Weatherization and Energy Efficiency for Existing Buildings

Christopher W. Closs
Western & Southern ME Preservation Advisor
for
Maine Preservation
& Greater Portland Landmarks - in partnership with the National Trust for Historic Preservation

Rochelle Bohm
Northern and Eastern ME Preservation Advisor
for
Maine Preservation -
in partnership with the National Trust for Historic Preservation

Energy Efficiency

What is the goal?

Efficient energy use

How do you achieve it?

Weatherization

Weatherization as a step toward gaining Energy Efficiency

"Weatherization is the practice of protecting a building and its interior from the elements, while modifying it to reduce energy consumption and optimize efficiency."

National Trust for Historic Preservation

http://www.preservationnation.org/issues/weatherization/whats-at-stake.html

Key Concepts

- Understand your building
- Apply Appropriate Technology
- Maintenance-Free - is a myth
- The Importance of Reversibility

Understand the Building

The key to any successful weatherization project is to understand the building.

What is the current condition of the building?

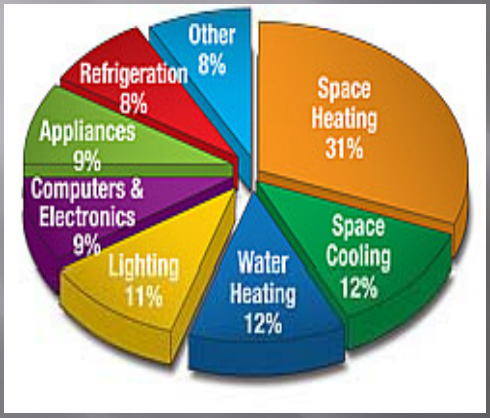
How was the building built? Why was it built that way?

What changes have been made? Have they altered the energy efficiency?

Assessments

- Conditions Assessment
- Historic Structure Report
- Energy Audit

Where Energy is Expended?

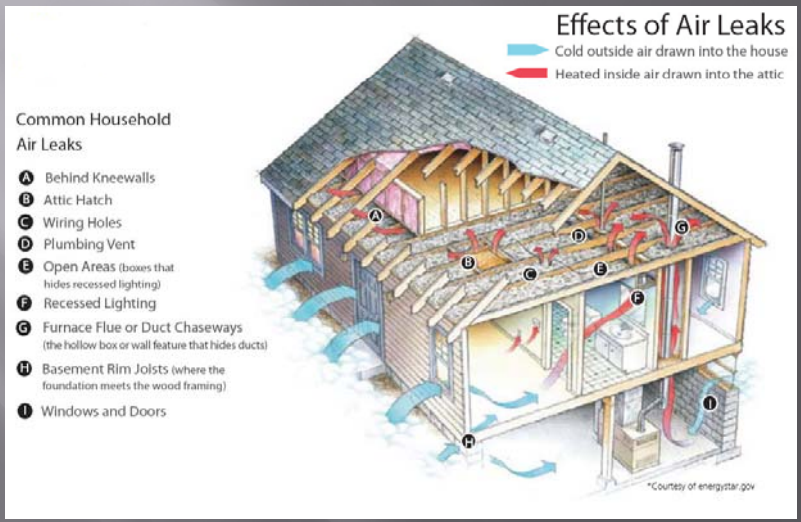


How we use energy in our homes

Heating accounts for the biggest chunk of a typical utility bill (43%)

(*Source:* **Energy Savers, Energy Efficiencyand Renewable Energy, U. S. Department of Energy)**

Causes of Energy Loss



Weatherization: Designing an Achievable Plan

Tailor the Plan specifically for:

- Climate
- Technology of the Building
- Site Considerations
- Occupancy Patterns

Considerations

- **Identification of:**
- **Moisture Generation**
  - Point Sources
  - Quantity
  - Moisture Management Approaches
- **Historic Character of the Property**
  - Preserving Integrity = Maintaining $$ Value

Passive and Active Measures

Two Approaches:

- User Behavior Modification
- Planned Intervention or Retro-Fitting

I. Modifying Occupancy Patterns

Heating/Cooling:

- Program the thermostat to modify temperatures based on occupancy patterns.
- Install fans to increase comfort instead of lowering the thermostat during warm months.
- Lower the thermostat during cold months and raise it during hot months.
- “Manage” natural cooling opportunities

I. Modifying Occupancy Patterns

Lighting (11%):

- Install timers or motion detectors to ensure lights are off when rooms are not in use.
- Replace incandescent bulbs with compact fluorescent bulbs.

