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Efficiency for New York's Various Housing Stock

May 19, 2010

Introduction to housing stock basics and the common and specific problems and solutions to weatherizing each type.



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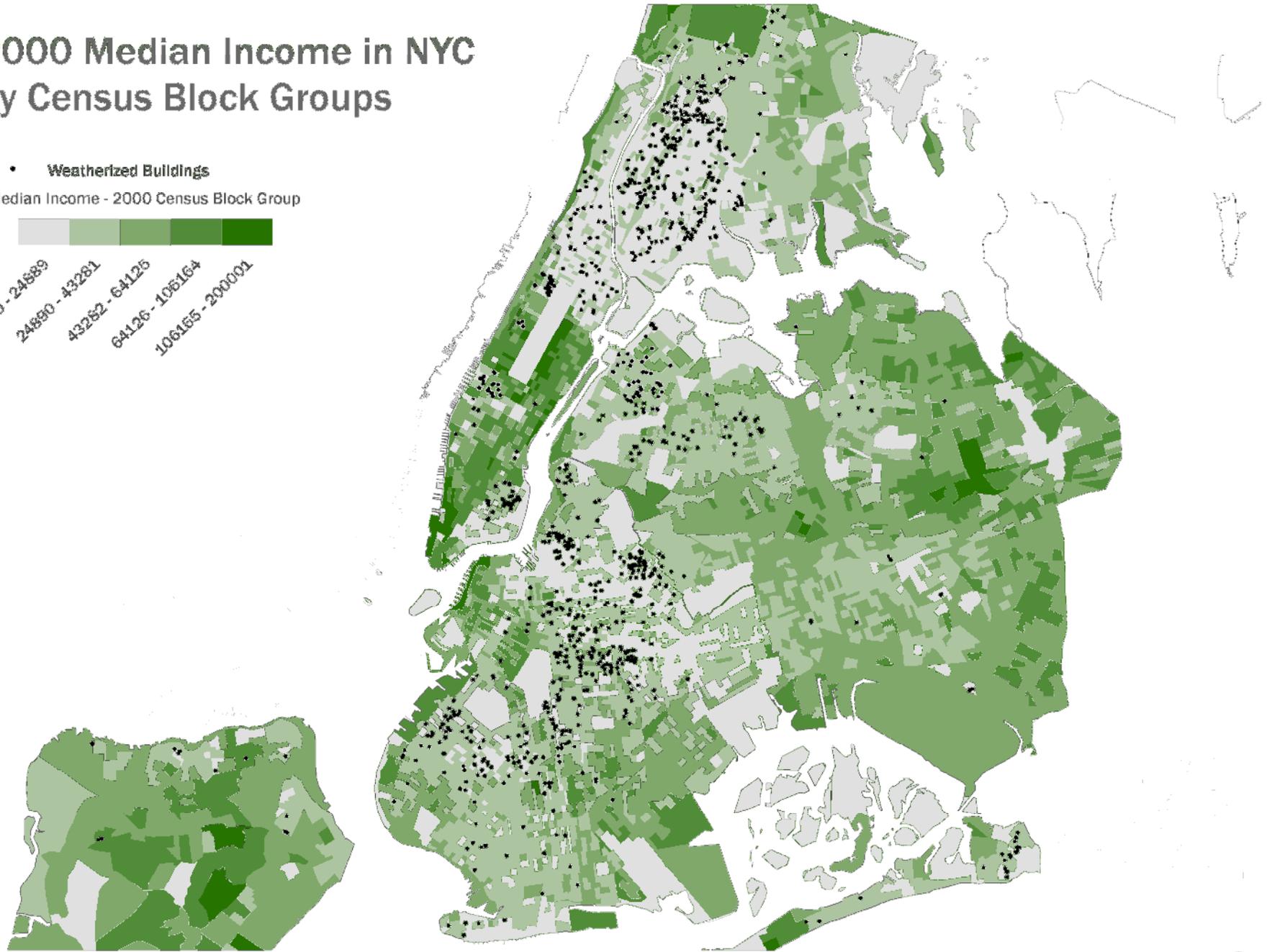
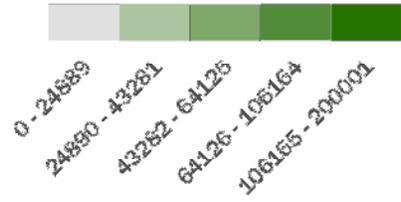
Outline:

- Who you are
- Who we are, What we do, and Why
- Building Science 101
- Housing Stock Overview
- Housing Stock Commonalities
 - Problems & Solutions
- Housing Stock By Type
 - Problems & Solutions; Opportunities & Restrictions
- Goals
- Q& A

2000 Median Income in NYC by Census Block Groups

• Weatherized Buildings

Median Income - 2000 Census Block Group





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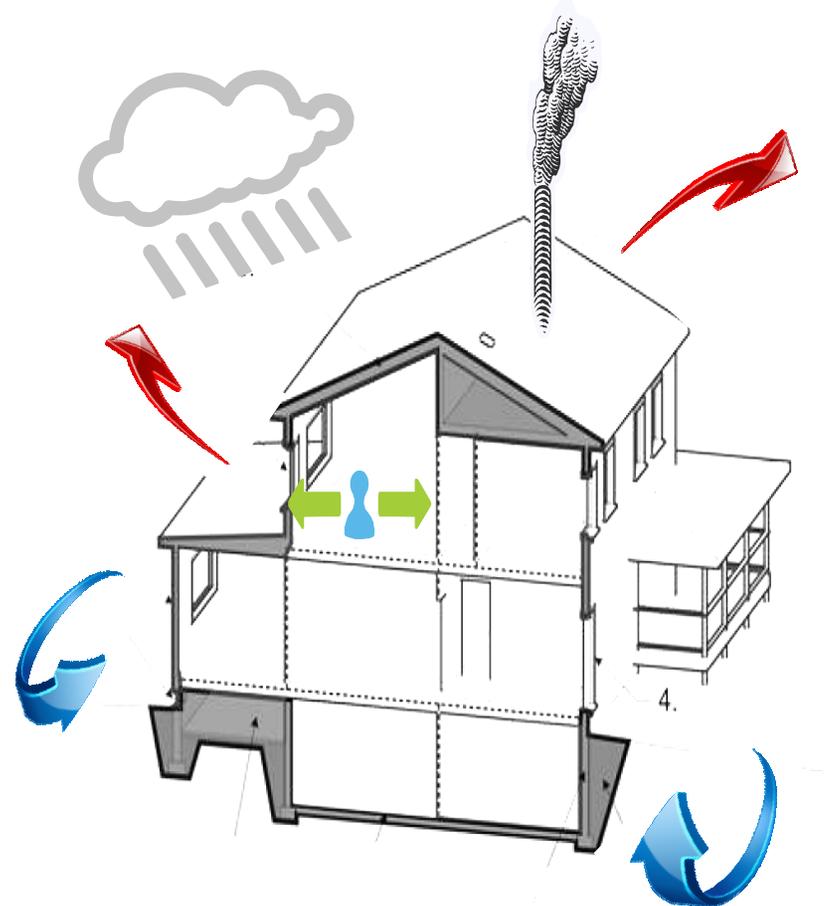
Building Science 101

