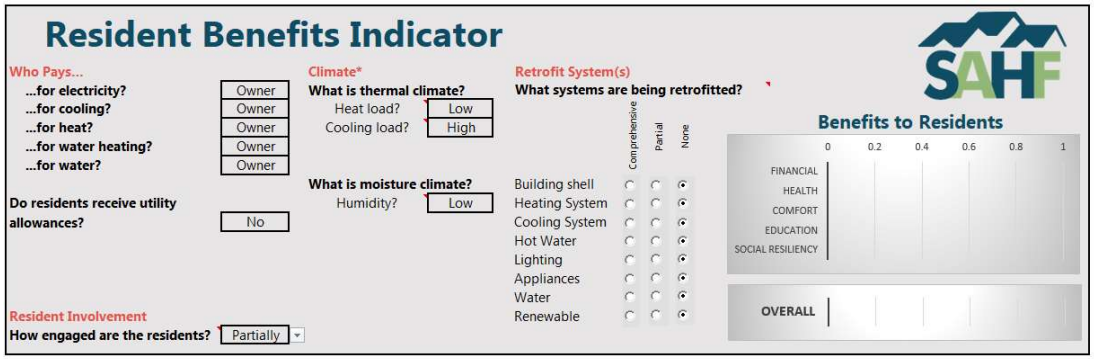
- Increase resident involvement in implementation
- Use savings to provide additional resident benefits
- Increase resident understanding of how installed systems operate to maximize benefits

Resident Benefits Indicators Tool

An interactive Excel-based tool that allows affordable housing providers to compare the benefits to residents from different building upgrade scenarios

Inputs

1. Who Pays…
2. Resident Involvement
3. Climate
4. Retrofit Systems



Note: Hover over cells with a red triangle for further guidance on how to answer questions.
*Not sure of your climate? Click here for an indication

Interpreting the scale of benefits:
The indicators for financial, health, comfort, education, social resiliency, overall benefit are based on the individual benefits of different efficiency upgrades laid out in Table 1 of "Driving Toward the Greater Good" paper (see link on Introduction sheet) as well as data on Who Pays, Resident Involvement, Climate, and Retrofit Systems and levels entered on this sheet.
For example, a score of 0.4 on the Financial indicator means that the retrofit scope entered for this property captures 40% of the maximum financial benefit available from a comprehensive retrofit at the property with ideal payment, engagement, and climate conditions.

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Wysong Village Apartments

Wysong Village Apartments, National Church Residences

- Location: Alhambra, California
  - Thermal Climate: Hot (Low Heat, High Cooling)
  - Moisture Climate: Dry (Low Dehumidification)
- Building Characteristics
  - Built in 1984
  - 95 units
  - Population Served: Seniors
  - All utilities are owner-paid
- Scope of Work
  - LED Lighting: In-Unit and Common Areas
  - High-Efficiency Boilers
  - ENERGY STAR Refrigerators

Making the Case for More Resident Benefits

- Internal Advocacy
  - Achieve **multiple organizational goals** by prioritizing a package of efficiency measures rather than a single measure
  - Demand **healthier building upgrade materials** to provide even greater benefits for your residents
  - Raise **resident awareness** and encourage **resident-centric retrofits**
- External Advocacy
  - Identify resources like efficiency incentives programs to pursue your prospective scope of work
  - Work with industry partners to advocate for comprehensive measures that produce greater resident benefits

Thank You!