Appliances (26%) Turn off or remove 'vampire' devices such as phone chargers and DVD players that use electricity in standby mode or whenever they are plugged into an outlet.

II. Intervention or Retro-fitting

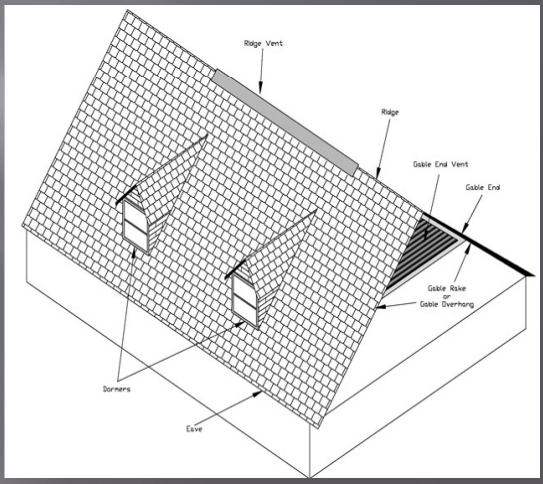
- Eliminate air infiltration
- Select efficient heating, cooling, and electrical systems with programmable controls
- Select efficient appliances (Energy Star rating)
- Install insulation in the attic, basement or crawlspace and around pipes and ducts
- Repair and upgrade windows and doors.
- Add shading elements (awnings and trees)

Roofs / Attics

Ventilation

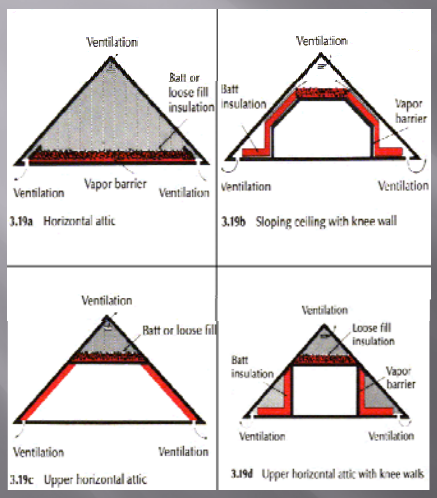
- The 1/300ths Rule
- The Cold Roof Principle

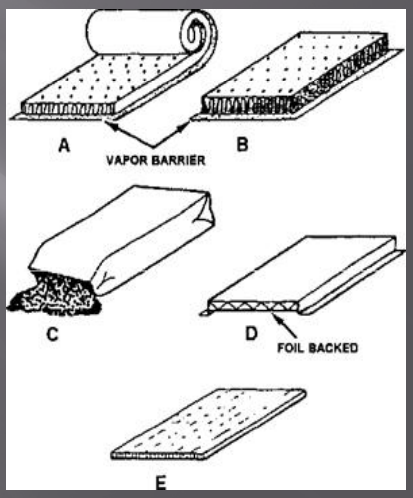
- Gables
- Eaves
- Ridges



Ventilate Roofs/Attics Properly to Avoid Ice Dams & Excessive Moisture Concentrations

Insulating Attics: Options





Insulating Products / Methods

Insulating Products / Methods

- Cellulose
- Fiberglass
- Mineral Wool

- Bagged
- Blown-In

Recommended:
Increase to R-60 Value for Attics

Walls

What materials were used to construct the walls?

masonry, timber and wood frame, composite of masonry and wood, concrete

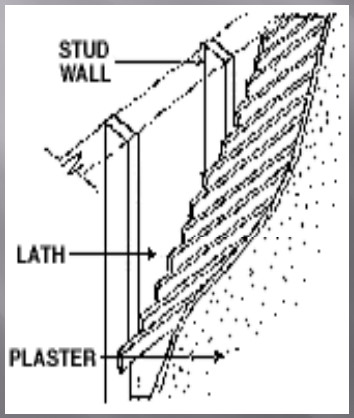
How are the walls designed? How do they react or respond?