- Building as a system
- Laws of Thermodynamics
- Heat Transfer
- Moisture Flow
- Air Flow

Building as a system



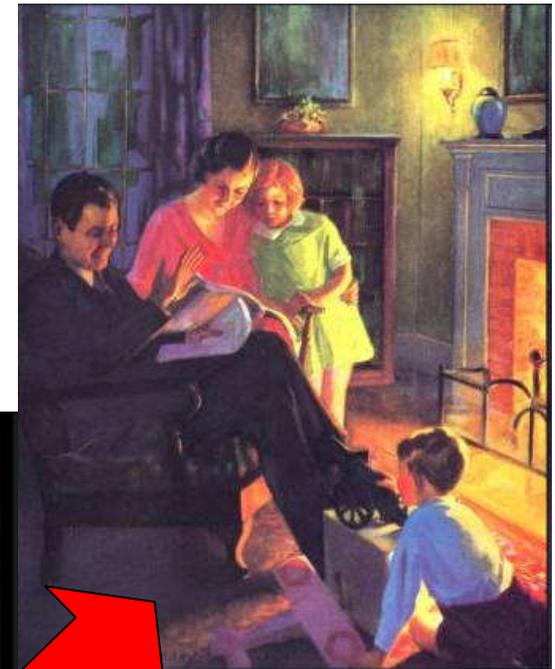
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Laws of Thermodynamics

- First Law: Energy is neither created nor destroyed





Laws of Thermodynamics

- Second Law: Energy moves from higher to lower concentrations.
 - Heat: Temperature
 - Moisture: Wetness
 - Pollutants: Density
 - Air: Pressure

Laws of Thermodynamics



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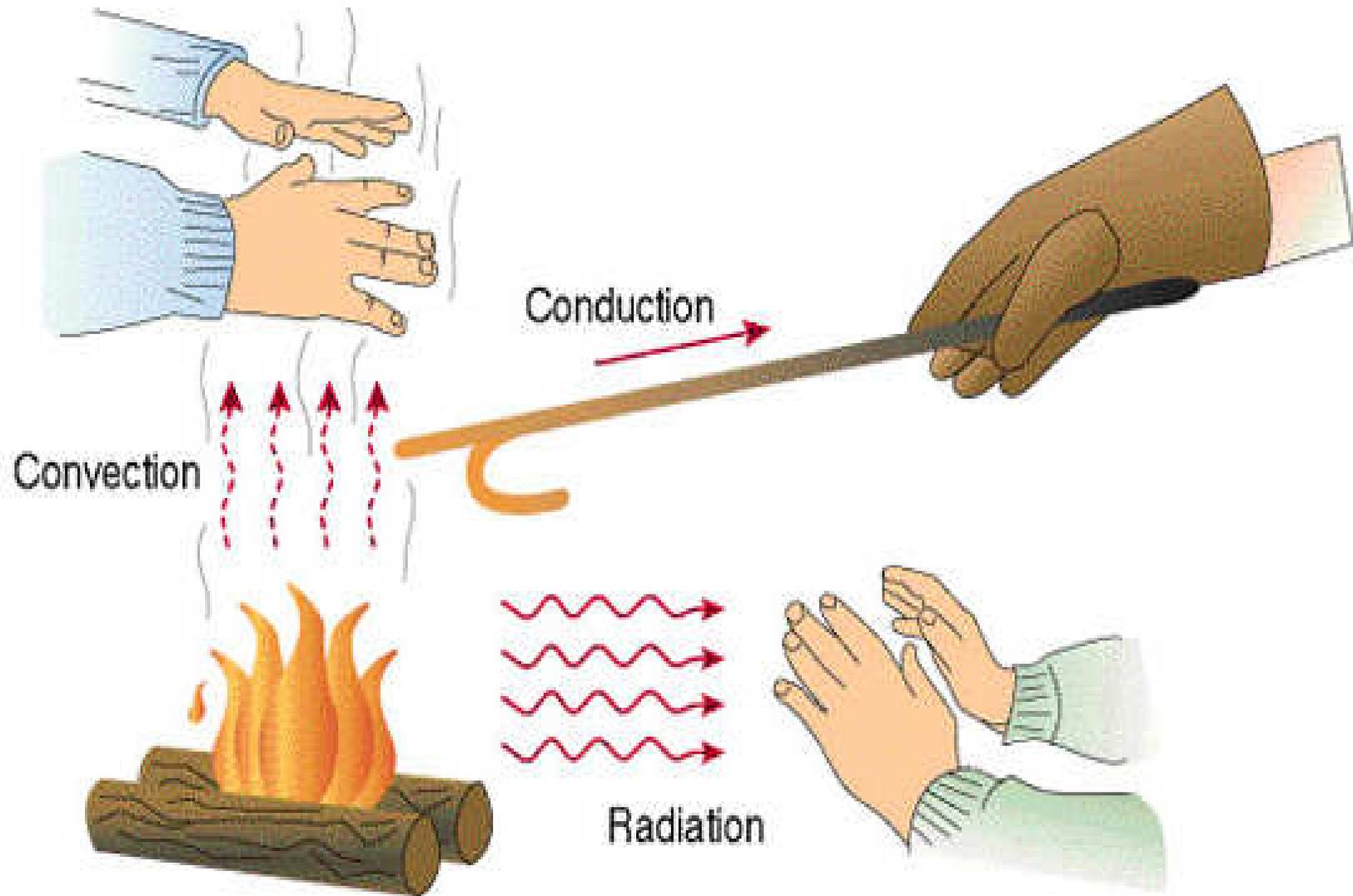
Hot Air....