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William Weber

Healthy Building Network (HBN)

U.S. DEPARTMENT OF ENERGY

Better Buildings Summit

Avoiding Toxic Chemicals in Insulation and Air Sealing Materials

William Weber

HEALTHY BUILDING NETWORK

Estimated Benefits from Weatherization

- E4theFuture estimated non-energy impacts (NEIs $) from MA low income household and societal benefits per weatherized unit

NEI Value	Annual Per Unit Benefit*				
	Household W/ Avoided Death Benefit	Household W/O Avoided Death Benefit	Societal	Total w/ Avoided Death Benefit	Total W/O Avoided Death Benefit
Tier 1	A	B	C	A+C	B+C
Reduced asthma symptoms	$9.99	$9.99	$322.01	$332.00	$332.00
Reduced cold-related thermal stress	$463.21	$4.67	$33.73	$496.94	$38.40
Reduced heat-related thermal stress	$145.93	$8.28	$27.00	$172.93	$35.28
Fewer missed work days	$149.45	$149.45	$37.36	$186.81	$186.81
Tier 2					
Reduced use of short-term, high-interest loans	$4.72	$4.72	$0	$4.72	$4.72
Reduced CO poisoning (5-year life)	$36.98	$0.25	$1.87	$38.85	$2.12
Tier 3					
Increased home productivity	$37.75	$37.75	$0	$37.75	$37.75
Reduced home fires	$93.84	$9.77	$17.87**	$111.71	$27.37***
Annual Total—per weatherized home	$941.87	$224.88	$439.84	$1,381.71	$664.45

Measures I recommended should provide some of the same benefits

- Reduced asthma from ventilation and filtration
- Reduced cold and heat-related stress from compartmentalization

Source: E4theFuture (2016), "Occupant Health Benefits of Residential Energy Efficiency"

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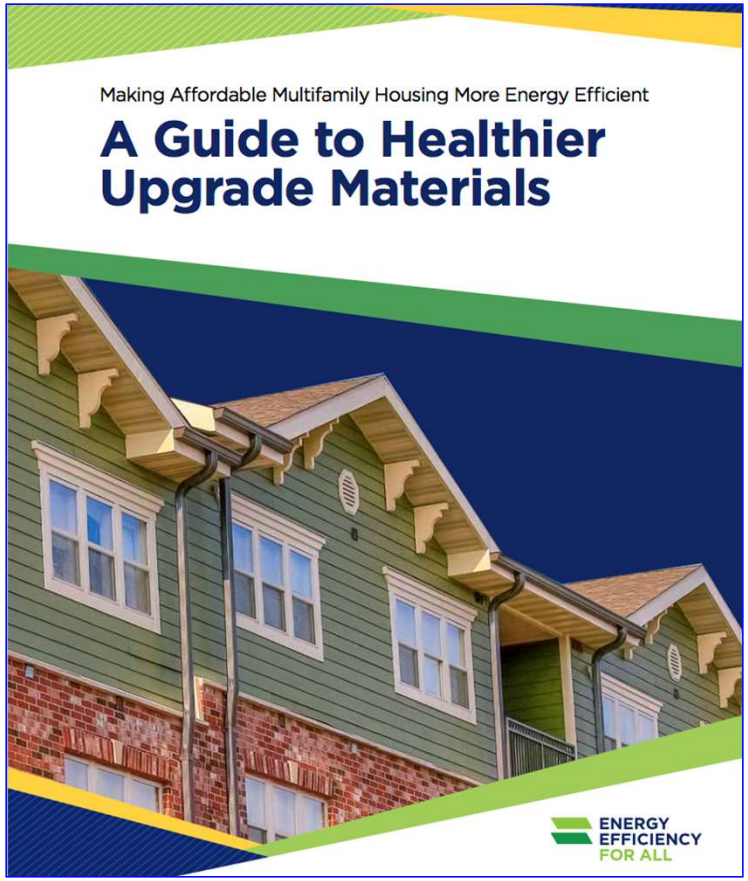
HomeFree



