Recycling Main Street

by Kennedy Smith

There was once a time, not *that* long ago, when a main street shopkeeper would just roll down the awning if the store got too hot – a practical solution to an almost daily problem.

But now it's 2006, and the odds are good that the store's awning is fixed in place, not retractable. In fact, the awning is probably just decoration, or maybe it's advertising. If the shopkeeper wants his store to cool down, he doesn't use the awning; he turns up the air conditioner.

He also inadvertently damages the environment.

Like many buildings built before the advent of air conditioning, cheap electricity, and suspended ceilings, traditional main street storefront buildings were designed from the beginning with energy conservation in mind. From their materials to their physical orientation, main street buildings were planned to make the most of the natural environment. For example:

• Retractable awnings protected storefronts from excessive heat gain during the hotter parts of the day but let sunlight warm the air inside during cooler hours.

• Storefront windows flooded the front of the storefront with sunlight; concrete and masonry floor aprons inside the storefront windows absorbed heat, radiating it back into the storefront when the temperature dropped.

• Transom windows filtered sunlight deep into buildings (sometimes intensified by small panes of prism glass), while white tin ceilings reflected sunlight far into store interiors, further minimizing the hours needed for artificial lighting.

• Long, shared party walls between storefront buildings minimized heat loss, with only the narrow front and rear facades exposed to the weather.

• On-roof water tanks collected rain water, and gravity carried it down into the building for flushing toilets and for other non-potable uses.

• Fans in the high first-floor ceilings recirculated sun-warmed air back into the store space below.

But that's just the beginning of the story of energy and historic main street buildings.

MAIN STREET BUILDINGS REPRESENT ONE OF THE MOST ENERGY-EFFICIENT RESOURCES IN MANY TOWNS AND CITIES.

The materials used to build main street buildings represent an enormous amount of encapsulated energy. On the heels of the energy crisis of the mid-1970s, consulting firm Booz Allen Hamilton measured the amount of energy inherent in various building materials. They found, among other things, that the amount of energy required to manufacture eight bricks, haul them to a construction site, and place them in a wall is equal to the amount of energy in a gallon of gasoline.

Why is this significant? Because it tells us that our existing downtown brick buildings – the heart of many of our main streets – represent a huge energy investment; an investment that is lost when these buildings are torn down. For example, the amount of energy inherent *in the bricks alone* in a typical three-floor, 20-by-100-foot brick bearing-wall main street building is equal to the amount of energy in more than 3,700 gallons of gasoline – enough to keep the average American driving for almost eight and a half years.[1]

Every downtown building rehabilitated and kept in active use thus conserves energy – and every new commercial building built while a downtown building remains vacant or underused represents energy wasted twice. Moreover, commercial buildings made redundant by the glut of retail space our communities are developing contribute to the 300 million tons of construction and demolition debris America produces annually (that's a ton of debris for every American).

And, of course, main street districts – downtowns and neighborhood commercial corridors – are the most walkable places in a community, and are more likely than any other place to be served by public transit. People who work and live downtown can walk to restaurants, shops, and offices, minimizing the need for cars and reducing the number of parking spaces needed.

But, over the years, we have lost much of the energy efficiency that main streets were built to offer us. We've sealed up storefront transom windows or covered them with signs, stopping sunlight from entering. We've installed suspended ceilings, trapping hot air close to the ground. We've removed retractable awnings, making it impossible to modulate indoor temperatures.[2]

Our first challenge, then, is to undo the damage that's been done to main street buildings so that their natural energy-efficient features can go to work again. Architectural and building features that used to be so common (such as

1 *Author's note:* We have a downloadable spreadsheet on our website that can be used to estimate the amount of energy embodied in the bricks in buildings of various sizes. Readers of this article are welcome to try it out: <www.cluegroup.com/EnergyInBricks.xls>.

2 As I've noted in previous columns, we've also made policy choices that have (sometimes inadvertently) harmed our downtowns — from zoning ordinances that make it difficult to develop housing over storefronts, to facility standards for new government buildings that are often impossible to meet within a downtown setting.

retractable awnings or transom windows) can often be sensitively restored or, in new downtown buildings, incorporated into the design.

