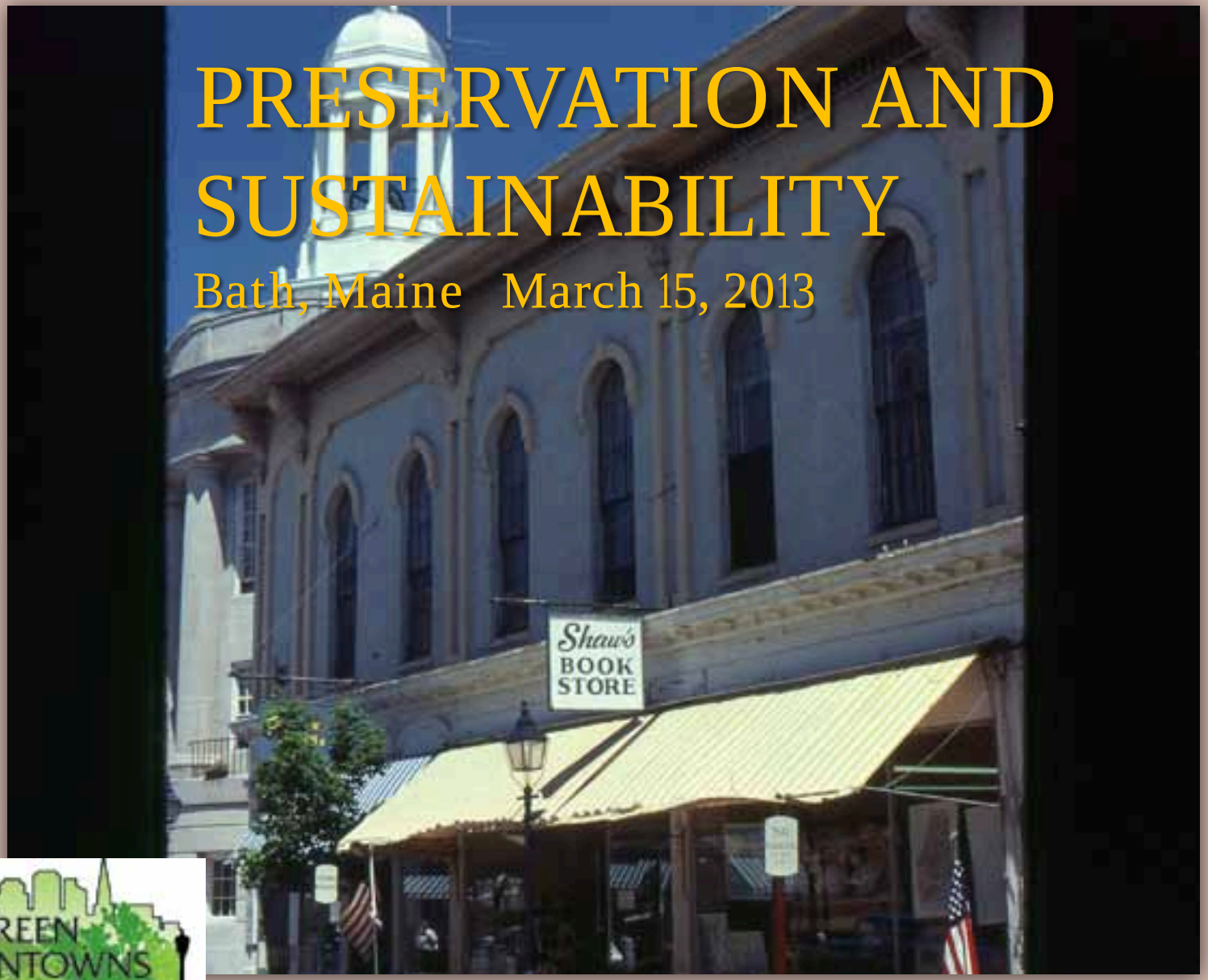
PRESERVATION AND SUSTAINABILITY

Bath, Maine March 15, 2013



GREEN DOWNTOWNS

A Program of the Maine Downtown Center

mdf.org

Green Design, Good Design

Malcolm Leigh Collins AIA, LEED AP

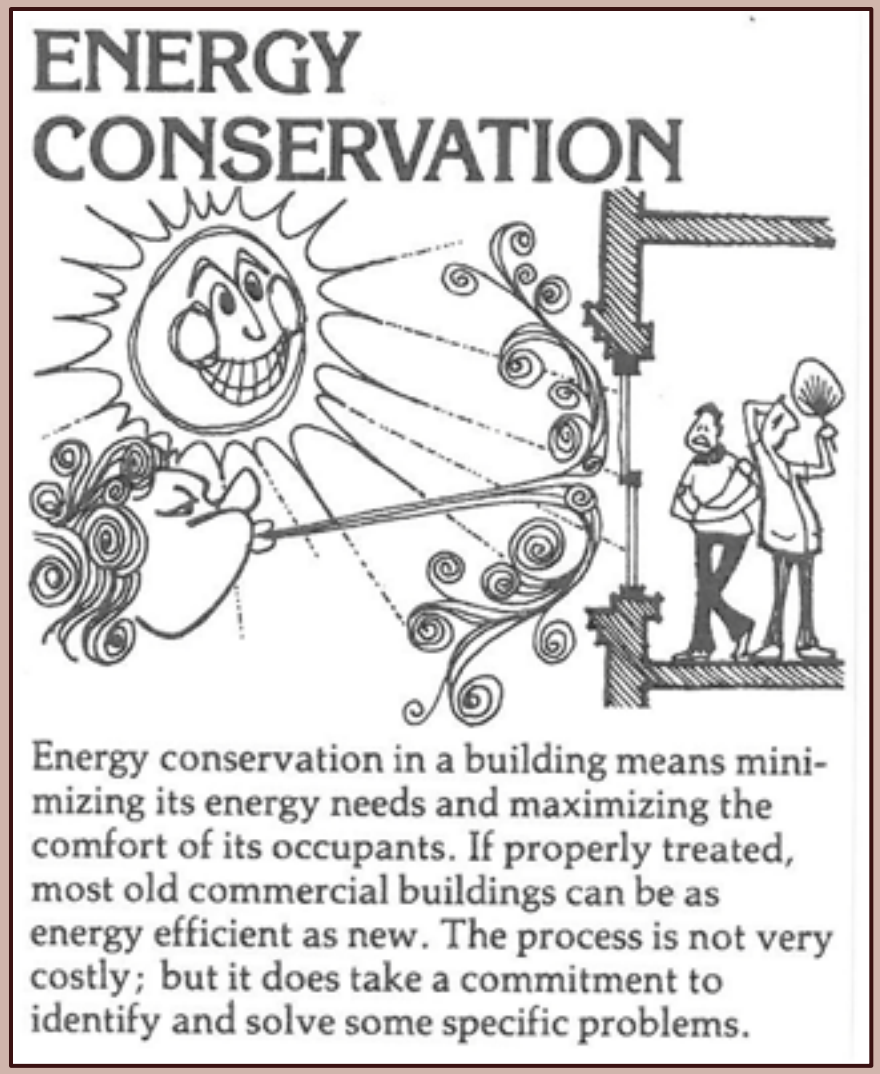
THE NATIONAL TRUST, MAIN STREET, AND ENERGY CONSERVATION

The NTHP Main Street commitment to energy conservation in historic building began with the origination of the program in the late 1970's.
The Building Improvement File was created as part of design point for some of the first Main Street communities.

- basic characteristics of traditional commercial buildings that save energy
- typical energy problems associated with these buildings
- window treatments, insulation, HVAC system modernization
- energy efficiency shortcomings/attributes of traditional Main Street bldgs.

These were the "hot" energy efficiency topics in 1978.
Now updating thinking with Green Design, Good Design, through MDC.

