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Preface

During the summer of 1979, a team of students and professional historians, architectural historians, architects and planners under the supervision of the National Architectural and Engineering Record (NAER), Heritage Conservation and Recreation Service (HCRS), worked for 12 weeks in Butte, Montana, to analyze and develop a revitalization strategy for Butte’s historic central business district, called Uptown. This study is the product of that effort. Some of the recommendations in this report have already been implemented; others will require additional study and consideration. We believe that this study will be a useful planning tool for future reuse, development, decision making, and ultimate revitalization of Butte, Montana, one of this nation’s most significant historic resources.

On February 19, 1981, the Secretary of the Interior signed Secretarial Order No. 3060, which abolished the Heritage Conservation and Recreation Service and provided for transfer of its programs to the National Park Service by May 31, 1981.
Introduction

Butte, Montana, is a city in transition. From its beginning as a mining camp in the early 1860’s until the present, Butte’s economy has undergone unsettling, volatile changes—due primarily to changes in the mining industry itself. The buildings in the Uptown business district reflect the economic and social changes particular to the city’s commercial and industrial history.

Today, the perception of the historic section of Butte, locally called “Uptown,” is one of abandonment. Empty windows and partially unused buildings create a sense of decline and neglect. Yet, the richness of historic Uptown Butte still survives in these buildings. Cast iron storefronts made by local iron workers remain intact. Rich, ornamental brickwork, cornices, and detailing express the wealth and pride of Butte’s earlier days. From high-style public buildings to the elaborate mansions of the “Copper Kings” to humbler “catalogue” workers’ housing, much remains. The sense of living history survives everywhere in Uptown Butte.

Butte has changed over the years. The “rip-roaring” mining camp atmosphere is gone, but much of the historic fabric remains. The character of Butte as a mining community is woven like a thread throughout Uptown Butte in its architecture, culture, and sense of uniqueness and independence. That heritage remains alive and intact like so many of the historic buildings waiting for reuse.

In 1979, the City of Butte asked the Department of the Interior, Heritage Conservation and Recreation Service (HCRS), to explore the possibility of revitalizing historic Uptown Butte through historic preservation. The role of HCRS was to develop new ideas and planning tools. A team of student and professional historians, architects, planners and a city planner worked together for 12 weeks during the summer to study and define town needs, to examine town problems from a contemporary as well as historical perspective, and to find practical solutions to the problem of revitalizing historic Uptown Butte.

Public meetings were held. An intensive survey of the whole historic area was conducted. Information was gathered from many State and local sources to guarantee that the historic features of the city were accounted for in all future recommendations.

This report, then, is the product of that summer. Some recommendations are already dated, especially in the area of economics, and particularly fluctuating interest rates. Despite this, the analyses and proposals still provide a sound beginning for the revitalization and future planning of this nationally significant mining town—Butte, Montana.
As is the case with many western mining towns, working-class neighborhoods grew up close to industrial activity.
Historical Perspective

As early as 1864, Butte prospered from gold mining. Yet, as was the case in many western mining settlements, Butte’s first residents built as few structures as possible, as quickly as possible. These rugged individuals were interested in what lay in Butte’s ground, not on its surface. By late 1867, the 180-acre townsite had been plotted and there were centers of activity along Main Street with scattered commercial and residential activity along Quartz, Copper, Park, and Broadway. In the late 1860s, gold mining declined, and there are no structures from the gold mining era left in the central business district. The single legacy of the era is the location of the central business district.

Butte’s declining fortunes were reversed in 1874 when silver was discovered. Throughout the next year an estimated 300 new miners arrived in Butte, and the few hotels and boarding houses quickly became overcrowded. There was an immediate surge of new construction to house the influx of fortune seekers. Butte’s earliest extant structures date from this period of prosperity. Scattered throughout the business district are two-story brick buildings of similar size, plan, and window and door arrangement, which housed the mostly single male population. A few other brick and woodframe structures built mostly for retail and mixed uses also survive.

Between 1874 and 1879, silver mining, new technology, and the development of an urban character quickly brought Butte to maturity. The first successful local ore smelting was a major industrial advancement that altered the physical and economic complexion of the growing city. Smelters belched a sulfurous smoke that killed vegetation in the area, yet their presence was an investment necessity that saved time and money. Previously, ore had been shipped to the East coast or to Swansea, Wales, for processing, a time-consuming and expensive proposition. With the incorporation of the city, a regularly published newspaper, accelerated property values, and the construction of 15 substantial brick buildings, Butte’s permanence was assured. Within 5 years the log cabin mining settlement had become the largest and most prosperous city in Montana.

During the 5 years of rapid expansion and well into the 1880s, Irish and English immigrants settled in Butte. Attracted by the prospect of steady work and wealth, experienced miners left deteriorating tin mines in their native Cornwall, England, to settle close to the mines in the local communities of...
The commercial and residential areas are delineated by past and present mining activities.
Centerville and Walkerville. These communities of single men directly affected the services that developed in Butte and the buildings that housed them. Scattered throughout the central business district today are 2-story brick buildings built to accommodate this population of single miners. These buildings are essentially the same with similar floor plans, window and door arrangements. To satisfy growing markets, a variety of wood frame and brick buildings were constructed for mixed uses.

Butte's burgeoning industrial and commercial development was accelerated in 1881 with the completion of the Utah Northern Railway, which linked Ogden, Utah, and Butte. The railroad allowed easier access to equipment and supplies and facilitated the shipment of ore throughout the country. Rail transportation became particularly important after 1883 when large copper deposits were discovered at the Anaconda mine in Butte. This significant discovery would eventually change Butte from a mining camp to a more stable, industrialized city. The rapid success and promise of new industrial inventions introduced at the 1876 Centennial Exposition in Philadelphia, including the first electric motor generators and hand drawn wire and arc lighting, dramatically increased the national demand for copper.

Butte's gold and silver industries had already established a framework for mining and easily facilitated the rapid prosperity that copper mining brought. By 1890, Butte's affluence was well marked by the construction of a second generation of buildings. New boarding houses such as the Hamilton Block, the Curtis Music Hall, and the Stephens' Block were more spacious and refined than earlier housing. Several of the new structures on East Galena and Mercury Streets housed Butte's growing population of prostitutes, a clear sign of a community of single male miners. The more sophisticated "parlor houses" on Mercury Street between Main and Wyoming catered to an affluent clientele, while working class miners frequented the "cribs" on East Galena. Prostitutes also generated commercial enterprises. Maria Paumie relocated her dyeing and cleaning services one block from the red-light district to capitalize on the special needs of women "on the line," and saloons and gambling houses lined both sides of South Main Street between Park and Galena Streets.

The prospect of employment that accompanied the 1874 silver discovery encouraged many Chinese living in Rocker, a mining camp on the outskirts of Butte, to move into town. Mine operators solicited Chinese laborers to cut wood for timbering (Appendix A-6) the silver mines. The Chinese community developed in the heart of the central business district on South Main and to the west on Galena and Mercury Streets. By 1890, the two city blocks between Main and Montana Streets were densely populated by Chinese, virtually creating a closed community of paved alleys, which

The Copper Block (1892) located on East Galena Street was not a brothel but served as lodging and headquarters for prostitutes in this area.
served as main thoroughfares for the residents and shopkeepers.

Much of Butte's Uptown commercial development was directly attributable to its Jewish immigrants. As early as 1876, a small group of Jewish merchants were supplying goods and services to local residents as clerks, tailors, jewelers, grocers, barbers, and clothing merchants. Over the years, many Jewish merchants attained prominent positions in the community. Henry Jacobs, one of the first merchants in Butte, was elected as the first mayor in 1876. Two early clothing stores, Sans & Boyce and Gans & Klein, were founded by prominent Jewish citizens. Gans & Klein, located for many years on Main Street between Granite and Broadway, also opened branch stores in other Montana cities.