- rate of heat loss and gain
-moisture retention and transmission
-expansion and contraction

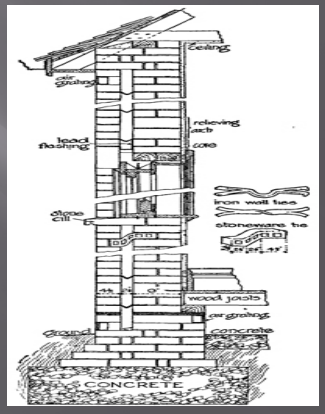
Exterior Walls

Typical Wall Sections

LATH & PLASTER ON STUDS



MASONRY CAVITY WALL



Weatherizing Walls

Remember older buildings were built to perform differently.

Consider how the building was designed to accommodate heating and cooling depending on the season.

Consider what the original heat source would have been.

Determine how the building was meant to breath and ventilate .

Weatherizing Walls

Do not forget the obvious sources of inefficiency.

Penetrations in exterior walls

appliance vents, utility and technology lines

Penetrations in interior walls

light switches, outlets, phone and cable jacks

Insulating Exterior Walls: Not Recommended

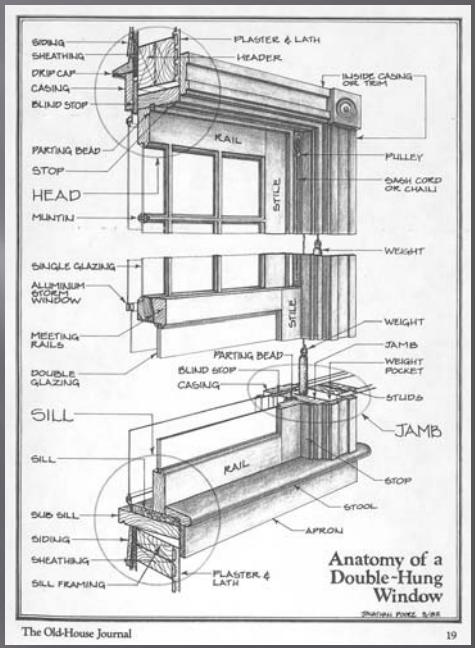
Windows

Performance:

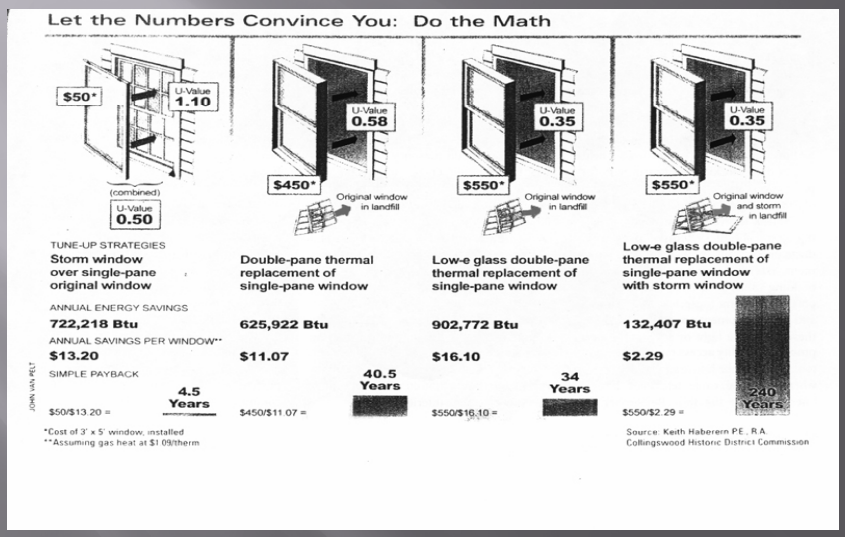
- Single-glazed 0.89 R- Value

Storm Window
+ Primary Sash= R 1.79
Versus
½″ Insulated Glass in Replacement = R 1.72

Source: US Dept of Interior, NPS Preservation Brief #3, 1978



Why Retain/Repair Historic Sash?



Window Treatment: Exterior

WOODEN STORMS

CUSTOM, NARROW PROFILE ALUMINUM STORMS

Window Treatment: Exterior

AWNINGS

- Reduce Solar Gain

Add Color and Interest in Main Street shopfront applications

Window Treatments: Interior

BLOCKING SOLAR GAIN

- Use operable window shades or shutters to reduce heat gain during the summer.

