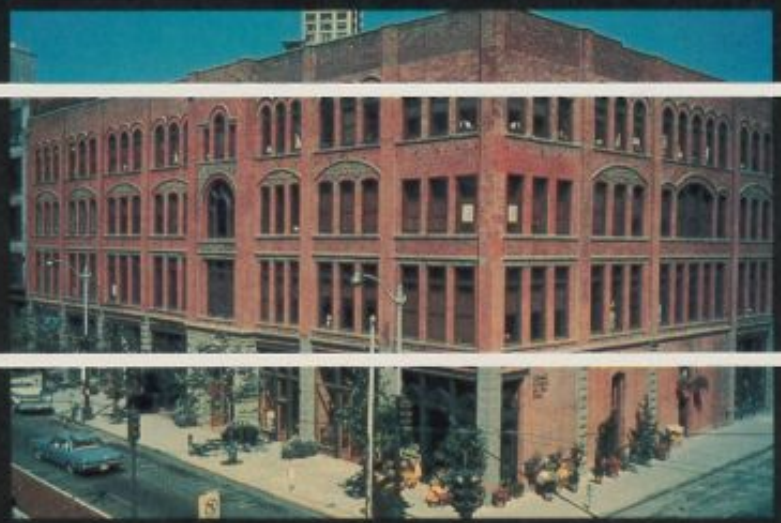
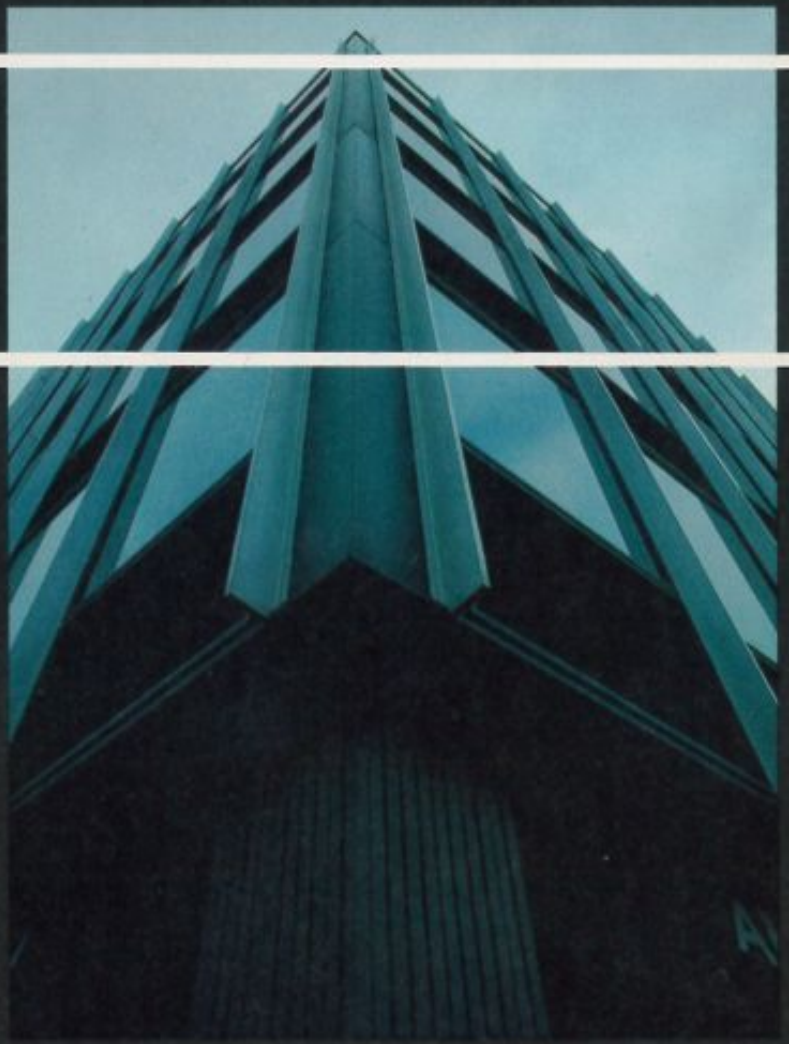
Preservation and Energy Conservation