But one of the most exciting challenges for the years ahead is introducing new "green building" technologies to main street. And one of the most promising new technologies for traditional main street buildings is the green roof. While green roof technology is commonplace in many parts of the world and increasingly found in large U.S. cities like Chicago (with 2.5 million square feet of green roofs) and Portland, Oregon, it has yet to take hold on the main streets of America's small and mid-sized communities.

There are many variations on green roofs – but, in most instances, a green roof consists of a waterproof membrane, a layer of insulation, a root barrier, drainage channel, a thin layer of soil or other growing medium, and a layer of vegetation (usually sedum, a small, weather-hardy succulent). The entire green roof is typically no thicker than eight inches and, even when saturated with water, usually weighs less than a traditional tar roof with several inches of gravel.

Green roofs offer many benefits for both property owners and local governments. For property owners, green roofs can last two to three times as long as black tar roofs, and they provide excellent insulation, dramatically reducing building temperature – and lowering energy costs. A study by the National Research Council of Canada found that a green roof reduced the amount of heat gain by 26 percent.[3] In central Florida, recent research found that a green roof resulted in 18 percent less summer heat gain than a conventional roof.[4] And besides their energy savings benefits, green roofs can also reduce rainwater runoff by as much as 75 percent, substantially reducing the burden on municipal sewer systems.

Because they are virtually flat, the roofs of traditional main street commercial storefront buildings are physically ideal for green roofs. But because main street storefront buildings are relatively small (most are between 2,000 - 3,000 square feet), the per-square-foot cost of installing a green roof is likely to be higher than that of a comparable installation on a larger roof. Property owners can mitigate this cost somewhat by partnering with the owners of adjacent buildings who might be willing to install green roofs at the same time.

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Our main streets can be centers of energy efficiency. Here, brick buildings line Main Street in Brattleboro, Vermont.

There are a host of other emerging technologies that may hold promise for boosting the environmental performance of traditional downtown buildings. Some, like photovoltaic panels, are likely to be a good fit. Others, like rooftop wind turbines, are unlikely to be a good option for downtown buildings as turbines' vibrations can damage masonry walls.

The National Park Service (which maintains the National Register of Historic Places), the U.S. Green Building Council, and other entities involved in environmentally-friendly development and historic preservation are just beginning to look at how some of these new materials might be incorporated into historic buildings.

But in the meantime, main street buildings already represent one of the most energy-efficient resources in many towns and cities. Reusing these buildings – keeping them in good shape and in use – is the ultimate form of recycling. There are a number of things a planning commission might do to encourage their reuse and boost their efficiency even farther:

• Ensure that planning policies call for existing buildings to be used as completely as possible before permitting new construction.

• Create incentives for using new energy technologies in older and historic downtowns. Several states – Maryland, New York, Oregon, Pennsylvania – offer tax incentives for green building, and a growing number of cities offer grants or other incentives for doing so (since the fiscal benefits of green roofs in minimizing rainwater runoff accrue to local governments). Chicago, for example, offers $5,000 grants to small businesses that install green roofs and waives some permit fees.

• Insist that new buildings incorporate high-performance environmental features. Offer incentives for new buildings that obtain LEED certification.[5]

• Make downtown buildings owned by the municipal government models of energy efficiency.

• Work with local boards of architectural review to investigate ways to use energy-efficient building materials when rehabilitating downtown buildings.

Our main streets can serve our cities and towns not just as hubs of commerce, but also as centers of energy efficiency. ◆

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3 As reported in *Energy Efficiency Trends in Canada*, 1990 to 2003; Table 4.1 (Natural Resources Canada, 2005).

4 Jeffrey K. Sonne, "Energy Performance Aspects of a Florida Green Roof" (Florida Solar Energy Center, 2006); available at: <www.fsec.ucf.edu/bldg/pubs/Green_Roof/index.htm>

5 *Editor's note:* for more on the LEED environmental certification process, see "Leading the Way," in *PCJ #61* (Winter 2006).