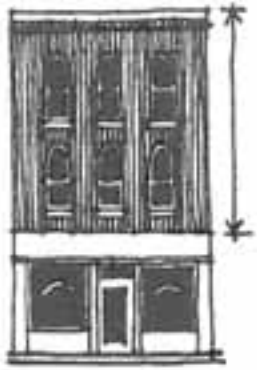
MAIN STREET BUILDING IMPROVEMENT FILE



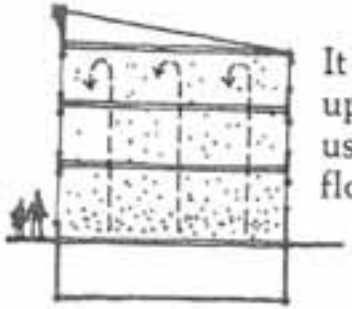
INHERENT CHARACTERISTICS OF HISTORIC COMMERCIAL BUILDINGS

1. The traditional commercial building has some basic characteristics which help save energy.

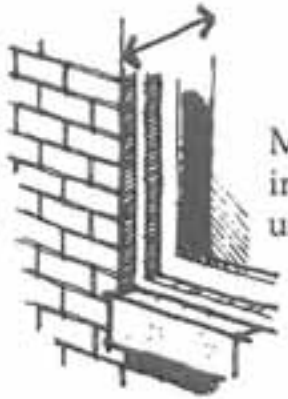
Relatively little of the building is exposed. Sides are usually covered (and insulated) by adjacent buildings.



Above the storefront, windows tend to be small and widely spaced. Compare this to the typical new building facade.



It has several floors. The upper stories trap and use heat rising from the floors below.

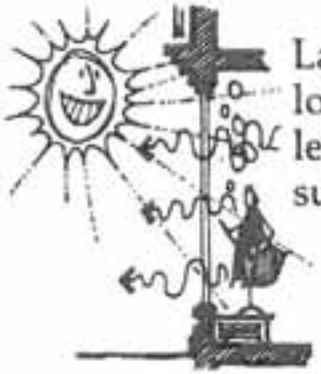


Masonry construction is good insulation. Also the walls are usually rather thick.

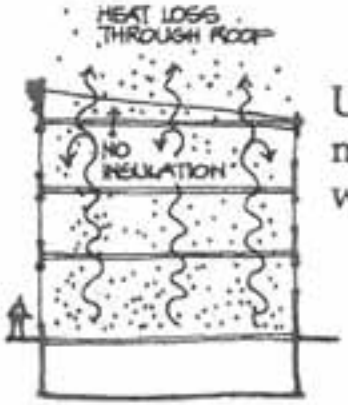
TYPICAL ENERGY PROBLEMS OF HISTORIC COMMERCIAL BUILDINGS

2. However, old commercial buildings have some typical energy problems too.

Old windows and doors haven't been maintained. Consequently they leak air and moisture.



Large storefront windows lose heat in the winter and let in the hot sun during the summer.



Uninsulated flat roof loses much usable heat in the winter.

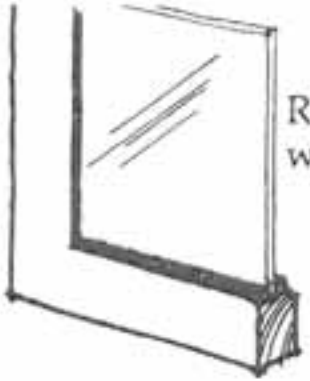
Old heating systems are often inefficient and outdated.

WINDOWS

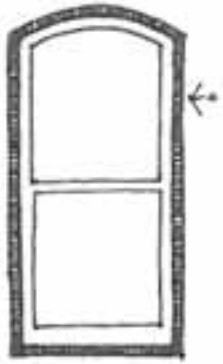
3. WINDOW TREATMENTS—Windows and doors should be sealed as tightly as possible. When closed they should not leak air or moisture.

Repair all windows and doors so that all their pieces fit tightly.

Carefully weatherstrip around all window and door openings.