The Advisory Council On Historic Preservation



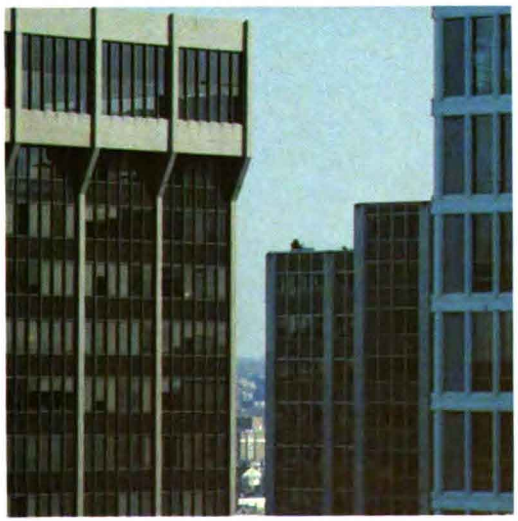


Preservation and Energy Conservation

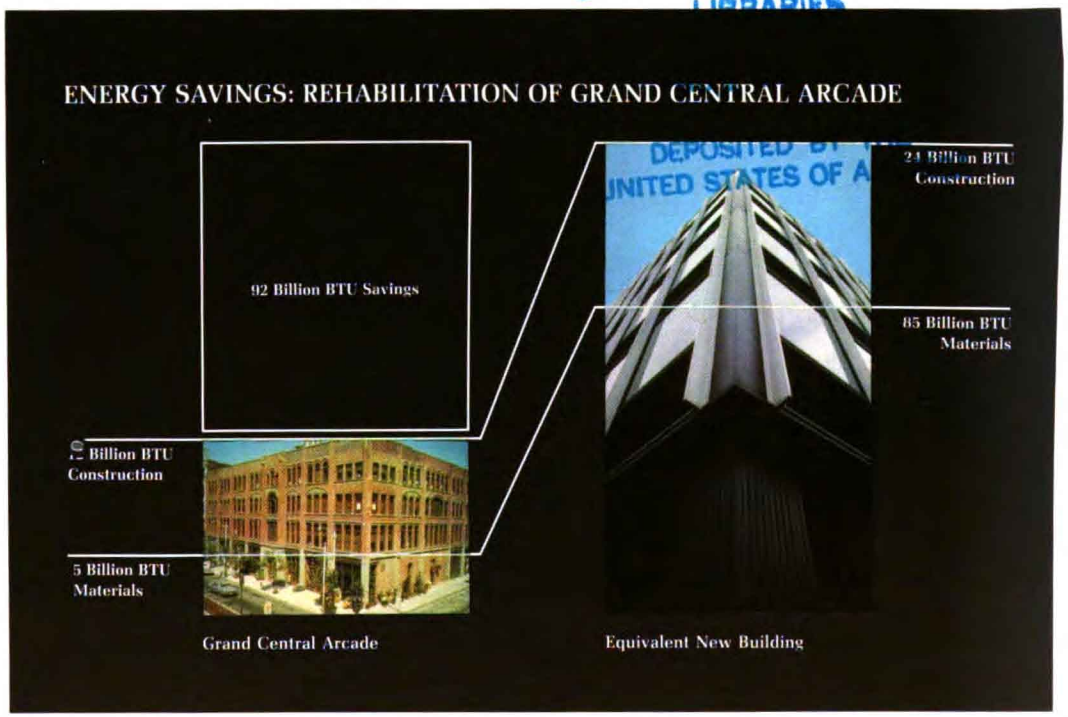
Every year, millions of people enjoy the benefits of preservation in the United States. Visitors and residents alike revel in the atmosphere of San Francisco's Mission District, Cincinnati's Mount Auburn, Boston's Faneuil Square, and the Vieux Carré section of New Orleans. These and other restored areas highlight the unique regional heritage of our Nation's cities, and provide a delightful contrast to the imposing architecture of modern downtown buildings. These areas are successful because they have been made functional in today's economy, but still provide a visible link to the past.

Successful restoration projects have demonstrated that preservation has many benefits for society. Individual buildings or entire districts, when restored or rehabilitated, often become the focus for dramatic resurgence of community spirit and pride. Historically preserved areas attract businesses, visitors, and concerned residents, all of which can stimulate the economy of our older cities. Buildings which provide a tangible link to our Nation's heritage can soften the perceived pace and impersonal character of today's highly mobile and technical society.