rises





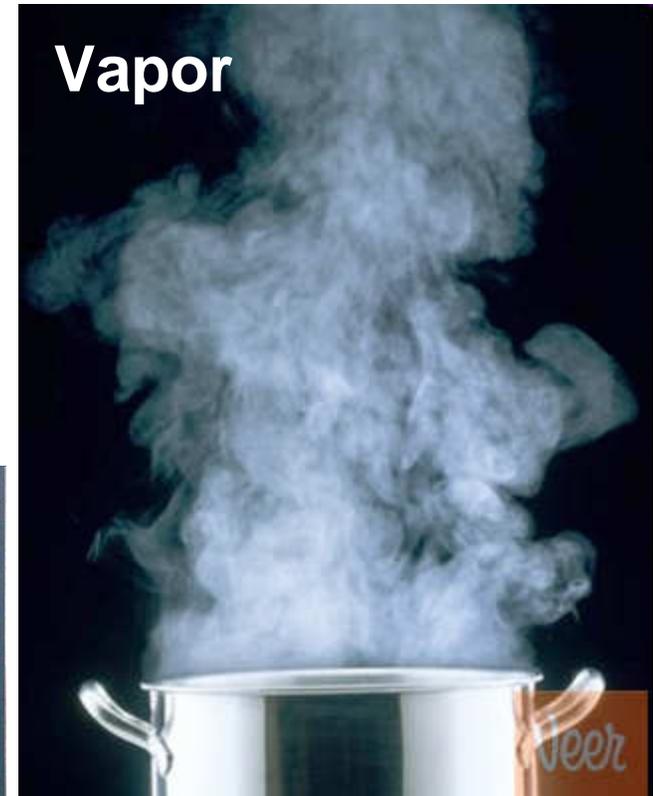
Heat Transfer





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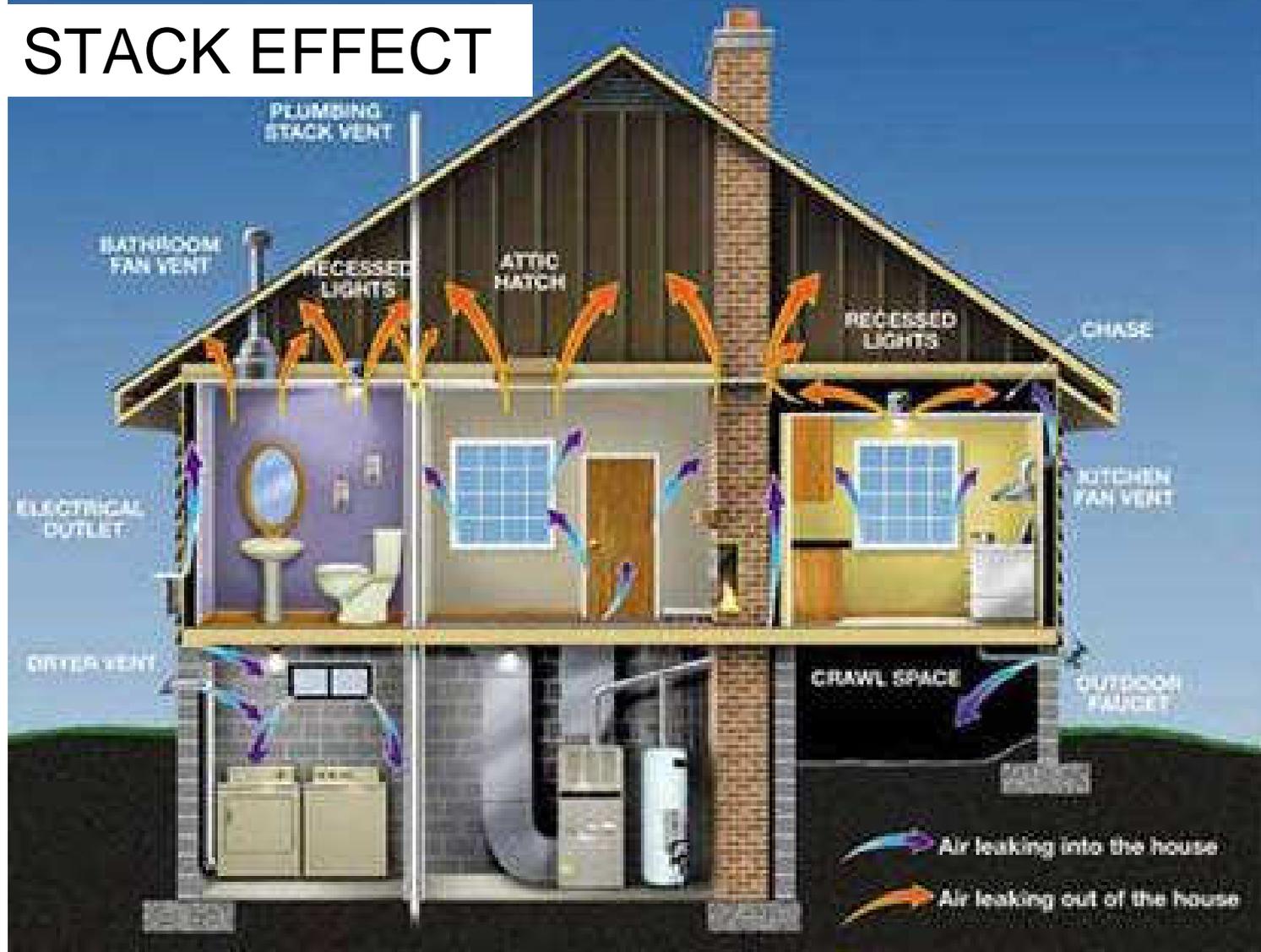
Moisture Flow