The success of these commercial establishments and the buildings that housed them were clear manifestations of Butte's prosperity during the 1890s, and commercial development continued to prosper as stability and confidence in the copper industry grew. An influx of eastern and foreign capital and the consolidation of mining companies directly influenced and supported Butte's economic well-being. In 1899, the New York based Standard Oil acquired the local Anaconda Copper Company and other smaller mining concerns to form a gigantic holding company, the Amalgamated Copper Mining Company. This financial activity lent support to new construction, and, although the third generation building boom did not occur until 1906, several substantial structures were built around the turn of the century. When Sutton's New
One of the more interesting of these commercial buildings built by Jewish businessmen is the Pincus Building at 22 S. Main pictured on the left. Pincus operated a jewelry business on Park Street for many years, and in 1894 constructed this building to serve a mixed use of pawnshop and saloon.

Grand Theatre opened on September 10, 1901, it was advertised as the largest and most elegant theatre in the West with a seating capacity of 2,175. Butte, with a population of 30,000, had become an important cultural center and the most famous acts in vaudeville, opera, and theater often played there. Butte's first skyscraper gave the city a distinctive urban character. Built in 1901 for the French-Canadian land speculator, Emanuel Hirbour, the Hirbour Block is an eight-story steel-frame brick and stone structure, which has been continuously used for office space.

Despite Butte's prosperity, the years between 1899 and 1906 were marked by conflicts over mining rights, which in turn created turmoil in employment and ultimately affected the construction trade and other commercial activity. A 1903 shutdown by Amalgamated affected 80% of the wage earners in the state, and an article in the Anaconda Standard indicated that never before had there been such an unfavorable outlook for construction in Butte.

By 1906 the legal disputes had been resolved, and Butte's economy reflected a renewed confidence in the mining industry's financial stability. The consolidation of mining interests placed in the hands of local businessmen such as Miles Finlen, Rod Leggat, and John O'Rourke the capital to finance Butte's third generation building boom. With this new surge of construction, Butte's business blocks assumed a new scale and variety. Small two-story commercial buildings with cast-iron storefronts were suddenly joined by more monumental structures, such as the eight-story Metals Bank Building designed by the New York architect Cass Gilbert. The skyscrapers gave Butte a distinctive urban quality lacking in other Western mining cities. The new building also reflected a broadening of public and private services characteristic of an urban settlement. Public buildings such as the Silver Bow County Courthouse and the Silver Bow County Jail assumed grander scale and finer detail.

When local businessmen invested in Butte in 1906, they were not merely building to accommodate a growing population or growing markets as was the case in earlier periods of expansion. Immigrants who had made their fortunes in the mining industry were looking to the cultural traditions of the east to imitate and adopt. They were building with a vision toward a rich, thriving mercantile city. Unlike earlier building periods where function dictated a certain form that was
repeated in many buildings, this period of prosperity allowed for greater diversity and a kind of opulence of form and design that was translated to smaller business establishments.

The commercial and residential areas around the central business district were also developing rapidly during the early decades of the twentieth century. Butte's substantial Chinese, Cornish, and Irish populations were joined by a bustling Italian settlement east of Uptown at Meaderville, a Finnish district on East Broadway, and a mixture of Croatians, Slavs, Italians, and English in McQueen east of Meadville. From these pockets of ethnic diversity sprang neighborhood commercial and community activities including schools, churches, lodges, stores, saloons, and boarding houses. Although many of these establishments were outside the Uptown area, they did not impinge on its significance nor did they diminish the significance of activities centered there. Main and Park Streets remained the principal corridors for public celebrations, demonstrations, and meetings.

It is interesting to note that, although the copper industry was prospering during the early twentieth century, the corporate enterprise had little interest in other commercial developments in Butte. In 1910, Amalgamated merged with subsidiaries to become the Anaconda Copper Mining Company. Policy decisions were still controlled from New York, although no longer by Standard Oil; and except for a hardware store, the Anaconda Copper Mining Company operated no other commercial establishments and owned little property in the central business district. Despite local perception, Butte's commercial development was almost solely in the hands of its citizens although the presence of the mining company obviously reinforced local business commitment. An increase in the demand for copper caused by World War I instigated a new spiral of commercial prosperity.

The zenith years for the mining industry were between 1910 and 1918, and much of the success was manifested by a rise in the social and economic status of the Chinese, whose increased real estate investments and acquisitions were dramatic. Storefronts on Main Street to the east of Chinatown Alley acquired by Chinese merchants and businessmen were leased to tenants for meat markets, saloons, and barber shops.

The pattern of industrial-led commercial growth fell off after World War I; the drop in copper...
demand and price was accompanied by a concurrent decrease in Uptown commercial growth. By 1924, the production at Anaconda mines was up significantly and the levels held until 1929 when the economy bottomed out. By 1931 copper had dropped to 5¢ per pound.

Throughout the Depression, the exodus of citizens who had depended on mining for livelihood sapped commercial activities and a general strike lasting several months against Anaconda in 1935 increased the bread lines. Boarding houses, hotels, grocery stores, meat markets, hardware stores, and restaurants closed, and residential areas suffered a similar decline. The Chinese were hit especially hard because it was against them that tax laws regarding delinquent payments were most strictly enforced, and much of their real estate was confiscated. And even though World War II stimulated the economy and increased the demand for copper, Butte's mines were crippled by the nationwide lack of manpower.

In 1947 the Anaconda Copper Mining Company initiated the Greater Butte Project to attract new miners to the area and to induce the existing labor force to stay. The project called for a new block-caving method (Appendix A-6) for mining low-grade ore, and for 2,000 company subsidized houses for miners and their families. Ultimately, however, block-caving proved too expensive and Anaconda resorted to large-scale, open-pit (Appendix A-6) mining in 1955.

The advent of open-pit mining brought drastic change to Butte's physical and economic environments. The cost saving factors characteristic
The Pekin Noodle Parlor built in 1909 is located in what was the heart of Chinatown. The first floor of the building originally housed a gambling room and saloon on the south and a Chinese herb doctor’s office on the north. In the early 20th century, the upstairs noodle parlor was partitioned into curtained spaces accommodating four to six customers.

Drawing by Dave Hutchinson.

Forced relocation and gradual suburban development caused an influx of residents to settle on the Flats and the rise of the automobile after World War II facilitated and escalated this growth. As suburbanization expanded beyond the central business district, different commercial ventures came into the Uptown. Gradually, from the 1940s, the structures that once housed Chinese merchandise stores, noodle parlors, rooming houses, and residences were replaced mostly by car dealers. The fire department demolished all the structures in Chinatown below Mercury Street in 1945, and today only two Chinese commercial buildings remain to recall this once vibrant part of Butte’s history: the Wah Chong Tai Company Buildings, and the Pekin Noodle Parlor.

Despite changes in the Chinatown section of Uptown, the rest of the commercial structures in the central business district remain largely intact. Commercial buildings that housed Butte’s businesses were a barometer of activity in the mining industry. The buildings that remain in Uptown Butte represent the vicissitudes of the industry and evidence the city’s growth. Given the role that the mining industry has played in Butte’s history, it is essential to place that role in perspective to determine how it effects Butte’s current situation and what new factors have or may supplant its influence in the future.

View looking into the Berkeley Pit.
Current Situation

The influence of the mining industry on Uptown Butte is considerably less than it was in the past. And yet there exists in the minds of many Butte citizens a perception that the mine’s influence is much greater than it actually is. This perception is historically rooted and is perpetuated by the physical presence of the mining industry, population decline, and unemployment. For instance, statistics do not support the popular belief that Butte’s population once surpassed 100,000. The population peaked in 1920 with 60,313 people, and it has declined at a varying rate over the last 50 years. Because the population was directly tied to the price of copper and the success with which it was extracted, even small fluctuations in price and output were reflected in the local employment figures. These fluctuations and the inflated population count created a false picture of Butte’s current situation vis-à-vis its “boom town” history. And although the present population, 36,064, is approximately 60% of its 1920 high, the rate of decline has abated and reflects a broadened economic base and a decreasing reliance on the mining industry.