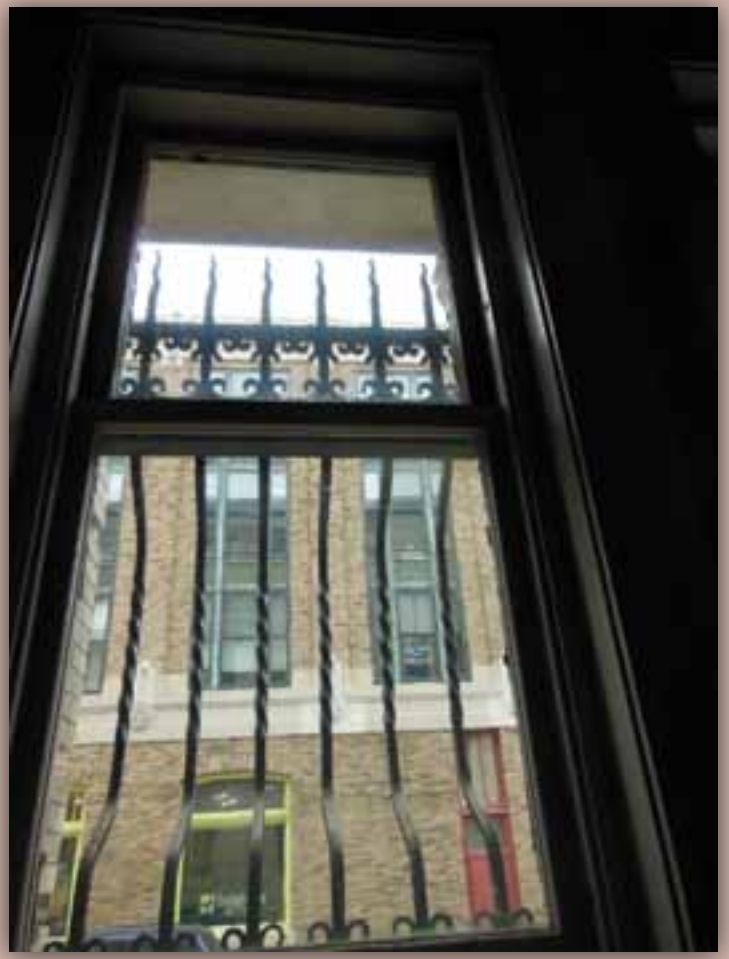


Reglaze all loose or broken window panes.



Caulk the cracks between window and door parts (non-moving parts); also those between the window or door and its masonry openings.

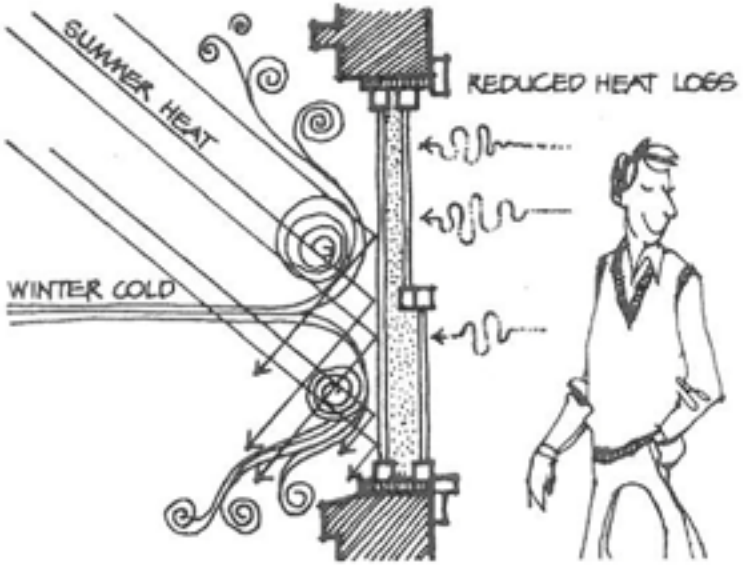
WINDOWS



WINDOW REPLACEMENT

STORM WINDOWS

4. STORM WINDOWS—Storm windows can greatly reduce winter heat loss through wall openings. While rather impractical for the storefront (the constant opening and closing of the door negates their value), the use of storm windows on the upper facade and the rear and side walls should be considered.