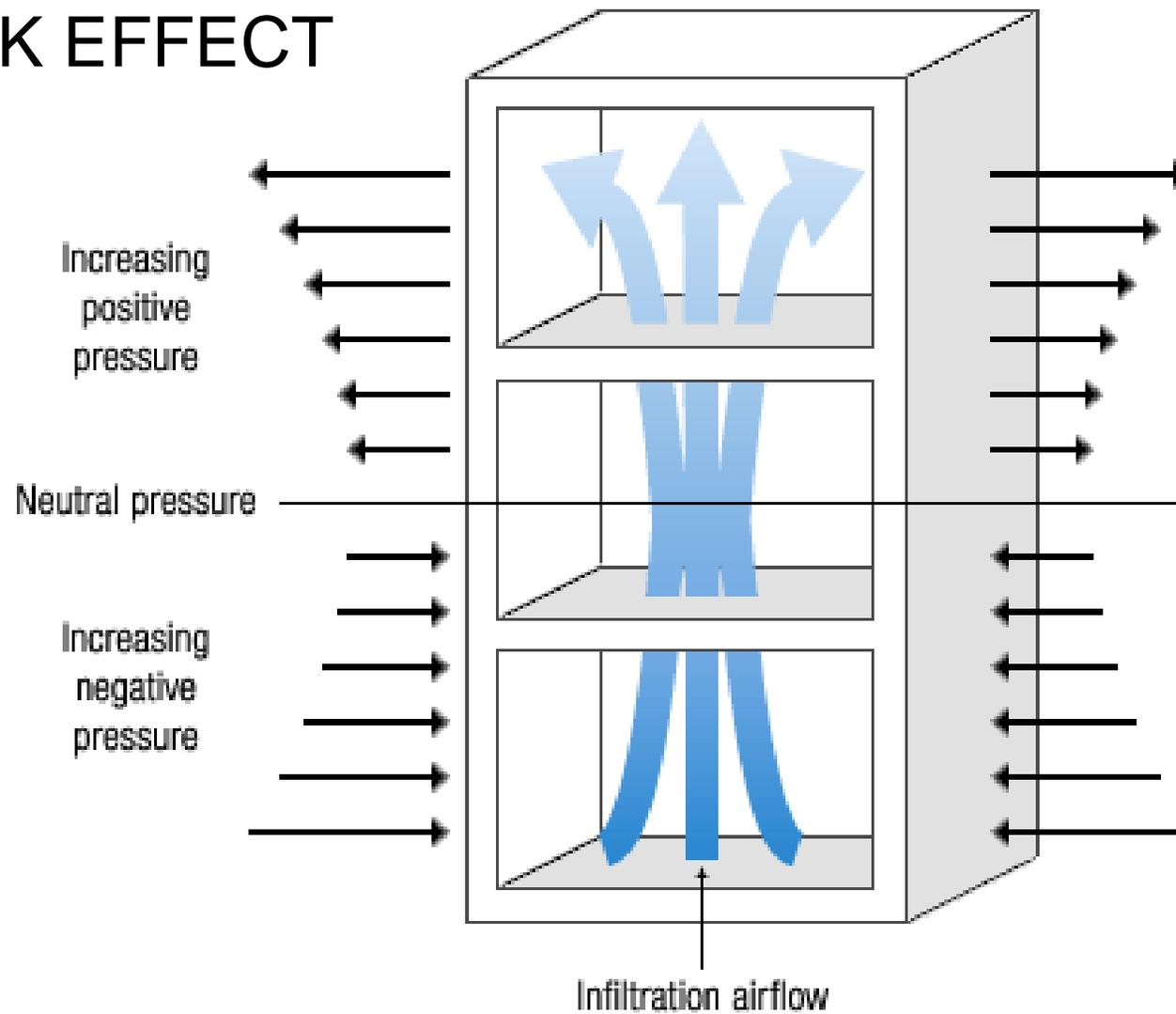
Air Flow

STACK EFFECT





STACK EFFECT





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Housing Stock Overview

- Type and Size
 - 3 Basic types
- Composition
 - Envelope and Mechanical Systems
- Location and Climate



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Type and Size

Multifamily Buildings





Type and Size

- Small Homes
 - Row Houses
 - Stand Alones
 - Garden Style





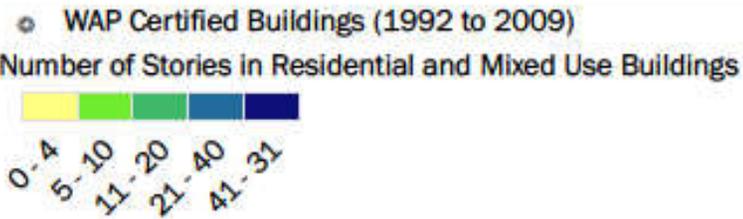
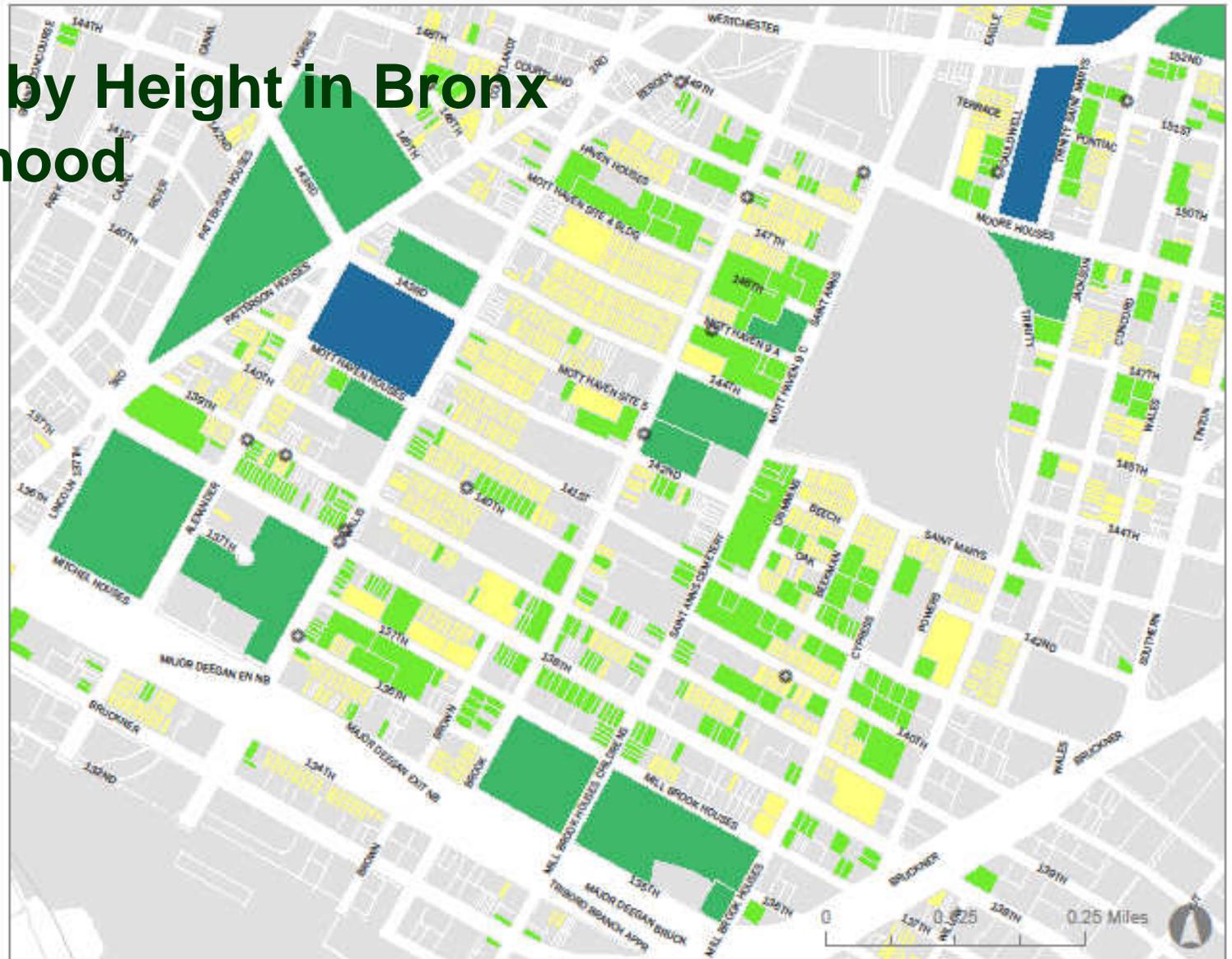
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Type and Size