RETAINING HEAT IN WINTER

- Use drapes and curtains to reduce drafts around windows in the winter.

INSTALL INTERIOR STORMS

Doors

Doors by their very design are meant to let things in and out so it seems improbable to look here for energy savings, but there are some strategies that may help increase efficiency.

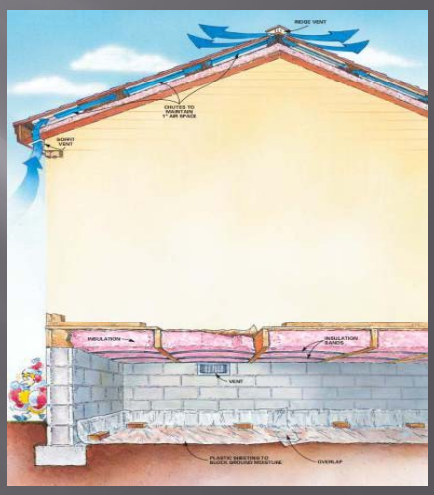
-Install a storm door
-Weather strip around the door
-Install door sweeps on the bottom of the door
-Place draft blockers or draft dodgers at the base of the door

Doors & Storm Doors

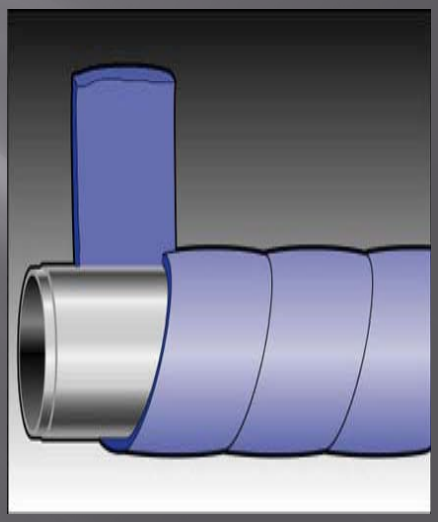
Insulating Foundations

Best Practices:

- Install vapor barrier at floor; or paint
- Apply inside of sill around perimeter
- Extend insulation from bottom of floor joists to 3'0 below grade
- Optional: 1st Floor



Insulating Basement Spaces



Site: Weatherization Elements

With existing buildings you cannot change the orientation of the building, but you can consider natural strategies for increasing energy efficiency.

- Plant Shade Trees
  - Deciduous
  - Evergreen
- Plant Vines
- Conserving Roofwater Runoff on-site
- Limiting Lawn area requiring mowing

Resources

- National Trust for Historic Preservation
  - www.preservationnation.org
  - http://www.preservationnation.org/issues/weatherization/
- National Park Service
  - http://www.nps.gov/history/hps/tps/weather/index.html
  - http://www.oldhouseweb.com/how-to-advice/the-national-park-services-preservation-briefs.shtml
- *Energy Efficiency, Renewable Energy and Historic Preservation: A Guide for Historic District Commissions*
  - *http://www.cleanair-coolplanet.org/for_communities/index.php*
- *Main Street – NTHP*
  - *http://www.preservationnation.org/main-street/main-street-news/2009/04/greening-MS-buildings.html*

Funding Sources

- Federal
  - U. S. Department of Energy
    - http://www1.eere.energy.gov/wip/weatherization_innovation.html
      - Weatherization Innovation Pilot Program
      - Energy Efficiency and Conservation Block Grant Program
      - Weatherization Assistance Program
- Local
  - Efficiency Maine Trust
    - http://efficiencymainetrust.org/
  - Build Green Maine
    - http://www.buildgreenmaine.org/About-Us/

Maine Field Service Program

- Western and Southern Maine and Greater Portland Area Preservation Advisor
  - Christopher W. Closs
  - 500 Congress St, 2nd Floor, Portland, ME 04101
  - Cell (207)809-9103
  - Office (207)775-3652
  - Fax (207)775-7737
- Eastern and Northern Maine Preservation Advisor
  - Rochelle Bohm
  - 644 Hammond Street, Bangor, ME 04401
  - Cell (207)809-9102