There is another benefit of preservation, however, which is not well known: it can save energy. Taking into account the energy required to tear down a structure, as well as that needed to fabricate new building materials, it can be demonstrated that it takes less energy to restore old buildings than it does to replace them.

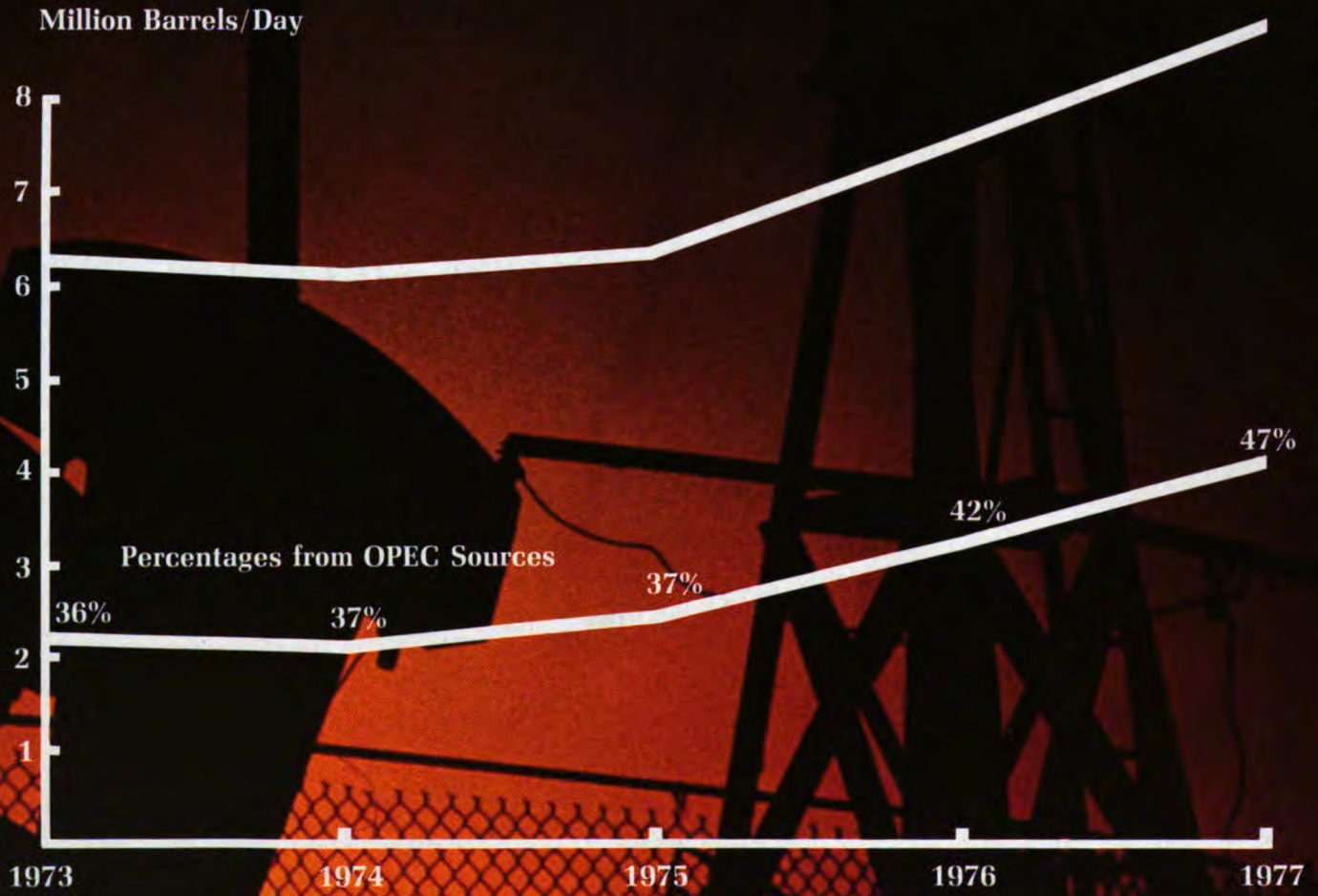


Rosslyn, Virginia. The demand for downtown office space has led to the creation of crowded highrise canyons of glass and steel.



Grand Central Arcade, Seattle. It takes less energy to restore old buildings than it does to replace them.