ENERGY EFFICIENCY FOR ALL

NRDC

ELEVATE ENERGY

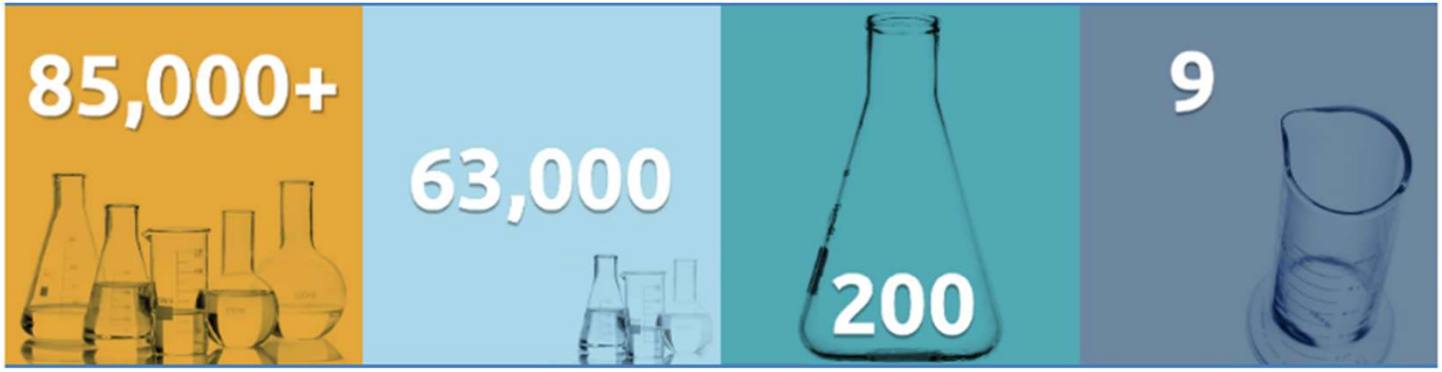
HBN HEALTHY BUILDING NETWORK

Vermont Energy Investment Corporation

Three3

INTERNATIONAL LIVING FUTURE INSTITUTE℠

HEALTH AND EQUITY



Toxic Substance Control Act

Chemical Hazards & Health Endpoints

PERSISTENT AND BIOACCUMULATIVE TOXICANTS (PBT)

CARCINOGENS AND MUTAGENS

DEVELOPMENTAL & REPRODUCTIVE TOXICANTS, AND ENDOCRINE DISRUPTION

ASTHMAGENS

OZONE DEPLETION POTENTIAL (ODP)

GLOBAL WARMING POTENTIAL (GWP)

Why is transparency important?

1. Right to know
2. Need to identify priorities
3. Innovation
4. Accelerates change

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Insulation and Exposure and Impacts