Since 1974, 1,600 jobs have been lost in the mining sector. The loss of these positions has been felt in the construction, trade, service, and retail sectors where an additional 400 jobs were lost.* Despite these losses, since 1976 the unemployment rate has dropped from 9.4% to approximately 8.0%. This decrease is related to a broadening economic base. Employers not directly related to the mining industry in Butte include Montana Power Company, the Mountain Bell Company, Stauffer Chemical, Montana Energy Research and Development Institute, The National Center for Appropriate Technology, Safeway, and Montana College of Mineral Science and Technology. As these employers expand and develop, their impact on Butte will increase, and the Butte Local Development Corporation and Butte-Silver Bow Government are actively working to attract new business investments into the area to provide additional fiscal stability to the local economy.

Following the national trend for increasing employment in the professional, managerial, and clerical sectors, Butte’s 1985 projections for these categories show growth. All the key indicators for income, employment, and business development in Butte show that economic stability is very likely. While Butte will not experience another “boom town” expansion, it does have the potential to undergo a gradual controlled growth. However, factors such as high energy and transportation costs will impose limitations on that growth.

Other demographic factors, including population age, household size, and income levels help to establish a clearer picture of Butte’s future and provide a data base for planning. The age distribution in Butte-Silver Bow County is higher than are state or national figures. The median age in Butte-Silver Bow is 30.2 years old as compared with 27.1 for the state as a whole. This relatively high median age is a good indicator for determining service needs and specialized demands in the retail and housing markets.

It is anticipated that in Silver Bow County the average household size will gradually decrease from 3.01 persons in 1970 to 2.7 persons by 1995. Presently, there are approximately 15,168 households in Silver Bow County. With the trend toward a shrinking per household occupancy, changes in market demands will occur because income distribution will change. For instance, households headed by single or elderly persons often reflect a limited income. On the other hand, a smaller household size may also indicate two wage earners, fewer children, and thus a large disposable income. Such factors require close monitoring.

When adjusted for inflation, projected income levels in Butte-Silver Bow on a per household and per capita basis show a slow but positive increase over the next fifteen years. The average household income in the Butte-Silver Bow market area for 1980 is $12,131, and is projected to reach $15,768 (in adjusted dollars) by 1995. Average per capita incomes show similar gradual increases, from $3,112 in 1970 to $5,840 in 1995. Taken together, these two sets of figures indicate a trend of economic stability, even with inflation.

Another important factor to be considered in Butte’s future, especially regarding industrial development, is its geographic location and transportation access. Montana is forty-third out of the fifty states in transportation costs to major markets, and its location in a sparsely populated mountain region makes it difficult for Montana to compete with other more centrally located states. Yet, for a city its size, Butte has a well-developed transportation system and is located at the juncture of two interstate highways. Interstate 90 running east and west and Interstate 15 running north and south provide good highway access to the city for tourism and shipping.

The Bert Mooney Silver Bow County Airport, four miles south of Butte, provides air service through Northwest Orient, Western intermittent commuter service, and charter companies. Rail freight service is provided by the Burlington Northern and Union Pacific railroads, and the Butte-Anaconda and Pacific Railroad serves local industry.

Bus service is offered through Intermountain and Greyhound lines, each of which provides interstate transit and package services, as well as connections to other major lines.

* Facts relative to the present situation and projections for the future were assessed prior to the closing of the smelter in Anaconda in September of 1980.
Economic Opportunities For The Private Sector

Having determined Butte's general demographic characteristics and its physical historic resources, the HCRS team targeted four market areas for analysis in terms of present conditions, investment potential, and re-use feasibility for historic structures in Uptown Butte. Specific case studies were developed for several buildings to demonstrate their cost-effective rehabilitation under the historic preservation provisions of the Tax Reform Act of 1976.

Although Butte historically served as a regional market center, in recent years other Montana cities have grown substantially and are able to provide services for residents outside their immediate market areas. As a result Butte has lost its hold on the region. However, Butte is in a stable growth pattern and can recapture some of the lost markets.

Retail Market Analysis

Initial statistics on Butte's 7-county retail market area are positive. By 1995 the primary market area, a 45 minute point-to-point driving radius from Butte (modified to reflect topographic barriers, transportation access, and competing retail centers), will reach a population of over 100,300, or over 37,170 households. Although the number of households will have increased from the 1980 figure of 15,168, there will be a decline in the number of persons per household from 2.9 in 1980 to 2.7 by 1995. This statistic is consistent with national trends.

A random telephone survey of 400 families in the retail market area indicated Butte is still a strong regional center for most shopping and services, including shopper's goods—higher cost items for which the buyer does not shop regularly, e.g., clothing, furniture, and appliances—and convenience goods. From these various statistics one can assume the retail market in Butte is good and could be developed. The focus for this study is to suggest how that growth can best occur in the historic Uptown district and what factors will affect that possibility.

Uptown is a center for banking and government and does not successfully compete with commercial strip developments and the suburban mall, but it does have a viable retail center. However, poor selection of goods and inconvenient parking detract from its position as a retail center. Improving the physical environment and offering a wider selection of moderately priced, quality goods would work to improve the image of Uptown and would help to draw shoppers back into the historic area. To effect a transition in retail activity, Uptown should focus on the development of specialty shops, which are not usually available in regional shopping malls. The immediate market for goods and services offered by these shops would be the approximately 5,000 employees working in Uptown. Most of the physical improvements would require little more than a general clean-up and upgrading of storefronts and sidewalks. An improved physical environment and a wider selection of goods to attract shoppers into the area could demonstrate a strengthened consumer movement and would be advantageous in attracting new commercial and business ventures.
But the demand for retail space, the type of space, and appropriate marketing techniques must be carefully considered. Some quality retail goods are available in the market area, but many dollars are being spent on a variety of quality merchandise outside the market area in Missoula, Helena, Billings, Bozeman, and as far away as Spokane, Washington. This seems to indicate that new retail development in Uptown should consider quality goods and should look to the changing nature of the market to determine what types of goods should be offered. For instance, many current businesses in Uptown fail to capture the young professional market. As a result, many of these individuals with strong buying power are shopping outside the immediate retail area. Thus, chances for Uptown retail success could be increased if development could address the unmet market needs evident in the retail shopping survey.

To more effectively compete with strip development and malls, the Uptown retail center should be thought of as a whole, and a marketing strategy should be developed to capitalize on strengths. For instance, the Uptown merchants could market themselves in a manner similar to a mall. Mall lease requirements mandate adherence to specific regulations in a mall setting, such as merchandising, advertising, and maintaining store hours and communal space. Voluntary cooperative efforts by Uptown businessmen and the city could work to a similar end by providing parking and maintenance for the Uptown area, unifying marketing and advertising schemes, and developing similar store hours.

In addition to existing retail space, approximately 1,000,000 gross leasable footage (GLF), in the market area, it is estimated that a demand for over 1,314,000 square feet of additional retail space exists. It is reasonable to assume that Uptown could capture 10% of the existing demand, which represents approximately 131,400 square feet of retail space in Butte. Even if retail development occurs at other locations throughout the market areas, which in all probability will occur, it is possible for Uptown to accommodate at least 130,000 square feet of additional retail space.

Housing Market Analysis

The dense residential use pattern in Butte is the result of the historical development of neighborhoods around mining operations. The large number of rooming houses and hotels in Uptown also demonstrates how housing needs were met historically. Much of the housing is today considered substandard by criteria established by the Department of Housing and Urban Development (HUD).