OIL IMPORTS WITH PERCENTAGES FROM OPEC SOURCES



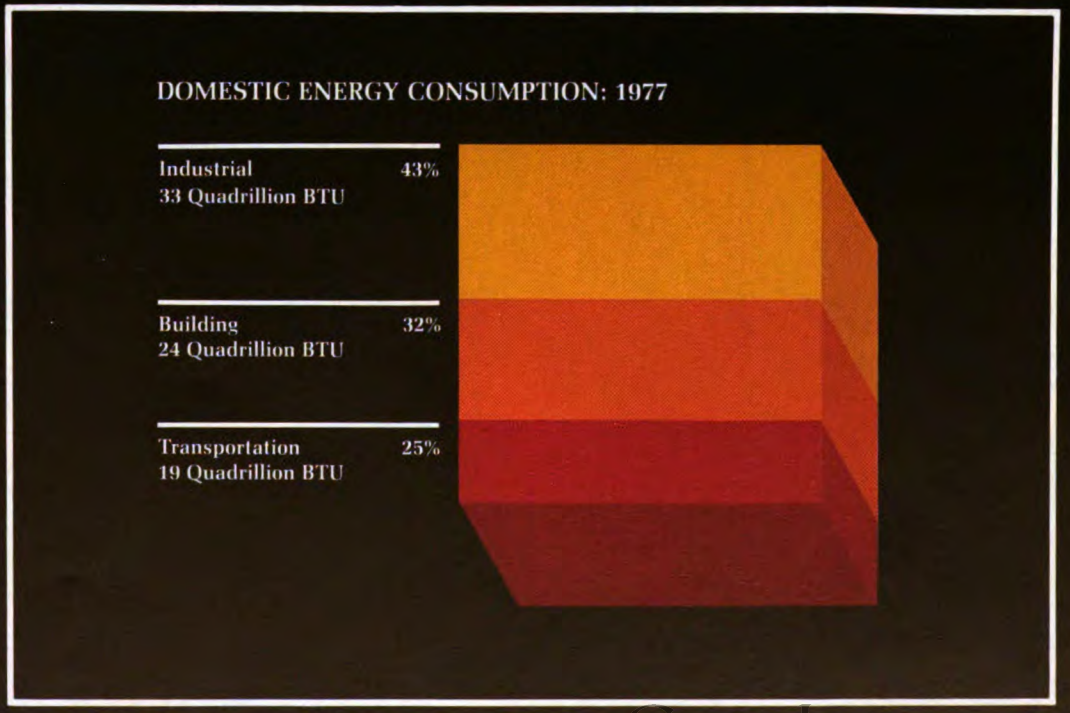
The need to save energy is an important priority for the entire Nation. Rising energy prices have accelerated inflation in the United States and throughout the world. Dependence on imported fuel has left us vulnerable to supply interruptions, which can have serious effects on the entire economy. Since the oil embargo of 1973, we have increased our dependence on imported petroleum. In 1973, we imported one-third of the oil used in the United States. Today, the amount is one-half.

Reducing reliance on imported oil is the main goal of the National Energy Act passed by Congress on October 15, 1978, and conservation is the cornerstone of this important law. By eliminating wasteful use, conservation can "stretch" existing domestic energy supplies and preserve some of the Nation's valuable fuel resources for the future.