Formaldehyde based binders adverse impact on indoor air quality

Occupational asthma in workers

Orthopthalates in air-sealing material

Fenceline Communities

Reduced recyclability

Persistent accumulative in people and the environment

Global Warming Impacts

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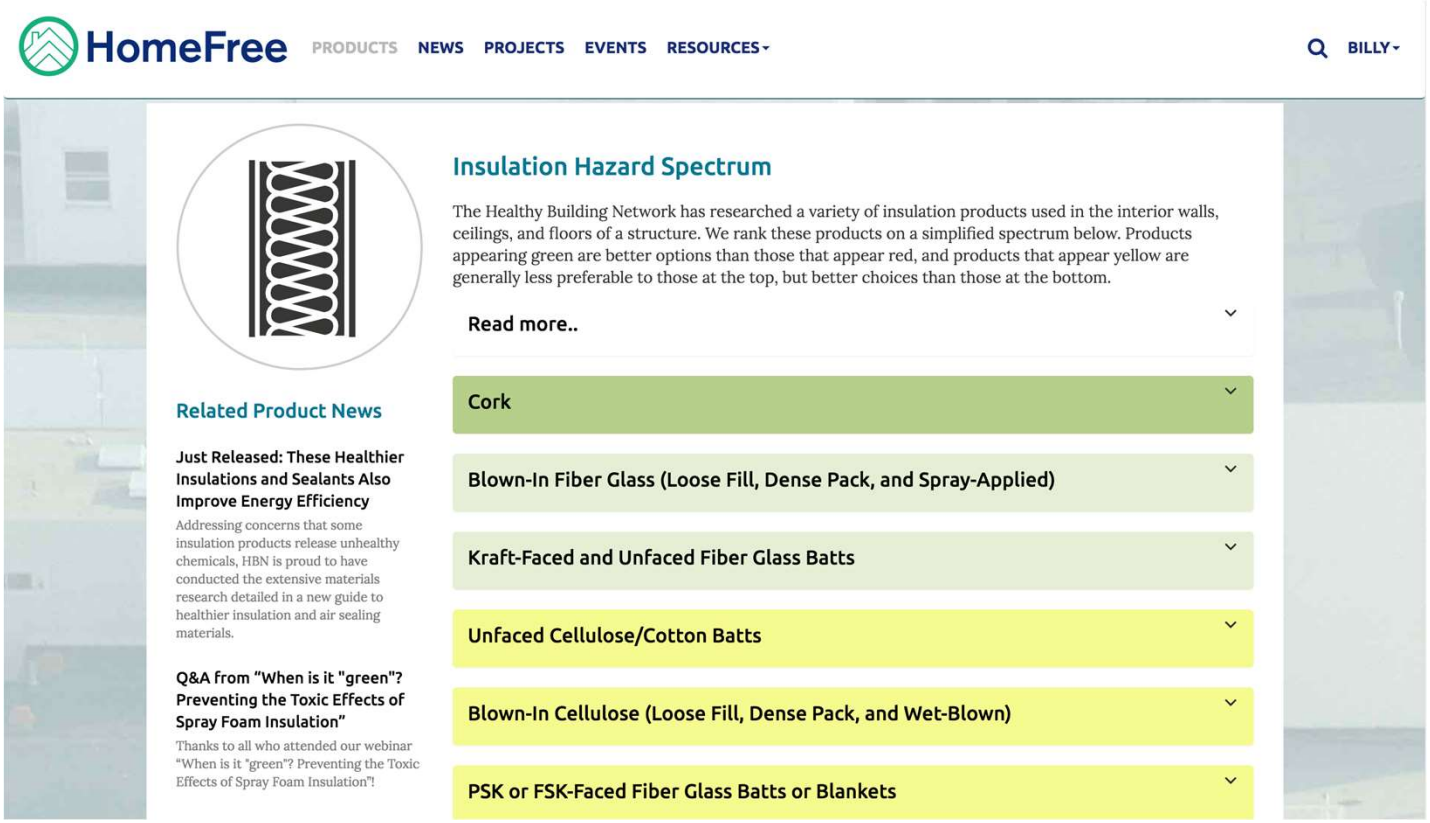
PRODUCTS - INSULATION



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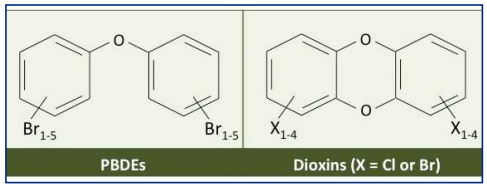
CHEMICALS OF CONCERN



Persistent, Bioaccumulative Toxicants (PBTs)

- Organotin catalysts

Halogenated flame retardants

- HBCD
- TCPP

Formaldehyde-based binders

Isocyanates

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Recommendations

- Cork
- Blown-In Fiber Glass (Loose Fill, Dense Pack, and Spray-Applied)
- Kraft-Faced and Unfaced Fiber Glass Batts
- Unfaced Cellulose/Cotton Batts
- Blown-In Cellulose (Loose Fill, Dense Pack, and Wet-Blown)
- PSK or FSK-Faced Fiber Glass Batts or Blankets
- Mineral Fiber Batts and Boards
- Fiber Glass Board (Duct Insulation)
- Polyisocyanurate
- Expanded Polystyrene (EPS)
- Extruded Polystyrene (XPS)
- Spray Foam Insulation (SPF)