- Mobile Homes

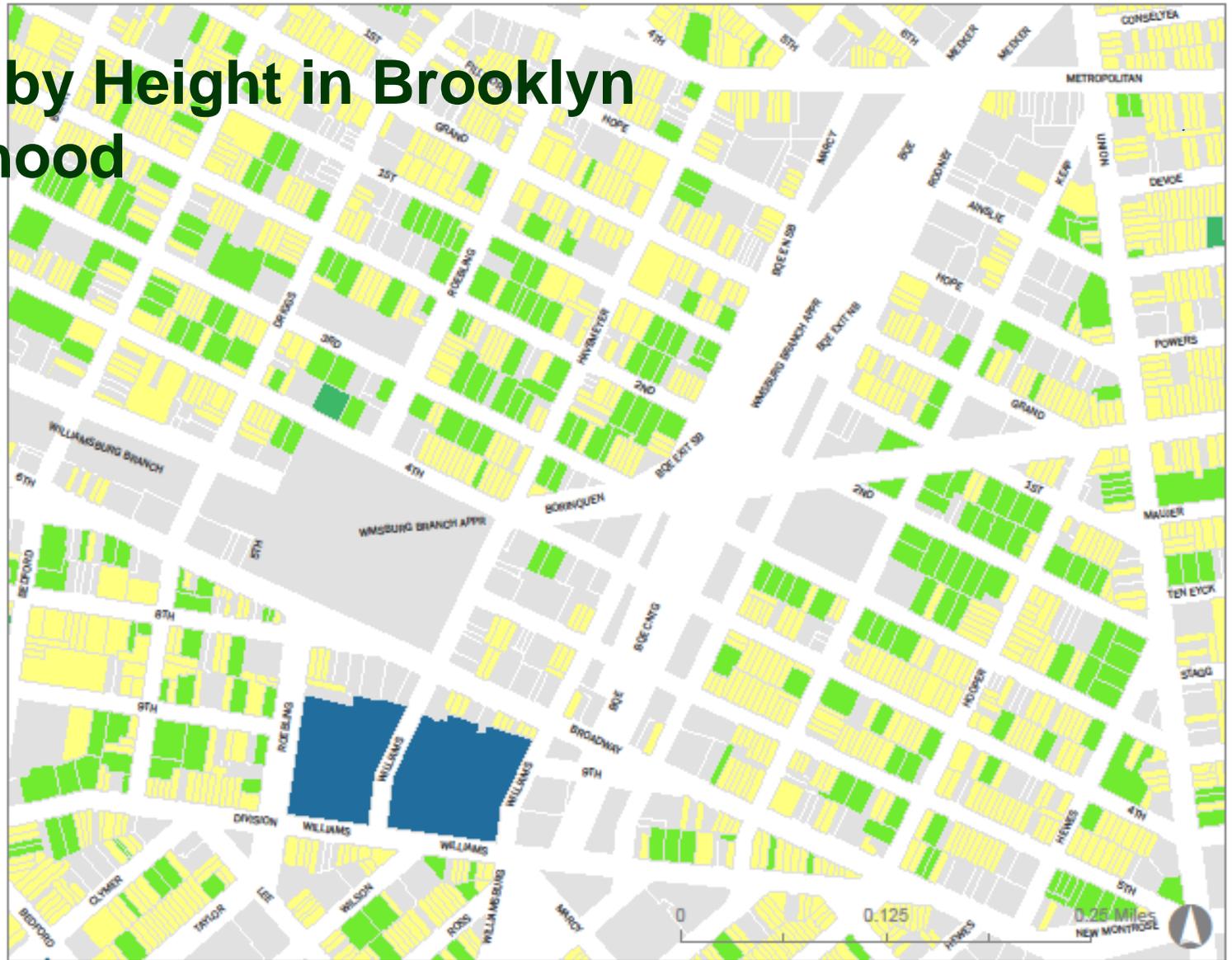


Buildings by Height in Bronx Neighborhood

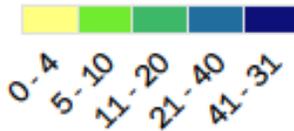


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 Data Source : 2009 PLUTO NYC DCP

Buildings by Height in Brooklyn Neighborhood

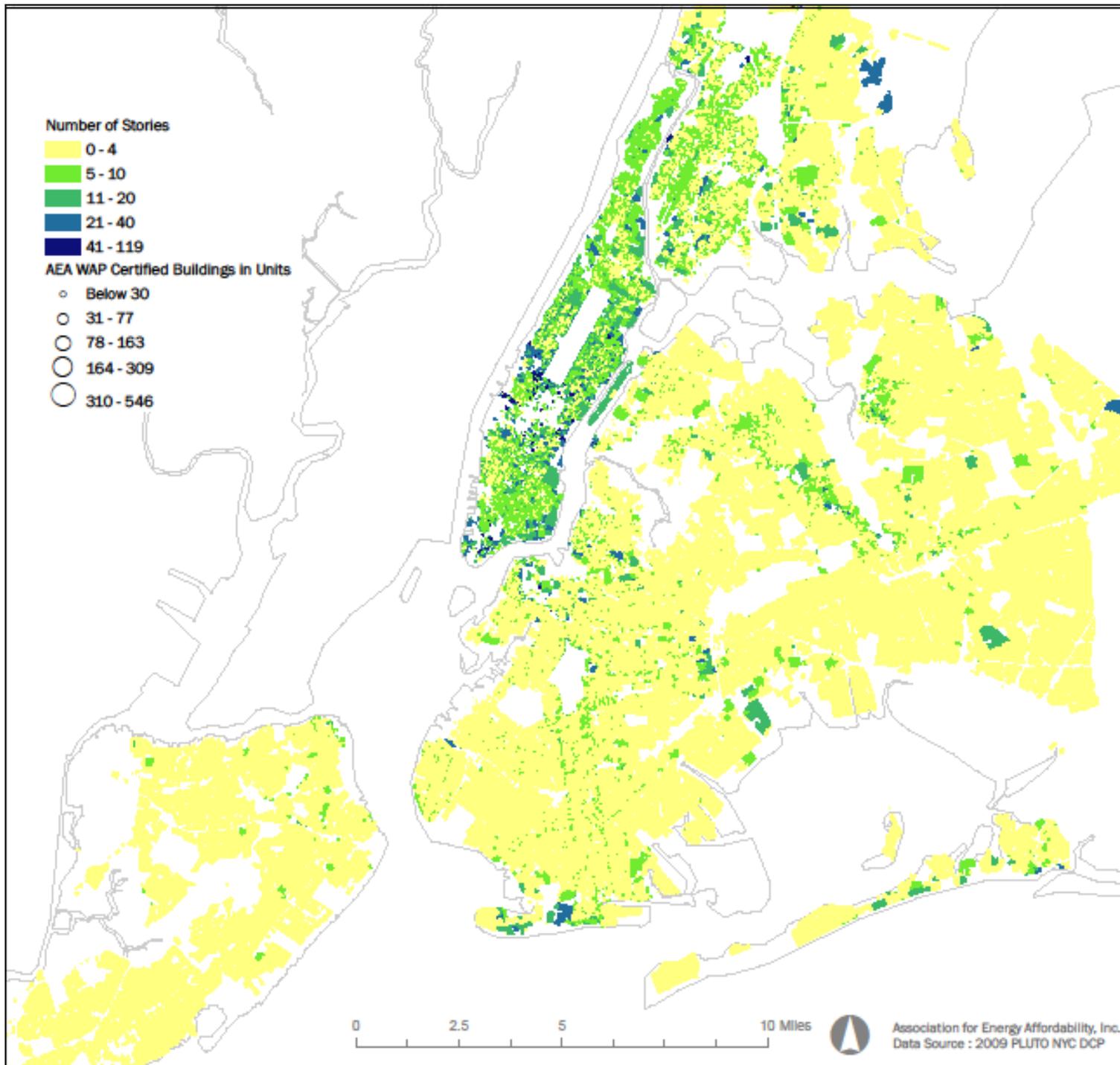


* WAP Certified Buildings (1992 to 2009)
 Number of Stories in Residential and Mixed Use Buildings