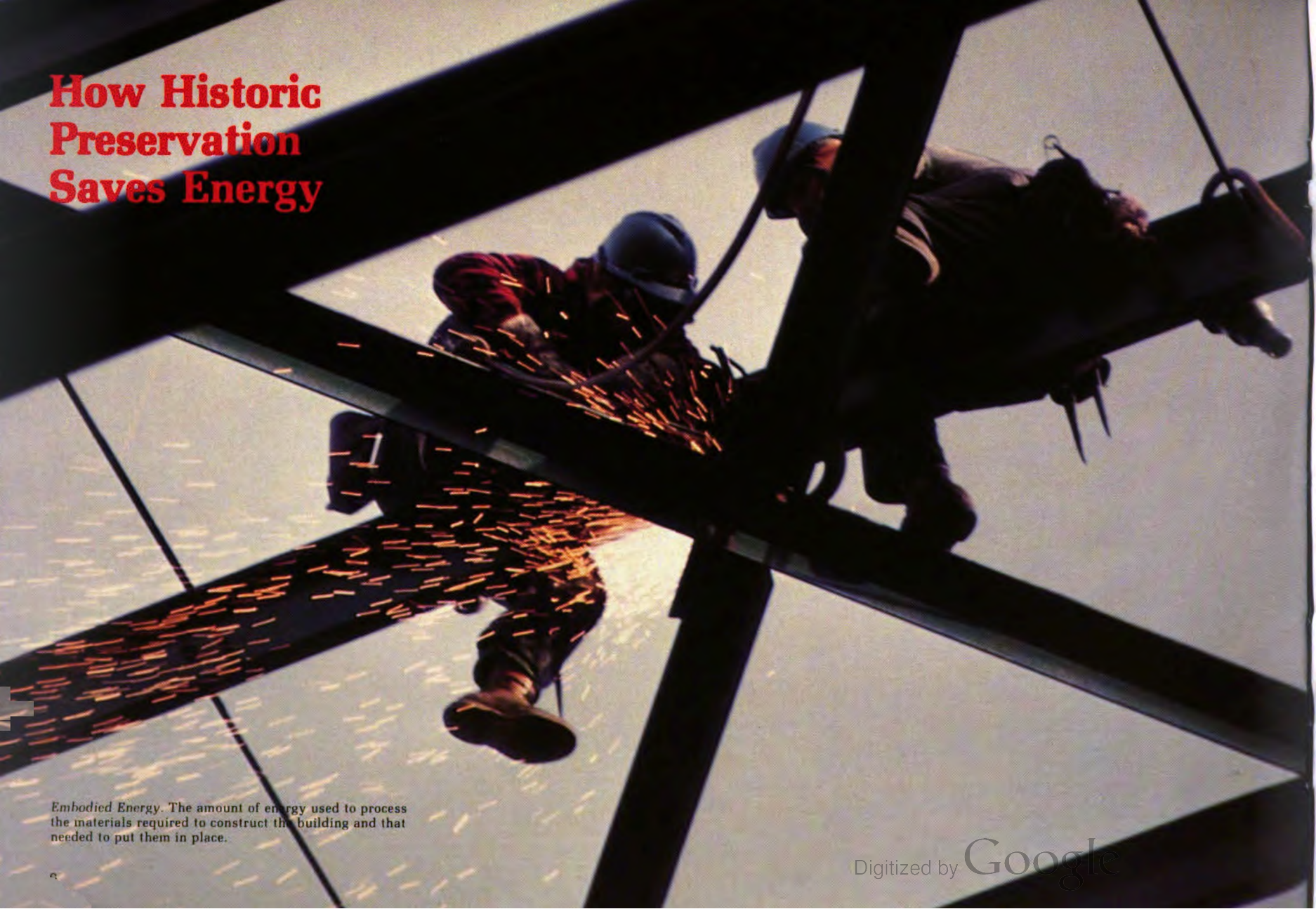
A major target for conservation is the Nation's building sector, which accounts for about 32 percent of the total amount of energy used in the United States. This figure represents not only the energy used in building itself, but consumed in obtaining, refining, and transporting construction materials—about 5 percent of our total annual consumption. Replacing all the existing buildings in the United States would require the entire world's energy output for about 1 year—approximately 200 quadrillion Btu's of energy. Clearly, America's buildings represent a major energy investment. Just like the oil and coal buried underground, they are an important resource.

But there are also more innovative ways to save energy in buildings. One of these is to consider preservation. Restoring buildings can preserve not only an important cultural resource, but also can conserve part of our Nation's investment in energy. To find out how preservation really saves energy—and how much—the Advisory Council on Historic Preservation recently commissioned a study. It resulted in the development of methods that can be used by builders, architects, or government organizations to determine whether or not proposed preservation projects will conserve energy for the Nation.

Energy Consumption. Buildings account for a full 32 percent of the energy consumed in the United States.