Recommended Materials

Formaldehyde binder

Halogenated flame retardants

Organotin catalyst Isocyanates

https://homefree.healthybuilding.net

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PERFORMANCE

Health-Based Ranking (Green is best; red is worst)	Insulation Type	R-Value per Inch*	Relative Installed Cost per R-Value**	Special Installation Equipment Required	Vapor Retarder^	Air Barrier Material^^	Level of Transparency on Chemical Content^^^ (More shading indicates less transparency within product type)
	Expanded Cork Board	3.6-4.2	$$$$	no	Class III	Information not available	
	Blown-In Fiber Glass						
	Loose-Fill Fiber Glass	2.2-3.1	$	yes	Vapor permeable	Not an air barrier	
	Dense-Pack Fiber Glass	3.7-4.6	$-$$	yes	Vapor permeable	Not an air barrier but does reduce airflow	
	Spray-Applied Fiber Glass	4.0-4.3	$-$$	yes	Vapor permeable	Not an air barrier but does reduce airflow	
	Fiber Glass Batts/ Blankets (Kraft-Faced and Unfaced)	2.9-4.3	$	no	Kraft-faced: Class II, Unfaced: Vapor permeable	Not an air barrier	
	Fiber Glass Batts/ Blankets (PSK or FSK-Faced, Basement Wall Insulation)	Duct wrap: 2.7-3.2#, Basement wall insulation: 3.0-3.5	$-$$	no	Class I (except basement wall insulation where facing is perforated to allow for moisture transfer)	Facing may be an air barrier material	
	Cellulose/Cotton Batts and Blankets (Unfaced)	3.5-4.0	$$-$$$	no	Vapor permeable	Not an air barrier	
	Blown-In Cellulose						
	Loose-Fill Cellulose	2.7-3.4	$	yes	Vapor permeable	Not an air barrier	
	Dense-Pack Cellulose	3.5-3.8	$-$$	yes	Vapor permeable	Not an air barrier but does reduce airflow	
	Wet-Blown Cellulose	3.6-3.8	$-$$	yes	Vapor permeable	Not an air barrier but does reduce airflow	

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PRODUCTS - SEALANTS

HomeFree PRODUCTS NEWS PROJECTS EVENTS RESOURCES BILLY

Sealant Hazard Spectrum

The Healthy Building Network has researched a variety of sealant products, and we rank these products on a simplified spectrum below.[1] Products in the green categories are better options than those that appear in the orange or red, and products in the yellow categories are generally less preferable than those at the top, but are better choices than those at the bottom.

Read more..

- Non-Combustible Sodium Silicate Caulk
- Expanding Polyurethane Foam Sealant Tape
- Acrylic Latex Sealant
- Siliconized Acrylic Sealant
- Intumescent Acrylic Firestop Sealant

Related Product News

Just Released: These Healthier Insulations and Sealants Also Improve Energy Efficiency

Addressing concerns that some insulation products release unhealthy chemicals, HBN is proud to have conducted the extensive materials research detailed in a new guide to healthier insulation and air sealing materials.

New Sealant Category for Healthier Energy Efficiency Programs

Healthy Building Network has introduced a new sealant category on HomeFree, our

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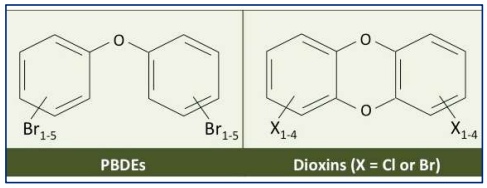
CHEMICALS OF CONCERN