Since most people within the Butte-Silver Bow County area live close to their place of employment, a housing market area based on a 30 minute driving radius around Butte describes the potential market. The area includes Butte, all of Silver Bow County, and a portion of Deer Lodge County.

Within the Butte-Silver Bow County market area, a scarcity of housing for both low/moderate and middle income families exists. The loss of 3,000 housing units between 1960 and 1970, as a result of expansion of open pit mining operations, and a 6% decline in new housing construction since 1970 have contributed to the scarcity.*

Low/Moderate Income Housing Market

It is estimated that 20% of the households in Butte-Silver Bow meet HUD low or moderate income levels. The lowest median income households are concentrated in the Butte central business district and to the north, while the areas to the west of the central business district, the southwest, and the Flats outside the boundaries of Butte, have low dependent populations and high median incomes. The needs of the low-income group have been addressed in the Butte-Silver Bow Housing Assistance Plan. According to the plan, almost one-half of the total housing units available are considered substandard using HUD criteria.

There is a demand for additional rental units for lower income persons. Rehabilitation of existing rental units at market rates or with rental subsidies would greatly increase the choice of standard housing. Historic Preservation Tax Act benefits coupled with various low-interest loans or subsidy programs may make such rehabilitation economically feasible.

* Butte received preliminary application approval in February 1980 for a $1.7 million grant from the small cities CDBG program for housing rehabilitation in a 24 block area in the historic district.
Middle-Income Housing Market

In 1978, local housing officials identified a deficiency of 100 units for middle-income households in Silver Bow County. A decrease in yearly building permits, tight money market conditions, smaller households, and long waiting lists for rental units indicate that this need is not being met.

A residential survey conducted by HCRS also reveals a shortage of rental housing for the middle-income market. The Butte market could easily support an additional 78 units of market rental properties between the range of $150-$225 per month. With current shortage of middle-income rental units in Silver Bow County, rehabilitated apartments could be used to ease the situation. Increased residential activity in Uptown could attract commercial support services in the area.

Potential for Uptown Butte

Housing in Uptown will appeal to several markets. The large elderly population in Butte represents individuals to whom Uptown residences may be particularly suited. Their needs for maintenance-free space, lower rents, and convenient shopping can be met in Uptown. Those who work in Uptown might also find the convenience and amenities of the area desirable. As energy considerations become more significant in the future, forcing commuting costs upward, the appeal for housing close to employment will make Uptown living an attractive and practical choice for a wider range of people.

Case Study—The Stephens' Block

The first floor of the Stephens' Block is currently occupied by a high quality gift store and a men's hairdresser. Because there are two thriving businesses on the ground floor, the HCRS case study does not include rehabilitation on that floor. However, costs incurred by a developer to convert the storefronts to a condition that meets the Secretary of the Interior's "Standards for Rehabilitation" would be eligible for the benefits of the Tax Reform Act of 1976. The HCRS team proposed rehabilitating the upper floors of the Stephens' Block as apartments suited to a small and very specific market.

The apartments are light and spacious (average size: 689 square feet) one-bedroom units, which could appeal to young professionals who want modern appliances and conveniences available in units on the Flats but appreciate the ambience and amenity of living in an older building in Uptown. A "pro forma" economic analysis for the Stephens' Block was computed using loans at 1979 market rates and renting units to residents without subsidies. Using those assumptions, the HCRS team found that a developer could realize a positive cash flow by charging $250 a month rent, which is competitive with rents charged on the Flats.

Furthermore, it should be remembered that a project such as the Stephens' Block rehabilitation could qualify for a HUD 312 (3% interest/20 year term) loan, which would significantly reduce the debt service.* A developer could also package the project as a HUD Section 8 substantial rehabilitation project. This would require a different architectural scheme, but the developer could collect subsidized rents up to $342 per month rent for such apartments.

All work proposed on the upper two floors of the Stephens' Block meets the Secretary of the Interior's "Standards for Rehabilitation." Interior space has been modified; however, the interior detailing such as the casing around the windows and doors, the wainscoting, and the ornate balustrade in the corridors, has been retained.

* President Reagan has recommended the HUD 312 Loan Program be eliminated. The proposal is awaiting legislative action.
Pro Forma Analysis

STEPHENS' BLOCK APARTMENTS
8,170 gross sq. ft. @ $18.25/sq. ft. $149,102.50

Total gross footage construction costs $149,102.50
Developer's Contingency @ 10% 14,910.25
CONSTRUCTION COSTS 164,012.75

Architect & Engineer fees @ 8% of construction costs $13,121.02
Insurance @ 1% 1,640.13
Taxes @ $3.36/$100 assessed value of $8,920.00 149.86
Developers overhead at 0% (marketing, legal, etc) .00
NON-CONSTRUCTION COSTS $14,911.01

FINANCE
(3.0096 service charge & 12.00% interest for 6 months)

TOTAL DEVELOPMENT COSTS $193,684.91
PLUS Purchase Price .00
TOTAL PROJECT COSTS $193,684.91

Project costs = $193,684.91/8170 sq. ft = $23.71/sq. ft.

Before Tax Cash Flow Projections

STEPHENS' BLOCK APARTMENTS
6,890 sq. ft. @ $4.20/sq. ft. $28,938.00

ANNUAL GROSS RENTS $28,938.00
LESS vacancies at 5% 1,446.90
NET RENTS 27,491.10

LESS real estate taxes @ $3.36/$100 assessed value 2,688.00
LESS operating expenses @ 20% of gross rents 5,787.60
LESS management, leasing, promotion, etc @ 1% of gross rent 289.38
ANNUAL NET INCOME $18,726.13

Capitalized @ 10.75% = $174,196.50
Loan @ 80.00% 139,357.19

LESS debt service (12.00% for 25 yrs) (annual payment is 12.75% of loan) $17,768.04
BEFORE TAX CASH FLOW 958.09

Annual gross rents/net leasable area = $4.20 average rent/sq. ft.

Tax Savings Without the Tax Reform Act Benefits

<table>
<thead>
<tr>
<th>Year</th>
<th>Before Tax Cash Flow</th>
<th>Plus Mortgage Amortization</th>
<th>Less Depreciation</th>
<th>Taxable Income</th>
<th>Less Taxes @ 48%</th>
<th>After Tax Cash Flow</th>
<th>Additional Income Sheltered</th>
<th>Total Tax Free Income</th>
<th>Total Taxes Saved @ 48%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>958</td>
<td>1,045</td>
<td>9,457</td>
<td>-7,453</td>
<td>0</td>
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<td>7,453</td>
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<tr>
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<td>6,657</td>
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</table>
### Tax Savings Using Substantial Rehabilitation of the Tax Reform Act
*(200% Accelerated Depreciation on Adjusted Basis After Construction)*

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
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<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6</th>
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<tbody>
<tr>
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<td>958</td>
<td>958</td>
<td>958</td>
<td>958</td>
<td>958</td>
</tr>
<tr>
<td>PLUS Mortgage Amortization</td>
<td>1,045</td>
<td>1,171</td>
<td>1,311</td>
<td>1,468</td>
<td>1,645</td>
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<td>0</td>
<td>0</td>
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<tr>
<td>AFTER TAX CASH FLOW</td>
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<td>958</td>
<td>958</td>
<td>958</td>
<td>958</td>
<td>958</td>
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<tr>
<td>Additional Income Sheltered</td>
<td>16,910</td>
<td>14,732</td>
<td>12,761</td>
<td>10,972</td>
<td>9,341</td>
<td>7,847</td>
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<td>7,531</td>
<td>6,585</td>
<td>5,726</td>
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<td>4,227</td>
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### Tax Savings Using 5-Year Write-Off Provision of the Tax Reform Act