How Historic Preservation Saves Energy



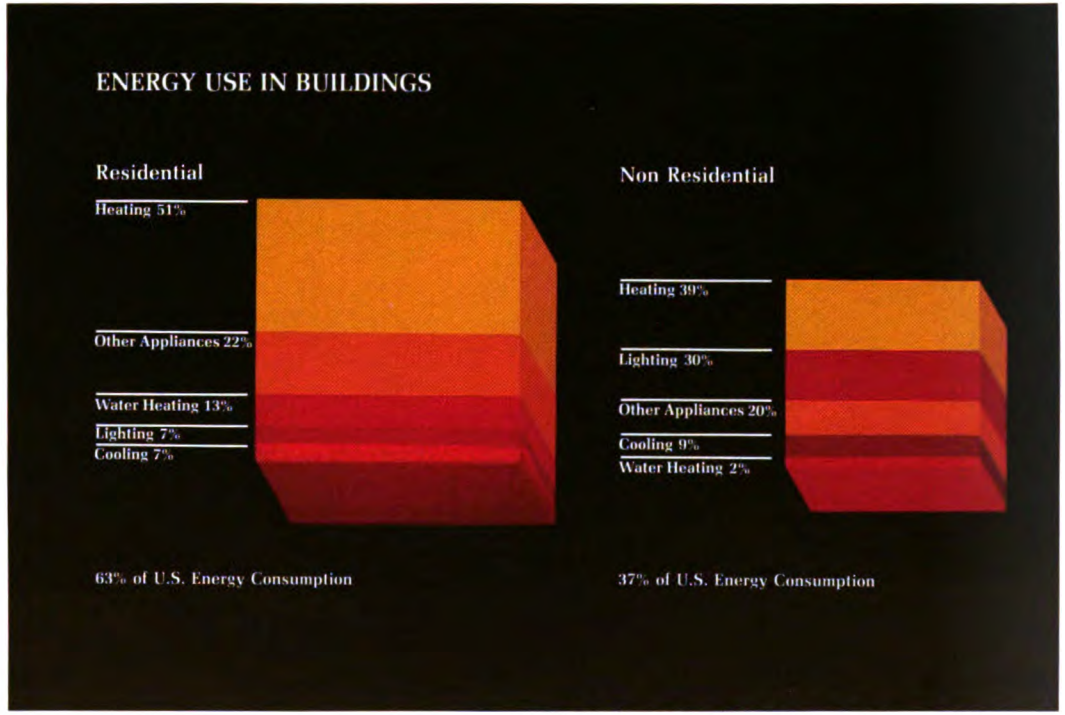
Embodied Energy. The amount of energy used to process the materials required to construct the building and that needed to put them in place.

It has been argued that preservation does not save energy, because new buildings may use energy more efficiently than old buildings. The Council's study found, however, that this argument does not take into account all the energy needed to build a replacement. To determine the total energy cost of any building, it is necessary to consider three kinds of consumption:

(1) The amount of energy used to process the materials required to construct the building and that needed to put them in place. This is called EMBODIED ENERGY.

(2) The amount of energy needed to tear down a building and dispose of materials. This is called DEMOLITION ENERGY.

Demolition Energy. The amount of energy needed to tear down a building and dispose of materials.



Operating Energy. The amount of energy needed to operate a building, provide light, heat, cooling and ventilation.

(3) The amount of energy needed to operate the building, providing light, heat, cooling, ventilation, etc. This is called OPERATING ENERGY, which depends on the climate, occupancy characteristics, and physical design of the building.

By estimating these three energy requirements for an older building and a proposed new one, and by comparing the results, it is possible to determine the net energy savings of preservation.

Preservation and Energy Conservation: Two Success Stories

Grand Central Arcade. The centerpiece of Seattle's delightful Pioneer Square Historic District.

The Grand Central Arcade, an old hotel in downtown Seattle, was renovated to provide 80,000 square feet of office and commercial space. With thousands of tourists attracted to its shops and restaurants each year, the Grand Central Arcade has become the centerpiece of Seattle's delightful Pioneer Square Historic District.

The Council calculated the total energy cost of renovating the Arcade compared with the estimated energy cost of a comparable new facility.