INSULATION

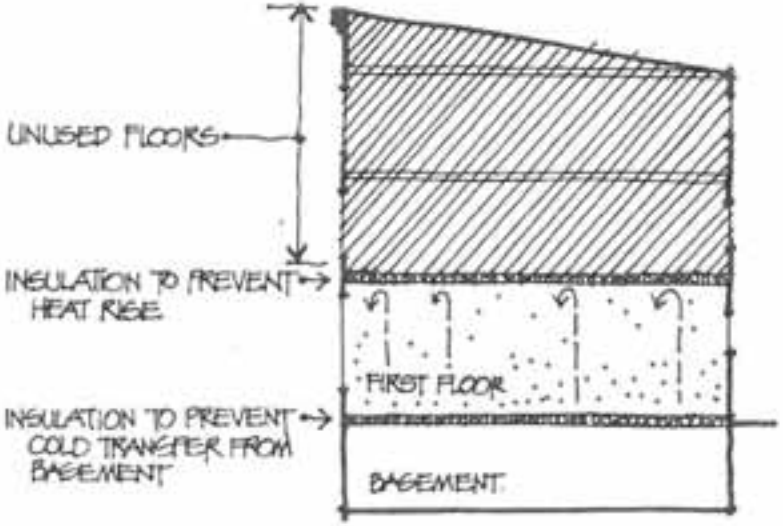
5. INSULATION—Carefully applied insulation can greatly improve a building's energy efficiency. While many kinds are available, two are most appropriate for downtown buildings.

Fiberglass consists of spun fibers attached to a paper backing. It is laid by hand and can be stapled to wood studs or joists.

The second kind is cellulose, shredded paper treated with a fire retardant. It is installed using a mechanical blower. This is ideal for relatively inaccessible parts of of the building.

As a general rule, the thicker the insulation blanket is, the better. Proper placement of insulation is very important. The roof is a critical location since much of the winter heat loss takes place there.

If the upper floors are not in use, consider temporary insulation of the second floor to trap heat below it. Insulation of the first floor will protect the store from the cold basement space.



ROOF

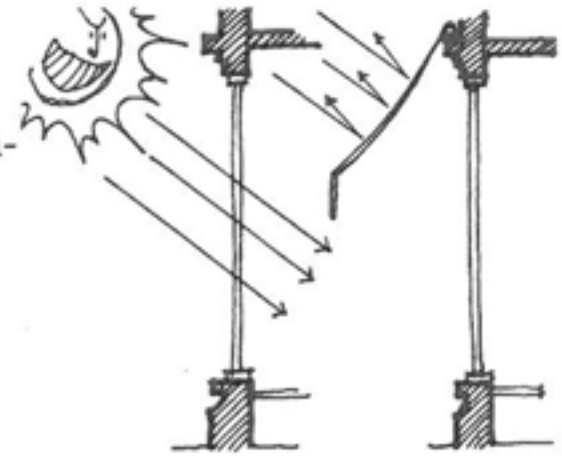
- Insulate roof and/or attic to the highest degree possible.
- If the roof structure can support it (or can be modified to support it), install a green roof to increase roof insulation, retain storm water (thereby minimizing runoff), and contribute to cooler temperatures in the downtown.

Photo courtesy Amy Cole-Ives, Sutherland Conservation & Consulting

STOREFRONTS

6. THE STOREFRONT—With all its glass, the storefront presents special energy problems. It loses heat in the winter and, if exposed to the summer sun, it gains heat.

Where the sun is a factor, an operable awning provides a partial solution. (See guidelines sheet—AWNINGS.) Extended in the summer, it shades the storefront. Retracted in the winter, it can allow the warming sun into the store.



Insulated or tinted glass can also reduce the inefficiencies of your storefront window. Some of the value of insulated glass will be lost by the opening door, but nighttime protection can be substantial. With tinted glass, remember that the darker the window, the more your storefront will lose in transparency—and visibility from the street.

Location of heating vents near the storefront windows can minimize the discomfort of winter heat loss as well.