<table>
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<tr>
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<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6</th>
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<tr>
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<td>958</td>
<td>958</td>
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<td>958</td>
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<tr>
<td>PLUS Mortgage Amortization</td>
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<td>1,311</td>
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<td>1,842</td>
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<td>LESS Improvement Amortization</td>
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<td>32,445</td>
<td>32,445</td>
<td>32,445</td>
<td>0</td>
</tr>
<tr>
<td>LESS Depreciation</td>
<td>1,500</td>
<td>1,500</td>
<td>1,500</td>
<td>1,500</td>
<td>1,500</td>
<td>1,500</td>
</tr>
<tr>
<td>Taxable Income</td>
<td>-31,941</td>
<td>-31,816</td>
<td>-31,676</td>
<td>-31,518</td>
<td>-31,342</td>
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<tr>
<td>LESS Taxes @ 48%</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>624</td>
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<td>958</td>
<td>958</td>
<td>958</td>
<td>958</td>
<td>334</td>
</tr>
<tr>
<td>Additional Income Sheltered</td>
<td>31,941</td>
<td>31,816</td>
<td>31,676</td>
<td>31,518</td>
<td>31,342</td>
<td>0</td>
</tr>
<tr>
<td>Total Tax Free Income</td>
<td>32,900</td>
<td>32,774</td>
<td>32,634</td>
<td>32,476</td>
<td>32,300</td>
<td>334</td>
</tr>
<tr>
<td>Total Taxes Saved @ 48%</td>
<td>15,792</td>
<td>15,732</td>
<td>15,664</td>
<td>15,589</td>
<td>15,504</td>
<td>160</td>
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</table>

* Mortage amortization is separate from, and should not be confused with, the amortization of Section 2124 of the Tax Reform Act of 1976. In the annual income stream table the total debt service (interest + principle of the mortgage) is subtracted from the annual net income to find the before-tax cash flow. For income tax purposes, only the interest is deductible. As more of the mortgage is retired each year, this amortization figure increases.

As the tax aspects of Section 2124 of the Tax Reform Act are complex, individuals should consult legal counsel, tax advisors, or a local Internal Revenue Service office for assistance in determining the tax consequence of any development project. Descriptions of tax benefits in this demonstration are for general information purposes only.

* Figures based on 1979 constant dollars.
Office Market Analysis

Within Silver Bow County, the concentration of office space is in Butte. Most office space needs are currently being met in Uptown or in strip developments on the outskirts of Butte, with very little building occurring outside Silver Bow County. Because Butte is a major city in Montana and in the region, the office demand is fairly substantial. County and district government offices and several major corporate offices are located in Butte. Among these are the Anaconda Copper Company, Western Energy, Montana Power Corporate Offices, and the Montana Energy Research and Development Institute. Doctors, lawyers, associations, real estate companies, and title abstract companies also have offices in Uptown. Many industry-related and government offices are currently rehabilitating office space in Uptown, and low acquisition costs and access to other services make the area attractive.

Supply and Demand

In historic Uptown, there are approximately 905,200 existing square feet of office space. Of that, 86,182 square feet is currently vacant or underused. By 1985, there will be a minimum demand for 92,400 to 105,000 square feet of office space in Silver Bow County. (This demand was determined by reviewing employment trends and their corresponding office space requirements. By using 110 to 125 square feet per office employee, a conservative estimate of demand was determined.) Growth in the number of professional, technical, and managerial positions, and jobs in the service sector account for much of the increase.

In addition to space requirements, modern offices must offer specific design configurations, services, and amenities. Modern or rehabilitated offices require quality space with design and climate control features comparable to new development. It is also important that office development be convenient to other business, financial and governmental offices. Access to low-cost or free parking and to interstate and airport facilities is essential.

Potential Office Development in the Historic Uptown

Uptown is the business center of Butte-Silver Bow, and many businesses locating in Uptown would be within walking distance of banks and the architectural variety and scale of the buildings in Uptown give Butte an urban quality.
courthouse. Plans are currently being developed by the city to insure adequate parking for employees and shoppers. Because Uptown is a National Historic Landmark, by law, governmental offices should locate in an historic structure, if such usable space exists. Uptown has the capabilities of providing necessary amenities for office development should the area attract new industries. These factors, combined with the substantial historic preservation tax incentives of the Tax Reform Act of 1976, make Uptown the most appealing center for new office location in Silver Bow County.

Table. Demand For Additional Square Footage By Category By 1985 (using 110 to 125 square feet per office employee)*

<table>
<thead>
<tr>
<th>Category</th>
<th>125</th>
<th>110</th>
</tr>
</thead>
<tbody>
<tr>
<td>Professional/Technical</td>
<td>22,500</td>
<td>19,800</td>
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<tr>
<td>sq. ft.</td>
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</tr>
<tr>
<td>Manager/Office</td>
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<td>Sales</td>
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<tr>
<td>Clerical</td>
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<td>-5,060</td>
</tr>
<tr>
<td>Crafts</td>
<td>-1,750</td>
<td>-1,540</td>
</tr>
<tr>
<td>Services</td>
<td>6,125</td>
<td>5,390</td>
</tr>
<tr>
<td>TOTAL</td>
<td>105,000</td>
<td>92,400</td>
</tr>
</tbody>
</table>

* Employment figures for Silver Bow, 1970 from County Profiles Division of Research and Information/Systems, Montana Department Community Affairs; 1985 Employment Figures from CDA, Helena.

Case Study—Carpenters’ Union Hall

There are historic buildings in Uptown that offer prime office space. Many of these structures are in sound condition and could be rehabilitated at minimum cost. The Carpenters’ Union Hall across the street from the courthouse is vacant and could serve a mixed use of lawyers’ offices on the second and third floors with a retail use and possibly a restaurant to capture trade from the employees of the courthouse on the ground floor.

The building could be rehabilitated to provide quality offices at rents competitive with others in the area, especially considering the building’s prime location. It should be noted that rehabilitation costs include the relatively expensive work of bringing the building up to seismic code.

The HCRS “pro forma” economic analysis shows that the Carpenters’ Union Hall can be rehabilitated to meet contemporary office standards and can compete in rents with quality office space elsewhere in Butte. Quality office space is currently being rented on the Flats in relatively new buildings for between $7.00 and $11.00 per square foot per year. Including the addition of a new elevator, the rehabilitation project would entail $286,677 in construction costs and $370,978 in total development purchase costs. By collecting $7.00 per square foot per year rent, a developer would show—after operating costs and debt service were...
paid—a before-tax cash flow of $4,283 per year. Additionally, by employing the five-year amortization provision of the Tax Reform Act of 1976, a developer could shelter approximately $58,000 a year for the first five years of the project (1979 dollars plus interest).

The work proposed must meet the Secretary of the Interior’s “Standards for Rehabilitation,” in order to qualify for historic preservation tax benefits under the Tax Reform Act of 1976. There are virtually no interior components to the Carpenters' Union Hall that contribute to its significance; therefore, interior spaces could be modified to meet new office needs without losing Tax Act certification. The exterior is in good condition and no major modifications would be required except those needed for seismic code specifications. Because there is space available next to the building, the HCRS proposal calls for exterior thrust buttresses to stabilize the structure. These will create additional space in the building for circulation and services. While these thrust buttresses modify the exterior, they are allowable under the Secretary of the Interior’s “Standards for Rehabilitation” because they are necessary to bring the building up to current seismic life/safety codes.