Alkylphenol Ethoxylates

Volatile Methylated Siloxanes

Halogenated flame retardants

- HBCD
- TCPP

Isocyanates

Phthalates

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Performance

TABLE 8. MULTIPURPOSE SEALANTS

Health-Based Ranking (Green is best; red is worst)	Sealant Type	Relative Material Cost*	Installation Considerations[105]	Level of Transparency on Chemical Content^^ (Less shading indicates more transparency within a product type)
	Noncombustible Sodium Silicate Caulk	$$$	Noncombustible backing material needed for large, deep openings; not recommended where there is continuous vibration or in areas expected to come into contact with water	
	Expanding Polyurethane Foam Sealant Tape	$-$$$^	Usually expands to fill 1 to 1 1/2"	
	Acrylic Latex Sealant	$$	Backing material needed for gaps deeper than about 1/2 "; not for gaps wider than about 1/2"	
	Siliconized Acrylic Sealant	$$	Backing material needed for gaps deeper than about 1/2"; some products can be used for gaps up to 1"	
	Intumescent Acrylic Firestop Sealant	$$$$	Noncombustible backing material needed for large or deep openings	
	One-Component Silicone Sealant	$$$	Backing material needed for gaps deeper than about 1/2"; not for gaps wider than 1"	
	Modified Polymer Sealant (STPE Sealant)	$$$	Backing material needed for gaps deeper than about 1/2 "; not for gaps wider than 1"	
	One-Part Polyurethane Spray Foam Sealant	$	For gaps up to about 1 1/2"; variations available for gaps of up to about 3"	
	One-Component Polyurethane Sealant	$$$	Backing material needed for gaps deeper than about 1/2"; not for gaps wider than about 1 1/2"	

* Estimate of relative material cost per linear foot sealed at a set width and depth. Based on information compiled from various sources. Scale of project, location, and other factors may affect relative costs. Relative costs are not comparable across the different tables in this report.

^ There can be a wide variation in cost for expanding polyurethane foam sealant tape. Interior-only sealant tapes are usually cheaper than dual-purpose, interior and exterior tapes. The tape expands to fill the gap that is present, so for smaller gaps, the cost per volume filled will be greater than for larger gaps.

Policy Opportunities

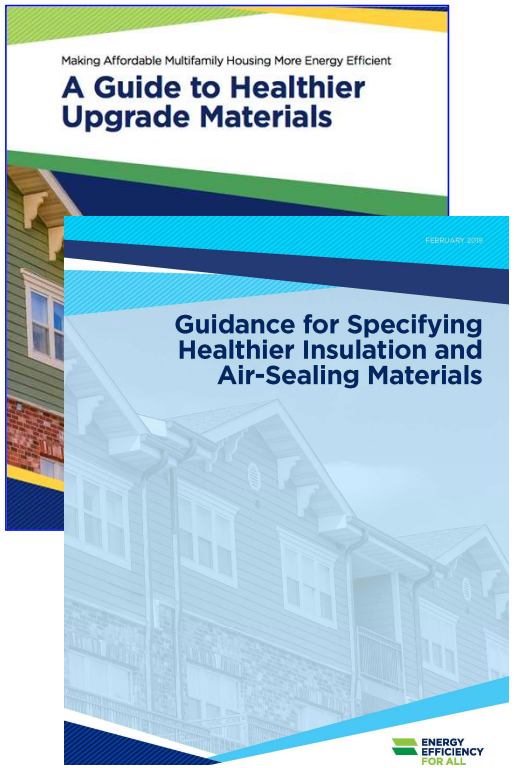
Low-Income Housing Tax Credit (LIHTC) Projects

- Improve LIHTC requirements & incentives
- Incorporate requirements for disclosure and incent the use of non-toxic materials in the green building standards used by LIHTC projects

Weatherization Assistance Program (WAP)

- Use work with WAP providers through the WAP PLUS program to incorporate health requirements into their product standards