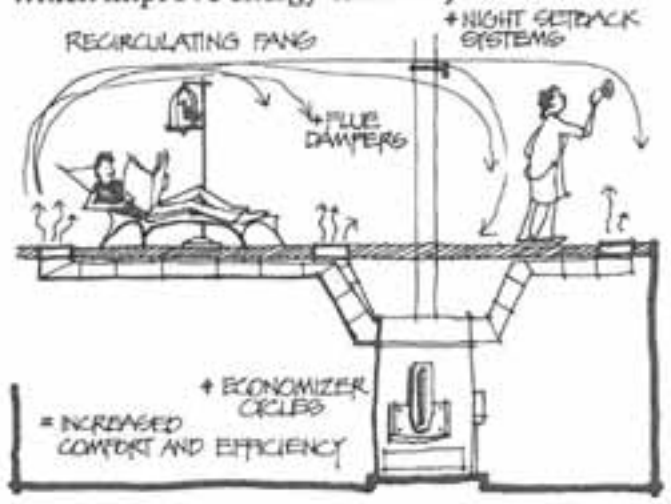
Because of these special problems, do remember that good weather stripping and caulking of storefront windows and doors is very important.

HEATING/VENTILATING/AIR CONDITIONING SYSTEMS

7. THE HEATING SYSTEM—If your present heating system is old or inefficient, it is probably wasting energy. Have it checked and consider replacing it if possible.

Since a wide variety of systems and heating units are available, look carefully at the benefits and disadvantages of each one.

Are there options for the system which will help you save money in the long run? Economizer cycles, night setback systems, flue dampers, and recirculating fans are all devices which improve energy efficiency.



HEATING/VENTILATING/AIR CONDITIONING SYSTEMS

- Carefully evaluate existing HVAC systems to see if they can be upgraded rather than replaced.

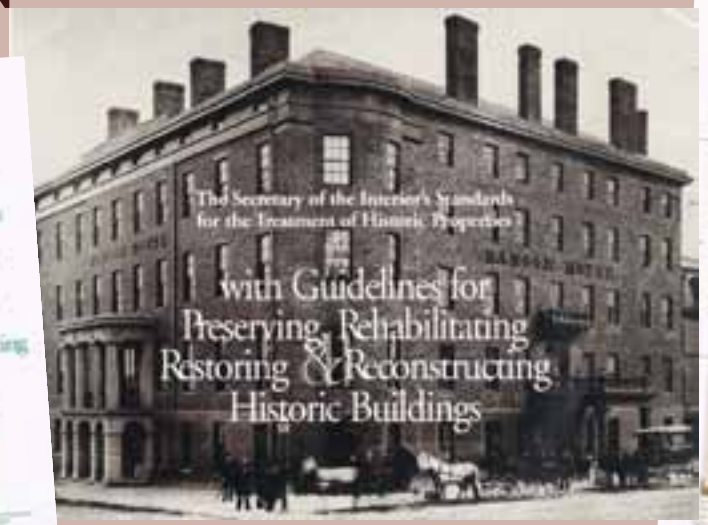
HEATING/VENTILATING/AIR CONDITIONING SYSTEMS

- If obsolete, replace existing heating and cooling systems with new systems to take advantage of recent significant improvements in energy efficiency, occupant comfort, space requirements, and air quality.
- Take advantage of changing energy/ fuel sources and costs.

ELECTRICAL SYSTEMS

- Evaluate existing electrical systems; upgrades almost always required to meet modern codes.
- Take advantage of many advances in electrical technology and power sources.

NATIONAL PARK SERVICE TECHNICAL PRESERVATION SERVICES & ENERGY CONSERVATION



These and other NPS documents were published to guide those taking advantage of state and federal programs such as:

- The National Register of Historic Places
- The Section 106 project review process
- Federal and state historic preservation tax credits

SECRETARY'S GUIDELINES: INHERENT TRAITS OF HISTORIC COMMERCIAL BUILDINGS

Capitalize on inherent features of historic commercial buildings:

- high ceilings
- quantity and size of windows
- load-bearing masonry walls
- shared (party) walls
- heat transfer between occupied floors

SECRETARY'S GUIDELINES: WINDOWS

- Maintain windows and louvered blinds in good operable condition for natural ventilation.
- Improve thermal efficiency with weatherstripping, storm windows, caulking, interior shades, blinds, awnings.
- Install interior storm windows with air-tight gaskets, ventilating holes, and/ or removable clips to avoid condensation and allow for maintenance of windows.
- Install exterior storm windows which do not obscure or damage windows or frames.