**Carpenters' Union Hall**

Gross Square Feet:

3,606 sq. ft. each of three floors = 10,818

Net Leasable Areas

<table>
<thead>
<tr>
<th>Floor</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st floor</td>
<td>3,265</td>
</tr>
<tr>
<td>2nd floor</td>
<td>3,200</td>
</tr>
<tr>
<td>3rd floor</td>
<td>3,315</td>
</tr>
<tr>
<td>Total Net</td>
<td>9,780 sq. ft.</td>
</tr>
</tbody>
</table>

Construction includes

- Mechanical
- Electrical
- Plumbing
- Structural
  (Seismic)
- Elevator
Pro Forma Analysis

CARPENTERS' UNION HALL
10,818 gross sq. ft. @ $26.50/sq. ft. $286,677.00

Total gross footage construction costs $286,677.00
Developer's Contingency @ 10% $28,667.70
CONSTRUCTION COSTS $315,344.70

Architect & Engineer fees @ 8% of construction cost $25,227.57
Insurance @ 1% 3,153.45
Taxes @ $3.36/$100 assessed value of $11,900.00 199.92
Developer's overhead at 10% (marketing, legal, etc) 31,534.47
NON-CONSTRUCTION COSTS $60,115.41

FINANCE $28,381.03
(3.00% service charge & 12.00% interest for 6 months)

TOTAL DEVELOPMENT COSTS $403,841.13
PLUS Purchase Price $32,500.00
TOTAL PROJECT COSTS $436,341.13

Project costs = $436,341.13/10,818 sq. ft. = $40.33/sq. ft.

Before Tax Cash Flow Projections

CARPENTERS' UNION HALL

First Floor @ 3,265 sq. ft @ $8.25/sq. ft. $26,936.25
Second Floor @ 3,200 sq. ft. @ $7.75/sq. ft. 24,800.00
Third Floor @ 3,315 sq. ft. @ $7.00/sq. ft. 23,205.00

ANNUAL GROSS RENTS $74,941.25
LESS vacancies at 5% 3,747.06
NET RENTS $71,194.19

LESS real estate taxes @ 13.36/$100 assessed value $3,192.00
LESS operating expenses@ 25% of gross rents 18,735.31
LESS management, leasing, promotion etc @ 5% of gross rent 3,747.06
ANNUAL NET INCOME $45,519.81

Capitalized @ 10.50% = $433,522.00
Loan @ 80.00% $346,817.56

LESS debt service (12.00% for 25 yrs) $44,219.23
(annual payment is 12.75% of loan)
BEFORE TAX CASH FLOW $1,300.59

Annual gross rents/net leasable area = $7.66 average rent/sq. ft.
### Tax Savings Without Tax Reform Act Benefits

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before Tax Cash Flow</td>
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<td>1,301</td>
<td>1,301</td>
<td>1,301</td>
<td>1,301</td>
<td>1,301</td>
</tr>
<tr>
<td>PLUS Mortgage Amortization</td>
<td>2,601</td>
<td>2,913</td>
<td>3,263</td>
<td>3,654</td>
<td>4,093</td>
<td>4,584</td>
</tr>
<tr>
<td>LESS Depreciation</td>
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<td>18,654</td>
<td>18,654</td>
<td>18,654</td>
<td>18,654</td>
<td>18,654</td>
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<tr>
<td>Taxable Income</td>
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<td>0</td>
<td>0</td>
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<td>0</td>
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<tr>
<td>AFTER TAX CASH FLOW</td>
<td>1,301</td>
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<td>1,301</td>
<td>1,301</td>
<td>1,301</td>
<td>1,301</td>
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<tr>
<td>Additional Income Sheltered</td>
<td>14,752</td>
<td>14,440</td>
<td>14,090</td>
<td>13,699</td>
<td>13,260</td>
<td>12,769</td>
</tr>
<tr>
<td>Total Tax Free Income</td>
<td>16,052</td>
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<td>Total Taxes Saved @ 48%</td>
<td>7,705</td>
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<td>7,388</td>
<td>7,200</td>
<td>6,989</td>
<td>6,753</td>
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### Tax Savings Using Substantial Rehab Provisions of the Tax Reform Act (150% Accelerated Depreciation on Adjusted Basis after Construction)

<table>
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<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6</th>
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</thead>
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<tr>
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<td>1,301</td>
<td>1,301</td>
<td>1,301</td>
<td>1,301</td>
<td>1,301</td>
<td>1,301</td>
</tr>
<tr>
<td>PLUS Mortgage Amortization</td>
<td>2,601</td>
<td>2,913</td>
<td>3,263</td>
<td>3,654</td>
<td>4,093</td>
<td>4,584</td>
</tr>
<tr>
<td>LESS Depreciation</td>
<td>27,980</td>
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<td>23,619</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<tr>
<td>AFTER TAX CASH FLOW</td>
<td>1,301</td>
<td>1,301</td>
<td>1,301</td>
<td>1,301</td>
<td>1,301</td>
<td>1,301</td>
</tr>
<tr>
<td>Additional Income Sheltered</td>
<td>24,079</td>
<td>21,493</td>
<td>19,055</td>
<td>16,745</td>
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<td>12,433</td>
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<td>Total Tax Free Income</td>
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<td>Total Taxes Saved @ 48%</td>
<td>12,182</td>
<td>10,941</td>
<td>9,771</td>
<td>8,662</td>
<td>7,605</td>
<td>6,592</td>
</tr>
</tbody>
</table>

### Tax Savings Using 5-Year Write-Off Provision of the Tax Reform Act

<table>
<thead>
<tr>
<th></th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
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<tbody>
<tr>
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<tr>
<td>Taxable Income</td>
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<td>-59,792</td>
<td>-59,442</td>
<td>-59,051</td>
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</tr>
<tr>
<td>Additional Income Sheltered</td>
<td>60,104</td>
<td>59,792</td>
<td>59,442</td>
<td>59,051</td>
<td>58,612</td>
<td>0</td>
</tr>
<tr>
<td>Total Tax Free Income</td>
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<td>28,969</td>
<td>28,758</td>
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</table>

* Mortgage amortization is separate from, and should not be confused with, the amortization of Section 2124 of the Tax Reform Act of 1976. In the annual income stream table the total debt service (interest + principle of the mortgage) is subtracted from the annual net income to find the before-tax cash flow. For income tax purposes, only the interest is deductible. As more of the mortgage is retired each year, this amortization figure increases.

As the tax aspects of Section 2124 of the Tax Reform Act of 1976 are complex, individuals should consult legal counsel, tax advisors, or a local Internal Revenue Service office for assistance in determining the tax consequence of any development project. Descriptions of tax benefits in this demonstration are for general information purposes only.

* Figures based on 1979 constant dollars.
Case Study—Curtis Music Hall

Another structure that lends itself to a mixed office/retail use is the Curtis Music Hall on West Park Street. The building has been occupied almost continuously on the first floor, but upper floors have been vacant for years. Distinctive interior features include between-floor stairways with ornate wood detailing. Running along the longitudinal axis of the roof is a skylight that allows sunlight through to all three upper floors.

Curtis Music Hall (1892).

Unlike the Carpenters' Union Hall, which originally was an office and meeting facility, the Curtis Music Hall was a single-room occupancy boarding house and music hall. Because it is long and narrow, with skylit double-loaded corridors (offices on either side of hallway), it is not easily adaptable to new uses. By retaining the skylit space, however, exceptional offices can be created. A single firm could occupy a floor, using the large public open space for a reception area, or smaller firms could use single or multiple rooms along the corridor, sharing the special qualities of the atrium.

By leaving the floor plans essentially as they are, rehabilitation costs can be minimized. The only costs, then, would be cosmetic cleaning, painting, carpeting, and code work. If the structure is unchanged, according to the revisions in the 1979 Uniform Building Code, the building will not have to meet seismic code. However, an engineer may recommend that the building be structurally rehabilitated because of the suspected lack of resistance to shear loading in the front facade at the first floor level. In anticipation of this possibility, the HCRS “pro forma” economic analysis includes structural rehabilitation, specifically a shear wall near the front of the building, and exterior thrust buttresses in the light well to the west. The HCRS “pro forma” also includes the cost of a new elevator to serve the upper floors.