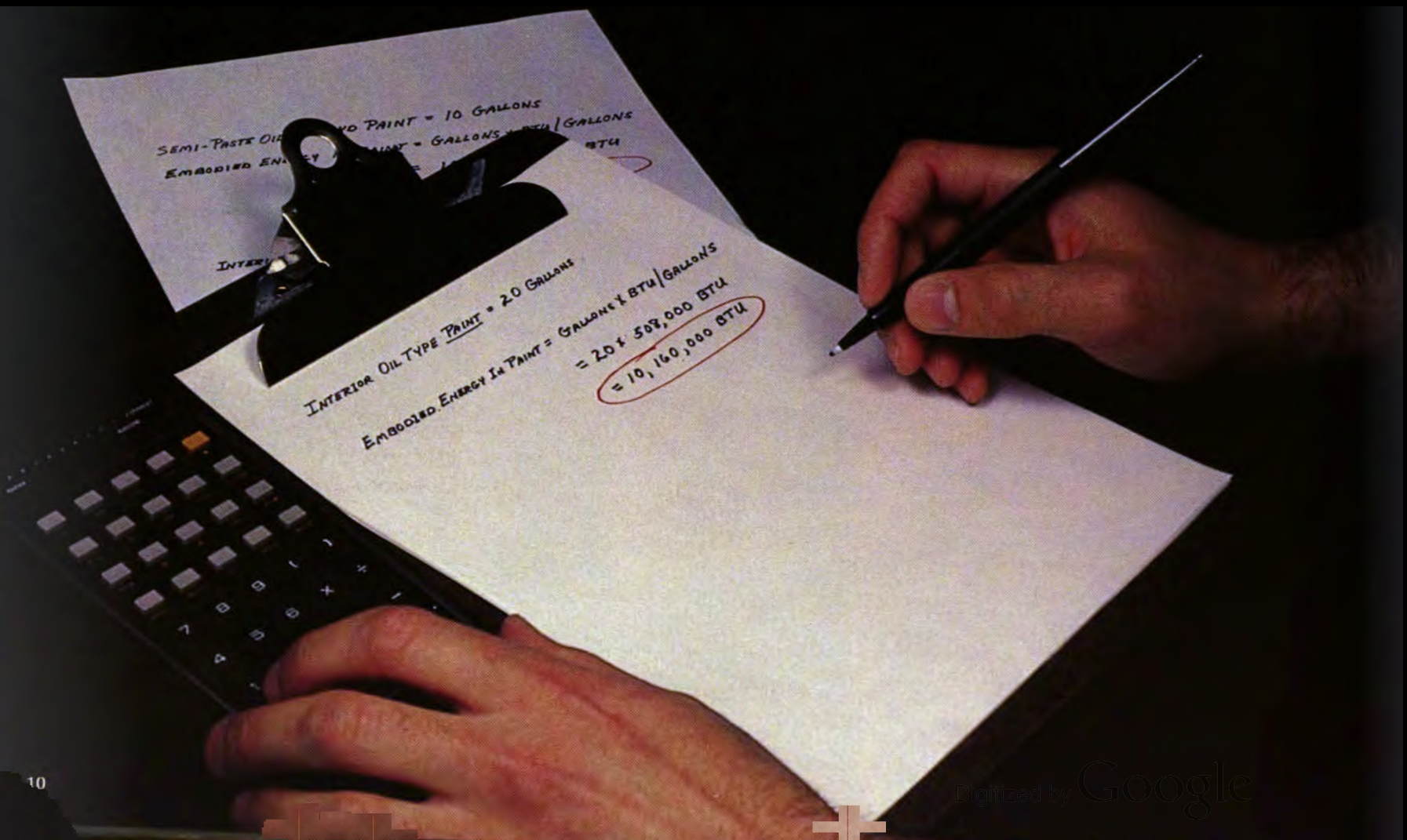
Analysis showed that renovation saved 90 billion Btu's of energy—the equivalent of almost 700,000 gallons of gasoline. *Energy savings resulting from rehabilitation of the Grand Central Arcade will offset the additional energy needed to operate the complex, when compared to a new facility, for more than 200 years!*

Another successful preservation project is the Austin House, an old carriage house in the Capitol Hill District of Washington, D.C. Austin House underwent an extensive rehabilitation that left only the exterior shell intact. The renovated structure contains apartment dwellings for three families.

Analysis showed that renovation required only about half as much energy as that needed for a comparable new building. This savings alone represents 1 billion Btu's of energy, or about 8,000 gallons of gasoline. Further, Austin House will use 5 percent *less* energy for heating and cooling. Over a 30-year period, *Austin House will save enough energy to heat and cool a new apartment building of the same size for over 10 years.*

Austin House. An old carriage house in the Capitol Hill district of Washington, D.C. underwent an extensive rehabilitation.