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Housing Stock Overview

- Type and Size
 - 3 Basic types
- **Composition**
 - Envelope and Mechanical Systems
- Location and Climate



Basic Composition

STRUCTURE

- Walls
- Apertures
 - Windows
 - Doors
- Roof
 - Pitched
 - Flat
- Basement

MECHANICAL SYSTEMS

- Heating
- Domestic Hot Water
- Ventilation
- Cooling



Basic Composition

STRUCTURE

- Walls
- Apertures
 - Windows
 - Doors
- Roof
 - Pitched
 - Flat
- Basement

MECHANICAL SYSTEMS

- Heating
- Domestic Hot Water
- Ventilation
- Cooling



Mechanical Systems:

- Heating
 - Burners
 - Boilers/Furnaces
 - Distribution
 - Controls
- Domestic Hot Water (DHW)
 - Direct
 - Indirect
 - Distribution
- Ventilation
 - Build Tight, Vent Right
 - Fans
 - Circulation
- Cooling
 - Production
 - Distribution



Mechanical Systems - Heating

- Fuel Types**

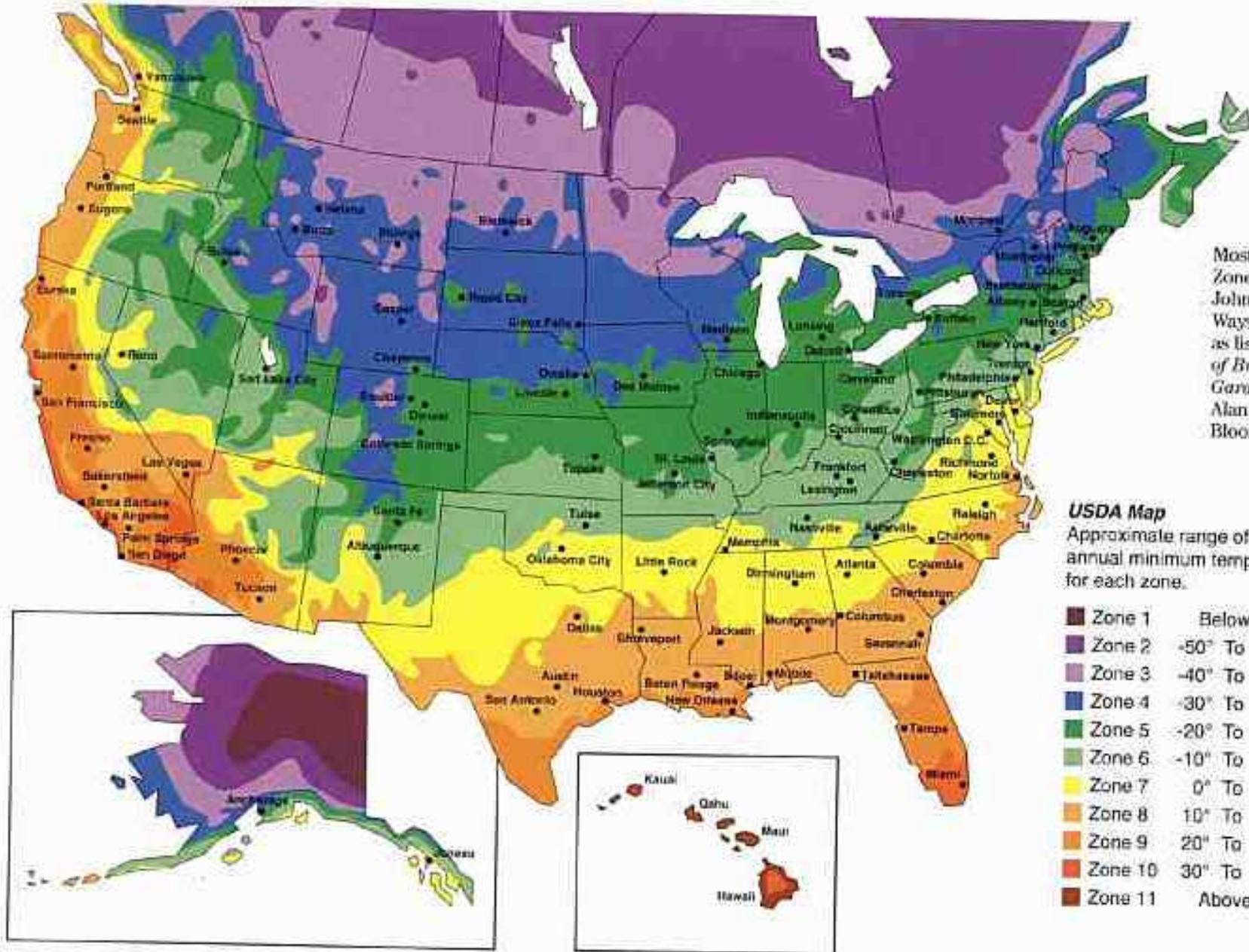
BTU Content of Fuels		
Fuel Type	Fuel Units	Approximate Energy Content
#2 Fuel Oil	Gallon	140,000 Btu/gallon
#4 Fuel Oil		145,000 Btu/gallon
#6 Fuel Oil		150,000 Btu/gallon
Natural Gas	Therm	1000 Btu/cf •1 ccf = 100 cf •1 therm = 1 ccf •100,000 Btu/therm
Electricity	kWh	3,413 Btu/kWh
Propane	Gallon	92,000 Btu



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Housing Stock Overview

- Type and Size
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Most Hardiness Zone ratings are by John Elsley of Wayside Gardens, as listed in *Blooms of Bressingham Garden Plants* by Alan and Adrian Bloom.

USDA Map
Approximate range of average annual minimum temperatures for each zone.