TOOL KIT and RESOURCES



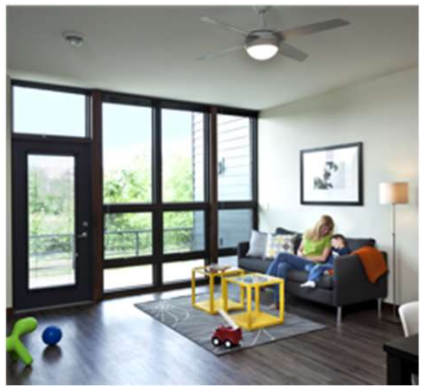
Material Spec Guidance

Policy Matters:
Making Energy Upgrades Healthier for Residents, Workers, and Neighbors

- **Brief**
- **Information Sheet**

Case Study: Energy Performance for Properties Retrofit with Less Toxic Insulation

On-the-ground Insights On Drivers, Adoptability, And Performance Of 'Greener' And 'Healthier' Energy-efficiency Retrofit Materials Used For Affordable Multifamily Housing



Images: CCH/Mithun, Liberty Bank Building; HBN; MSR, Rose

HomeFree

A national initiative supporting affordable housing leaders who are improving human health by using less toxic building materials.

homefree.healthybuilding.net

Tools and Resources

Products

Flooring
Paint
Drywall
Countertops
Cabinetry & Millwork
Insulation
Flooring Adhesives
Sealants

Baseline Specifications

California
Louisiana
Minnesota
Pacific Northwest
Washington, DC Metro

Case Study

Demonstration Projects

Education

Welcome to the HomeFree Campus!

HomeFree is a Healthy Building Network initiative supporting affordable housing leaders who are improving human health by selecting less toxic building products.

HomeFree online learning provides tools to build your knowledge and help you select healthier building products.

Our courses are dynamic, with an interactive format. The self-paced and self-directed structure allows you to choose which topics to explore. Simple, science-based information supports decision makers and their teams to choose less toxic materials across your portfolios and projects.

Who Should Take the Courses

- Affordable housing owners, developers, and operators
- Architects and designers
- Material specifiers
- Contractors
- Affordable housing funders, regulators, and intermediaries

HomeFree Resources

WEBSITES FROM HBN

Healthy Building Network

HomeFree

HomeFree Campus

INSULATION REPORT AND SPEC GUIDANCE

Making Affordable Multifamily Housing More Energy Efficient: A Guide to Healthier Upgrade Materials

Guidance for Specifying Healthier Insulation and Air-Sealing Materials

A Healthy Housing "Accelerator"

- We are considering launching a HH Accelerator over the next year.
- We would like a small planning group to help design the Accelerator.

Why a Healthy Housing Accelerator?

- Strong evidence that indoor home environment is a significant factor in resident health
- IAQ especially important when tightening buildings due to energy upgrade
- 36% of renters, 24% report some healthy housing concerns
- Air quality issues most prevalent: dust, mold and moisture, lack of sufficient ventilation
- Other concerns include water quality, pests, concerns about phyisal structure.
- Good progress in new construction but continuing barriers to paying for and adopting healthy housing measures in existing structures

Approach

- Convene 25 stakeholders to foster collaboration among state and local agencies, housing or home performance providers, hospitals, managed care providers, and other interested stakeholders.
- Host 1 to 2 one-day convenings of interested stakeholders
- Healthy Housing Accelerator workshop at next year's summit
- Hold up to 10 open calls and/or webinars between convenings

Potential Outcomes

- Expand Medicaid financing for healthy housing assessments, and community benefits funding for healthy housing improvements.
- Improve coordination of lead hazard, affordable housing, weatherization and other resources to deliver comprehensive energy plus health building upgrades.
- Expand adoption of combined health housing and energy audit/assessment tools
- Expand partnerships of managed care providers, hospitals, and housing owners/operators to implement comprehensive energy plus healthy housing interventions.

If Interested…

- If interested, let us know!
- Sign up for the Accelerator Planning Team.
- Contact: **Michael.freedberg@hud.gov** or **Leslie.Zarker@icf.com**

Thank You

Provide feedback on this session
in the Summit App!

Download the app to your mobile device or go to
event.crowdcompass.com/bbsummit19