If the offices were rented to small firms, the Curtis Music Hall project would show a positive cash flow at rents of $8.25 per sq. ft., competitive with the $7.00–11.00 per sq. ft. rents on the Flats. Because of the skylight, atrium and elaborate wood detailings, offices in the Curtis Music Hall would have a special quality unequaled on the Flats and probably in Uptown. The proposed rental has been calculated at the $8.25 per sq. ft. rate; but, if a single firm were to rent an entire floor, eliminating some of the public corridor space and increasing the net leasable area, the same income would be derived at rental rate of $7.25 per sq. ft.

The layout of the upper floors of the Curtis Music Hall is characteristic of other Butte boarding houses built around the turn of the century.
Pro Forma Analysis

CURTIS MUSIC HALL
15,108 gross sq. ft. @ $29.50/sq. ft. $445,686.00

Total gross footage construction costs $445,686.00
Developer’s Contingency @ 10% 44,568.59
CONSTRUCTION COSTS $490,254.59

Architect & Engineer fees @ 8% of construction cost 39,220.37
Insurance @ 1% 4,902.55
Taxes @ $3.36/$100 assessed value of $9,000.00 151.20
Developer’s overhead at 8% (marketing, legal, etc) 39,220.37
NON-CONSTRUCTION COSTS $83,494.49

FINANCE
(3.00% service charge & 12.00% interest for 6 months) $44,122.92

TOTAL DEVELOPMENT COSTS $617,872.00
PLUS Purchase Price .00
TOTAL PROJECT COSTS $617,872.00

Project costs = $617,872.00/15,108 sq. ft. = 40.90/sq. ft.

---

Before Tax Cash Flow Projections

CURTIS MUSIC HALL
11,283 sq. ft. @ $8.25/sq. ft. $93,084.75

ANNUAL GROSS RENTS $93,084.75
LESS vacancies at 5% 4,654.24
NET RENTS $88,430.52

LESS real estate taxes @ $3.36/$100 assessed value 5,544.00
LESS operating expenses @ 20% of gross rents 18,616.95
LESS management, leasing, promotion, etc @ 4% of gross rent 3,723.39
ANNUAL NET INCOME $60,546.18

Capitalized @ 10.75% = $563,220.25
Loan @ 80.00% 450,576.19

LESS debt service (12.00% for 25 yrs) $57,448.45
(annual payment is 12.75% of loan)
BEFORE TAX CASH FLOW $3,097.73

Annual gross rents/net leasable area = $8.25 average rent/sq. ft.
### Tax Savings Without the Tax Reform Act Benefits

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before Tax Cash Flow</td>
<td>3,098</td>
<td>3,098</td>
<td>3,098</td>
<td>3,098</td>
<td>3,098</td>
</tr>
<tr>
<td>PLUS Mortgage Amortization</td>
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<td>3,785</td>
<td>4,239</td>
<td>4,748</td>
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<td>3,098</td>
<td>3,098</td>
<td>3,098</td>
<td>3,098</td>
<td>3,098</td>
</tr>
<tr>
<td>Additional Income Sheltered</td>
<td>20,047</td>
<td>19,641</td>
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<td>10,453</td>
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### Tax Savings Using Substantial Rehabilitation Provision of the Tax Reform Act (150% Accelerated Depreciation on Adjusted Basis After Construction)

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before Tax Cash Flow</td>
<td>3,098</td>
<td>3,098</td>
<td>3,098</td>
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<td>3,098</td>
</tr>
<tr>
<td>PLUS Mortgage Amortization</td>
<td>3,379</td>
<td>3,785</td>
<td>4,239</td>
<td>4,748</td>
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<td>LESS Depreciation</td>
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<td>3,098</td>
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</tr>
<tr>
<td>Additional Income Sheltered</td>
<td>33,309</td>
<td>29,645</td>
<td>26,200</td>
<td>22,946</td>
<td>19,855</td>
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<td>Total Tax Free Income</td>
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### Tax Savings Using 5-Year Write-Off Provision of the Tax Reform Act

<table>
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<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before Tax Cash Flow</td>
<td>3,098</td>
<td>3,098</td>
<td>3,098</td>
<td>3,098</td>
<td>3,098</td>
</tr>
<tr>
<td>PLUS Mortgage Amortization</td>
<td>3,379</td>
<td>3,785</td>
<td>4,239</td>
<td>4,748</td>
<td>5,317</td>
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<tr>
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<tr>
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<td>-89,645</td>
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<td>-88,566</td>
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<td>3,098</td>
<td>3,098</td>
<td>3,098</td>
<td>3,098</td>
<td>3,098</td>
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<tr>
<td>Additional Income Sheltered</td>
<td>91,504</td>
<td>90,099</td>
<td>89,645</td>
<td>89,136</td>
<td>88,566</td>
</tr>
<tr>
<td>Total Tax Free Income</td>
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<td>44,734</td>
<td>44,516</td>
<td>44,272</td>
<td>43,999</td>
</tr>
</tbody>
</table>

* Mortgage amortization is separate from, and should not be confused with, the amortization of Section 2124 of the Tax Reform Act of 1976. In the annual income stream table the total debt service (interest + principle of the mortgage) is subtracted from the annual net income to find the before-tax cash flow. For income tax purposes, only the interest is deductible. As more of the mortgage is retired each year, this amortization figure increases.

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* Figures based on 1979 constant dollars.
Other buildings in Uptown, such as the Ivanhoe and the Hamilton, which are long and narrow, were once boarding houses and could be converted to quality skylit office space similar to the Curtis Music Hall.

Not all of the vacant or underused buildings in Uptown need to be adapted to new uses in the rehabilitation process. This is especially true of the existing office structures in the district. The rehabilitation of these buildings only involves bringing them up to current code levels. The best example of an office building which could be easily brought back to full vitality is the Metals Building. It was designed by Cass Gilbert (1859–1934), the architect for the Woolworth Building in New York City and the Supreme Court Building in Washington, D.C. The Metals Building is located at the corner of Park and Main, traditionally the central corridor of the commercial district. In recent years, the building had fallen into disuse because of management difficulties and only about half of the office space being occupied. The building has recently been sold, and the owner is leasing space through a realty firm.

The HCRS proposal shows the Metals Building rehabilitated to accommodate a restaurant on the first floor and office space on the other six floors. The Metals Building already has two relatively new elevators and in most cases the offices are in good condition. However, the building needs to be brought up to fire code, and plumbing, electrical work, and general cleaning need to be done. Once rehabilitated, the Metals Building will be able to supply top quality office space on Butte’s main intersection at rents below those being charged on the Flats ($6.00/yr./sq. ft. as compared to $7.00-11.00/yr./sq. ft.). The combined income from the restaurant and office rental will provide a generous income beyond expenses and debt service. Additionally, the project will provide handsome tax benefits. If the five-year amortization provision of the Tax Reform Act of 1976 is selected, the Metals Building rehabilitation will shelter approximately $150,000 a year for 5 years.

Hotel Market Analysis

The Market

Silver Bow County provides the majority of the competing hotel space in the market area. The city of Butte lies at the crossroads of Interstate Highways 90 and 15. Summer tourists frequently travel through Butte enroute to Glacier National
Park to the north and Yellowstone National Park to the south there is also a fair commercial trade hotel business. Sales people, Montana Energy Research and Development Institute (MERDI), National Center for Appropriate Technology, Montana Power Company, Anaconda Company, Montana Tech.-School of Mines, Safeway, Mountain States Telephone, 7 local financial institutions, the St. James Community Hospital and the Silver Bow Hospital, all consistently generate hotel traffic in Butte throughout the year. Traditionally, these travelers have been accommodated by a few privately owned, single structure hotels and motels. In the last 10 years, 3 modern facilities, the Best Western "War Bonnet," the Ramada Inn, and the Travelodge Copper King Inn (1980-1981) were built with the advantage of immediate interstate highway access. These facilities now serve much of the convention, business, and tourist trade in Butte.