Method and Models



The Council estimated energy savings of the Grand Central Arcade and the Austin House using methods developed as part of the study. These methods are a series of computation techniques for use in situations which require different levels of skill, detail, or precision. They use progressively more detailed information to determine whether a preservation project is more energy efficient in the long run than new construction. The three models are:

(1) *The Building Concept Model.* This is the simplest method, using a minimum amount of information. Analysis can be performed by a person with no technical background. Only one multiplication, based on the kind of building and floor area, is needed to estimate how much energy is embodied in materials and construction.

(2) *The Building Survey Model.* The intermediate method requires more information. Material quantities in seven broad categories must be estimated for the particular building. This model provides better results than the Building Concept Model without much additional effort.

(3) *The Building Inventory Model.* The most detailed method provides the most accurate results, but is time consuming. Calculations of building energy consumption using this method usually require computer assistance. Architectural plans and specifications are used to determine quantities of individual building components and products.

Model techniques can be used interchangeably to analyze energy savings for any preservation effort.

ENERGY EMBODIMENT OF PRIMARY MATERIALS

MATERIAL CLASSIFICATION	DESCRIPTION	UNIT	EMBODIED ENERGY PER MATERIAL UNIT
PAINT PRODUCTS			
Exterior Oil-Type Paint Products	Semi-paste oil + alkyd paints	gal	489,000
	Exterior water-type trade sales paint products	gal	489,000
	Interior oil-type trade sales paint products	gal	489,000
	Interior water-type trade sales paint products	gal	437,000
ASPHALT PRODUCTS			
Asphalt Felts & Coatings	Roof Asphalts + Patches		
	Roof Asphalt	lb	6,900
	Asphalt + Tar Roofing + Siding Products		
	Asphalt Roofing: Smooth Surfaced Rooled Roofing & Cap Sheet, Including Sanded, Talc, Mica, & Other Fine Material Surfacing	sq ft	7,800
	Mineral Surfaced Roll Roofing & Cap Sheet	sq ft	11,000

Building Inventory Model. Architectural plans and specifications are used to determine quantities of individual building components and products.

Applications

The use of the Council's models can be illustrated by examining a potential preservation project, the Lockefield Garden Apartments in Indianapolis, Indiana. Lockefield Garden Apartments is an abandoned low-income housing complex built by the Works Projects Administration in 1935. Demolition has been proposed.

The Council has used a combination of the Building Inventory and Building Survey models to compare the total energy cost of rehabilitating Lockefield Garden Apartments with the total cost of tearing down and replacing the complex. The results showed that:

Existing Lockefield Garden buildings represent an energy investment more than 150 percent greater than that required to build a new complex.

Rehabilitation would require only a fraction of the energy needed to construct a comparable new residential complex.

The rehabilitated apartments would use slightly more operational energy than comparable new facilities in the same climatic region. But this annual operational energy deficit is small compared with the overall embodied energy conservation advantage of rehabilitation. The final analysis showed that *the rehabilitated Lockefield Garden Apartments would have a net energy-investment advantage over an equivalent new complex for more than 50 years.*

Lockefield Garden Apartments. A net energy-investment advantage over an equivalent new complex for more than 50 years.

Conclusions

It is important that preservation receive proper credit for its energy savings.

Once energy is embodied in a building, it cannot be recovered and used for another purpose—8 bricks embody energy equivalent to a gallon of gasoline but cannot fuel a car. Preservation saves energy by taking advantage of the nonrecoverable energy embodied in an existing building and extending the use of it.

Because the energy embodied in an existing building was invested long ago, and is nonrecoverable, its economic value is not adequately recognized by normal economic comparisons of preservation versus new construction. Publicizing the energy conservation benefits of preservation can increase public awareness of this hidden benefit.

The Council has developed these methods to compute energy savings to increase public awareness and encourage preservation.

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For More Information

If you are an architect, a city planner, an administrator, or a citizen interested in preservation, you should learn more about the Advisory Council on Historic Preservation's study, entitled *Assessing the Energy Conservation Benefits of Historic Preservation.* The models described in this study are easy to understand, and can aid in decision-making by providing accurate planning information. To learn more about the study or about preservation in general, write:

The Advisory Council on Historic Preservation
1522 K Street, NW.
Washington, D.C. 20005

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