SECRETARY'S GUIDELINES: WINDOWS

Not recommended:

- Removing historic shading devices.
- Replacing historic multi-light sash with new thermal sash utilizing false muntins.
- Installing new exterior storm windows which are inappropriate in size and/or color.
- Replacing windows or transoms with fixed thermal glazing or permitting windows and transoms to remain inoperable rather than utilizing them for their energy conserving potential.

DOORS, ENTRANCES AND PORCHES

- Weatherstrip doors and caulk door frames.
- Maintain porches and double vestibule entrances so that they can retain heat, block the sun, and provide natural ventilation.
- Not recommended: changing the historic appearance of the building by enclosing open porches.

SECRETARY'S GUIDELINES: INSULATION

- Install thermal insulation in attics and in unheated basements and crawl spaces to increase the efficiency of mechanical systems.
- Install insulating material on the inside of masonry walls to increase energy efficiency where there are no interior character-defining features.
- Avoid thermal insulation with a high moisture content in wall cavities.

SECRETARY'S GUIDELINES: SITE

- Retain plant materials, trees, and landscape features which perform passive solar energy functions such as sun shading and wind breaks.

SECRETARY'S GUIDELINES: SETTING (DISTRICTS/ NEIGHBORHOODS)

- Maintain those existing landscape features which moderate the effects of climate on the setting such as deciduous trees, evergreen wind blocks, and rivers, ponds, or harbors.
- Avoid stripping the landscape features and landforms so that the effects of
- wind, rain, and sun result in accelerated deterioration of the historic buildings.

HISTORIC BUILDINGS: INHERENTLY GREEN

Most buildings that were constructed before the advent of modern systems and mass-produced materials made use of tried and true materials and systems that allowed occupants to be comfortable and safe, and spaces to be useable for their intended purpose(s), without relying on off-site energy sources and complex indoor climate control systems.

Recommended reading: the points addressed in the remaining slides are thoroughly discussed in the book, Sustainable Preservation: Greening Existing Buildings, written by architect Jean Carroon, FAIA, published in 2011.

EMBODIED ENERGY

Energy used directly or indirectly to:

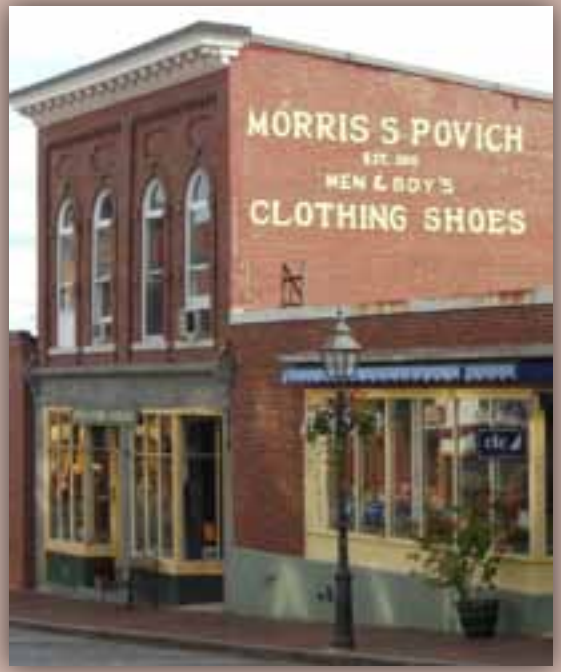
- Acquire raw materials
- Produce materials
- Transport materials
- Construct the building
- Demolish and dispose of materials if the building is to be replaced

By re-using an existing building, we are taking advantage of the fact that the embodied energy expenditure has already occurred – much of the "debt" has already been paid.