- Zone 1 Below -50°
- Zone 2 -50° To -40°
- Zone 3 -40° To -30°
- Zone 4 -30° To -20°
- Zone 5 -20° To -10°
- Zone 6 -10° To 0°
- Zone 7 0° To 10°
- Zone 8 10° To 20°
- Zone 9 20° To 30°
- Zone 10 30° To 40°
- Zone 11 Above 40°



Common Problems & Common Solutions

STRUCTURE

- Walls
- Apertures
 - Windows
 - Doors
- Roof
 - Pitched
 - Flat
- Basement

MECHANICAL SYSTEMS

- Heating
- Domestic Hot Water
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- Cooling



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Common Problems & Common Solutions

STRUCTURE

Air Seal & Insulate

MECHANICAL SYSTEMS

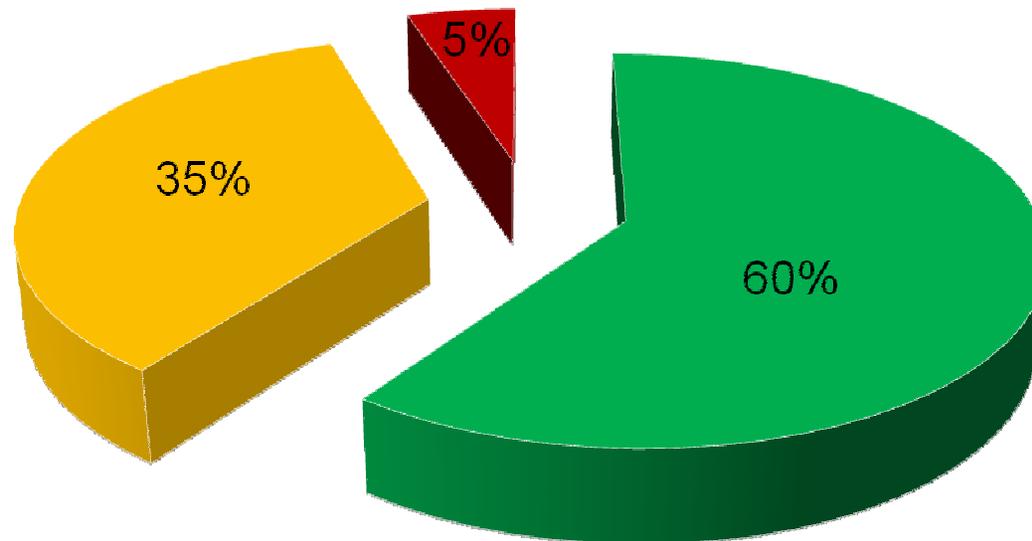
Repair and Replace



Where Buildings Waste Energy

Where Most Buildings Waste Energy

■ Enclosure ■ Mechanicals ■ Lifestyle



The energy waste in a building can be grouped into two major Categories: **The Building Enclosure** and **The Mechanical Systems**



Common Problems & Common Solutions

STRUCTURE

- Walls
- Apertures
 - Windows
 - Doors
- Roof
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 - Flat
- Basement

MECHANICAL SYSTEMS

- Heating
- Domestic Hot Water
- Ventilation
- Cooling

Common Problems & Common Solutions



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- Insulation & Air Barriers

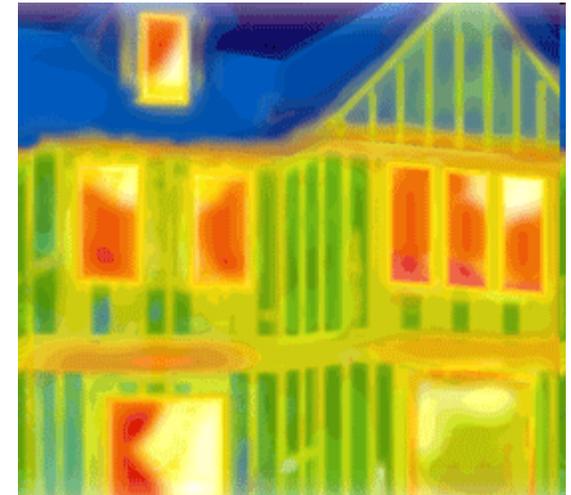
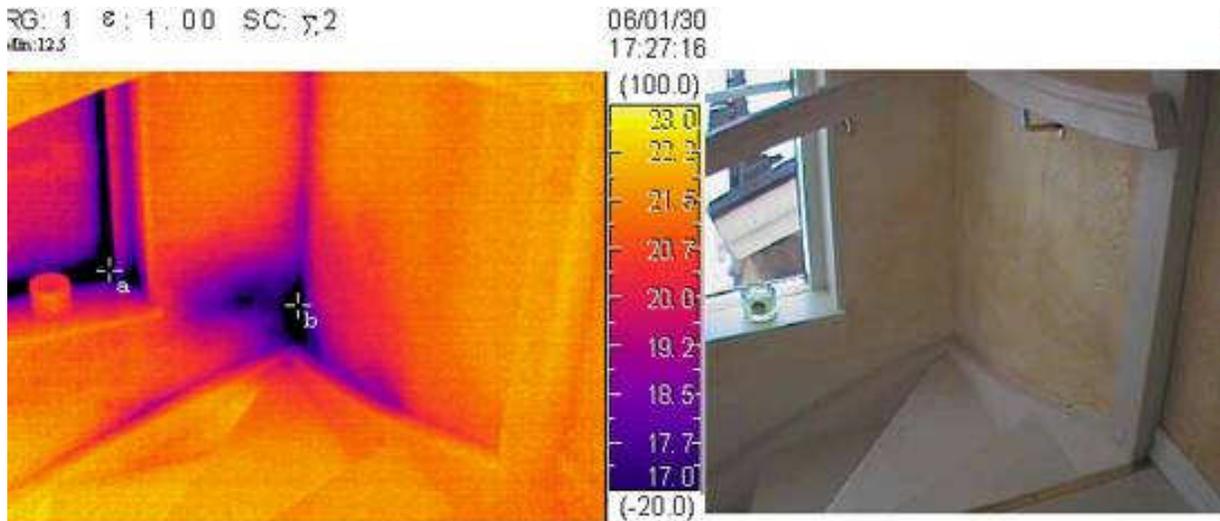


Structure: Common Problems & Solutions



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- Insulation and Air Barriers -- Discontinuous



- SOLUTION – Seal the Boundary

Structure: Common Problems & Solutions



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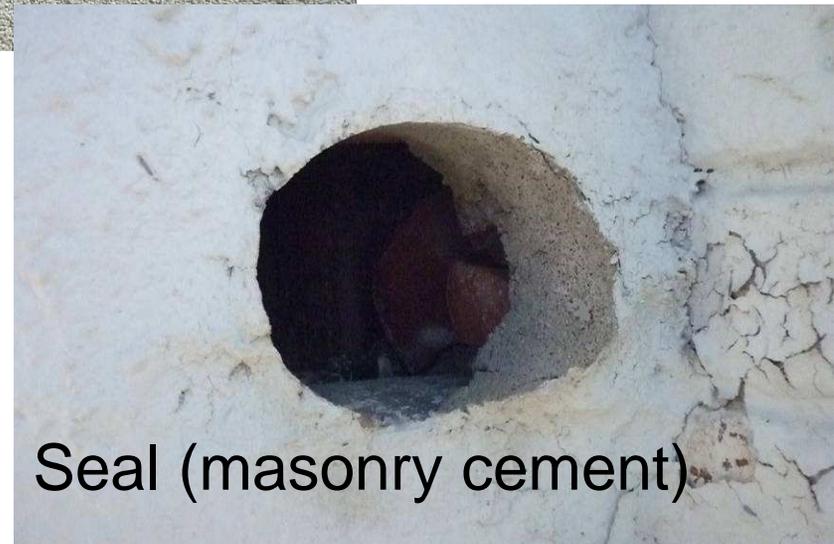
- Walls
 - infiltration



Seal
(tuckpoint)



Seal (drywall)



Seal (masonry cement)



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Structure: Common Problems & Solutions

- Walls
 - Conduction



SOLUTION – Insulate!

Structure: Common Problems & Solutions

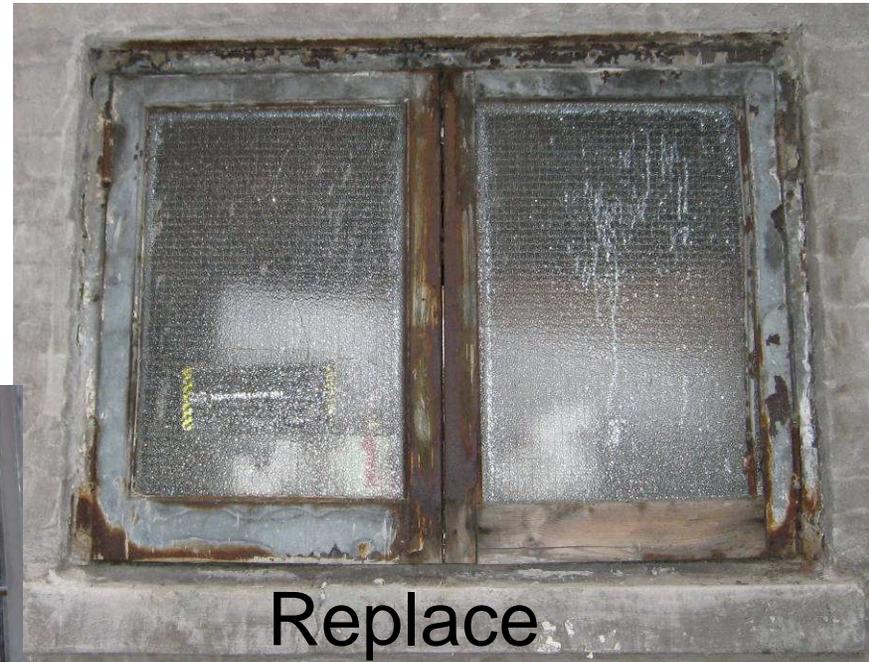


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- Apertures
 - Infiltration
 - Conduction



Rebalance



Replace

SOLUTION - Seal!

...replace

Structure: Common Problems & Solutions



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- Roof
 - Infiltration



SOLUTION – Seal!

Structure: Common Problems & Solutions



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Roof

- conduction



SOLUTION - Insulate



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Structure: Common Problems & Solutions

Basement
– infiltration



SOLUTION – Seal



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Structure: Common Problems & Solutions

- Basement
 - conduction



SOLUTION – Insulate



Common Problems & Common Solutions

STRUCTURE

- Insulation & Air Barriers
- Walls
- Apertures
 - Windows
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- Roof
 - Pitched
 - Flat
- Basement

MECHANICAL SYSTEMS

- Heating
- Domestic Hot Water
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Mechanical Systems: Common Problems & Solutions



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Heating

– Production

SOLUTIONS:

Repair or
Replace





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Mechanical Systems: Common Problems & Solutions



Solution

- Repair

Solution

- Insulate

Solution

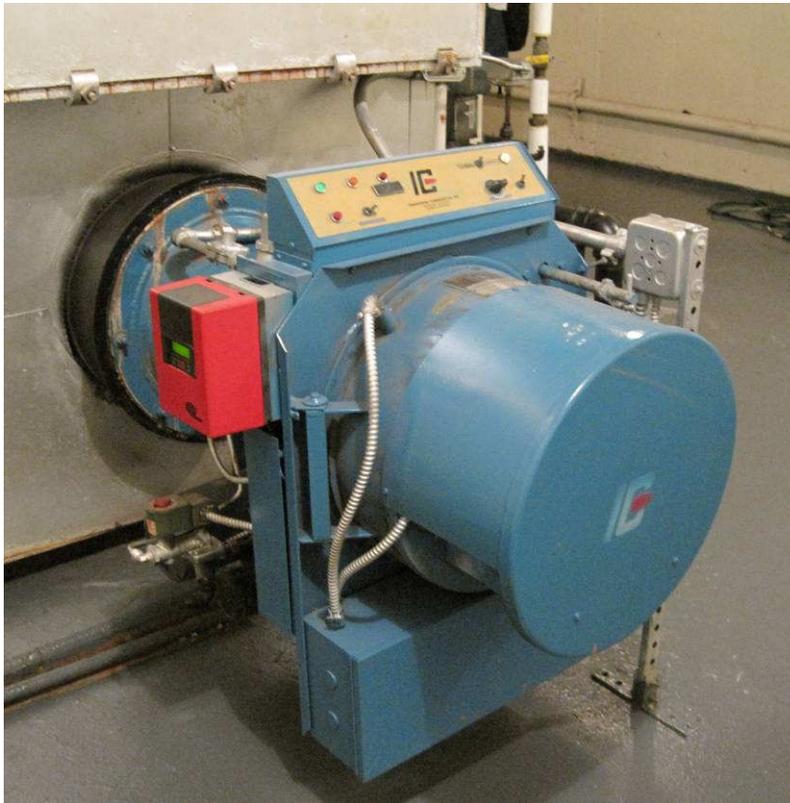
- Replace





Mechanical Systems: Common Problems & Solutions

- Heating
 - Controls



Solution – Calibrate or Replace

Mechanical Systems: Common Problems & Solutions



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- DHW - distribution



- Solution- Insulate



Tune



Replace

Mechanical Systems: Common Problems & Solutions



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- Ventilation
 - Fans



Solutions- Repair or Replace



Specific Problems & Solutions

- Scale: Infiltration - Stack
- Structure
- Operation





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Specific Problems & Solutions

- Structure: **Accessibility**





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Specific Problems & Solutions

- Operation: **Uniqueness**
- Operation: **Occupancy**



Specific Problems & Solutions In Conclusion

Basic Toolkit - is available for all buildings

- Envelope - Insulate and seal
- Mechanical - Repair or Replace



We use the individual tools in different frequencies based on the unique restrictions and opportunities provided by the building type.



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Housing Stock In Conclusion



Q & A



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Q & A?



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Thank You, Have a Great Day