EMBODIED CARBON

The amount of carbon emitted through building construction activities including:

- Extraction
- Fabrication
- Transportation
- Final assembly



The carbon expended in the construction of older buildings has already been recovered.

DURABILITY

Most historic buildings are constructed of long-lived materials such as:

- Masonry (brick, stone, concrete)
- Slate
- Wood framing (properly detailed and maintained)
- Plaster on wood lath
- Terrazzo

DURABILITY

These materials and composite systems can last hundreds of years, spreading environmental impacts over a long period of time.

- They often have lower recurring embodied energy (energy required to maintain, repair and restore materials).
- Less durable materials require frequent replacement and disposal, resulting in higher total embodied energy even though they may cost less to make.

INDIGENOUS MATERIALS

Older buildings are typically constructed with local materials, which in New England are usually:

- Older growth cold forest wood
- Granite and slate from local quarries
- Locally- or regionally-made brick
- Sand and gravel from local pits

Inherent advantages of these materials:

- Durability in the native climate
- Lower transportation costs
- Support of local economies

REPAIRABILITY OF MATERIALS, COMPONENTS AND SYSTEMS

Older buildings are typically constructed with materials, components and systems that can be repaired, thereby:

- Extending the life of products
- Minimizing construction waste/recycling
- Reducing the need for new materials/products
- Employing local craftspeople and suppliers
- Offsetting the cost of repair with lower material costs for maintenance rather than replacement
- Examples of materials and systems that should be repaired rather than replaced:

  Wood windows and doors
  Masonry walls
  Slate roofs
  Wood framing

PASSIVE SURVIVABILITY

Many design features of existing buildings allow them to continue in use even when modern systems fail.

Daylighting

- Large windows (storefronts)
- Light wells, skylights, clerestories and monitors
- Narrow building widths
- Glass transoms and doors
- Prism glass
- Glass block partitions, floors and sidewalks

PASSIVE SURVIVABILITY

Ventilation

- Vertical air flow by gravity through shafts, stairwells, light wells, chimney ducts, and transfer grilles
- Horizontal air flow through doors, transoms, interior windows, and transfer grills
- Introduction of outside air and breezes through strategically-placed large doors and operable windows
- High ceilings that promote cooler temperatures at sitting levels in warm weather
- Ceiling fans that promote warmer temperatures at sitting level in cold weather, and creating cooling air currents in warm weather

PASSIVE SURVIVABILITY

Water

- Cisterns collect and store rainwater
- Catchment systems channel rainwater for irrigation and other uses
- Gutters, downspouts, grading, pavement control run-off

LONG LIFE, LOOSE FIT

Long life, loose fit, is the basis for the adaptive use of existing buildings. Buildings should last a long time and allow for several changes in use over their lifetimes. Typical downtown commercial buildings are classic examples of this principle. They consist of long, narrow and open modules, and lend themselves to many uses:

- Retail stores of endless varieties
- Restaurant/bar
- Dance/martial arts studio
- Art studio/gallery

CONCLUSION

Interesting fact: commercial buildings constructed before 1920 use less energy per square foot than buildings constructed between 1920 and 2000. Only in the last decade have newly-constructed buildings become more energy efficient than pre-1920 buildings. (1999 study conducted by the General Services Administration, the nation's largest landlord, and cited in Sustainable Preservation: Greening Existing Buildings.)

CONCLUSION

" . . . preservationists are particularly adept at thinking about the long-term survivability of buildings and how they can be carefully maintained, innovatively re-used, and thoughtfully preserved for future generations to enjoy – tasks that represent the very essence of sustainability."

Richard Moe, former President, National Trust for Historic Preservation, quoted in Sustainable Preservation: Greening Existing Buildings.

Malcolm L. Collins AIA, LEED AP
Maine Licensed Architect
Historical Architect: 36 CFR Part 61
Architectural, Historic Preservation & Planning Concepts
Post Office Box 152
South Freeport, Maine 04078
p 207.865.0346
c 207.318.3180
mlcarch@comcast.net