In 1979 the hotels and motels in Butte operated with an average occupancy rate of over 75%, approximately 180,000 room nights per year. The 639 rooms in the total market area average an 82% occupancy rate, yet all the new hotel development is taking place on the outskirts of Uptown.

The construction of at least 150 new hotel rooms on the outskirts of Butte will increase the competitiveness of the hotel market in Butte. However, in analyzing the hotel supply, it is necessary to look at the range of hotel accommodations represented by the 639 rooms in the market area. Existing hotel space was analyzed to determine "most competitive," those hotels that provide amenities such as pools, conference rooms, and convention facilities. "Fairly competitive" and "least competitive" determinations indicate fewer amenities. 59% of Butte's hotel space was considered to be highly competitive.

**Demand**

Quality hotels require at least a 65% annual occupancy rate to succeed and the demand for quality hotel space in Butte is good. Indicators commonly used to determine hotel demand, such as apparent tourism, numbers and size of conventions, university and hotel traffic and growth in office employment and airport traffic, show that the need for quality hotel space will continue.

The airlines serving Butte show sizable increases in travel over the past year. For instance, boarding figures for Western Airlines for July 1979 were 48% greater than the same month the previous year. Similar trends were reported by Northwest Airlines. Most of the growth in air travel is attributed to activity generated by Butte businesses, especially by National Center for Appropriate Technology, Montana Energy Research and Development Institute (MERDI), Anaconda Company, and Montana Power Company.

Convention activity in Butte in 1979 was strong. There had been 12 conventions ranging from 250 to 1400 participants by summer 1979. In 1978, 20 conventions, ranging in size from 80 to 1200 attendees, were hosted in Butte. There is a seasonal fluctuation in convention trade; the heaviest activity occurs in the summer. Indications are that convention trade in Butte increases as the season extends into the spring and fall. It is reasonable to assume that Butte will capture a larger share of the state convention trade than it does now, as better convention facilities are developed.

Office studies have also shown a demand for an additional 92,400 square feet of office space by 1985. Much of this demand will result from Montana Power Company's 150 new employees. Montana Power, Anaconda Company, Mountain States Telephone and MERDI all have offices in Uptown, and Safeway has moved its main offices back Uptown. This new activity and the projected demand for office space, of which we assume Uptown can capture the majority, indicate Uptown will be a growing vital center for office activity. This would strengthen proposals to locate a new hotel in the Uptown adjacent to commercial, business, financial and government activity.

New hotel construction or rehabilitation in historic Uptown should be geared toward the development of a specialty hotel with convention facilities. The specialty hotel market, promoting the historic features of the city, has not been tapped. Thus, it is believed the development of hotel space with competitive amenities such as quality restaurants and conference rooms would do well in Uptown.
Comprehensive Public Improvements

For Uptown to prosper and function as a nucleus of activities and development as it once did, it is essential to analyze how the buildings and spaces worked together historically, and the new relationships and connections that can be created between buildings and spaces and to implement projects which emphasize those strengths.

When the city first developed, commercial and social activities supported each other, but as Uptown declined, the central business district became a series of disparate blocks and spaces, visually and functionally unconnected. To strengthen Uptown, blocks and spaces must be considered as individual entities and as integral components in the overall Uptown context.

There are several opportunities to make block-wide improvements in historic Uptown. In 1979, the Chief Executive of Butte's local government proposed a plan to develop historic buildings near the courthouse to serve as a civic center complex called Centennial Square. This project commemorated Butte's history in its centennial year and was a clear demonstration of the local government's support for revitalizing Uptown. Taking the city's plan, HCRS was able to develop specific proposals and to help the city execute them.

Centennial Square

The courthouse is the central feature of the complex. Built in 1910 on the site of the original Silver Bow County Courthouse, the present building captures the spirit of extravagance that characterized Butte at the turn of the century. The doors in the main entrance are copper; the spacious rotunda is lighted by a stained glass
Butte Silver Bow County Courthouse (1910).

skylight at the center of the building, and varieties of marble abound throughout the building. The courthouse is a well-maintained center of activity in Uptown.

Across from the courthouse is a small stuccoed brick house, the Jacobs House, once the home of Butte’s first mayor. Located on Montana Street, the most direct access to Uptown, the Jacobs House would make an excellent Visitors Center. Because it is between Butte’s central business district and the westside residential area with its wide assortment of turn-of-the-century architecture, the Jacobs House is perfectly situated as an orientation point for walking tours and rehabilitation and conservation information.

Behind the courthouse is the County Jail. This imposing structure visually compliments the Centennial Square Complex and is currently being rehabilitated in compliance with the Secretary of the Interior’s “Standards for Rehabilitation.”

One block north of the Jacobs House is the Christian Science Church. With the decline in population in Butte, the size of the congregation has been so reduced that it can no longer maintain such a large building. The plan proposes purchasing the building to house local government and community services. The church is in excellent structural condition and its full basement could provide office space for local government agencies not housed in the courthouse. The main floor of the church, the sanctuary, has an inclined floor and theater seats. With Butte’s strong theater tradition illustrated currently by its three active community theater groups and film society, there could be a great demand for this space.

One aspect of the Centennial Square Complex Plan has already been implemented. Butte’s old Fire Hall on Quartz Street is a half block east of the jail. The ground floor has been in use as a vehicle storage facility and the upper floor has been vacant. The team assisted by providing design and technical assistance in the rehabilitation of the building as an archives. The City of Butte received $12,500 in revenue sharing funds for insulation, wiring, smoke and burglar alarms, and general design of the interior space. A grant for $9,700 from the Montana Commission for the Humanities was awarded to the city to assemble Butte’s first comprehensive collection of local labor history materials; the Butte Historical Society, the World Museum of Mining, and the Butte Public Library have assisted in assembling city records for deposit in the archives.*

Public buildings in Centennial Square are intermingled with commercial structures. Future plans for the complex should link these civic buildings and enhance commercial activity and the Uptown environment. Vacant land on many of the Uptown blocks could be landscaped and better integrated into the streetscape for parking as increased activity Uptown creates the need. Such parking, shown in the site plan, would serve public employees; tourists using the Visitors Center;

* As of this writing, the project has almost been completed; ongoing maintenance, handicapped access, and equipment purchase are still necessary.
users of the library, archives, and courthouse; and evening visitors to the center for the performing arts. Landscaping would refine now vacant spaces and unsightly edges and also help to delineate Uptown's industrial, commercial, and residential activities.

**Edges**

The eastern edge of the central business district bounded on the north by the Anaconda mining operations, on the south by the railyards near Mercury Street, on the east by Continental Drive and on the west by Arizona Street, presents a significant problem. Commercial activity diminishes east of Arizona Street and a large percentage of vacant land and mine tailings (Appendix A-6) give an impression of a “no man’s land.” This conclusion is reinforced by the presence of the Berkeley Pit, four blocks from Arizona Street. There is a need for a physical separation of the central business district and mining operations. The mine spoils (Appendix A-6) scattered throughout the area are highly acidic and sulfurous.
A cluster of industrial structures to the north of Butte's central business district fail to define a much-needed boundary.
and, consequently, special landscaping specifications must be followed in this area. The dumps (Appendix A-6) are eroding, causing siltation in storm sewer systems nearby. Stabilization of these dumps must be included in any plans for this area. During the summer, the team worked with a volunteer landscaping/reclamation committee to assist the Butte-Silver Bow County government and the Anaconda Company to improve the area between the mine and the central business district. Individuals from the Bureau of Land Management, the U.S. Forest Service, Montana Energy Research and Development Institute, and the Heritage Conservation and Recreation Service worked in an unofficial capacity on this committee.

Suggestions for improving this area include stabilizing the dumps, landscaping them, and improving and developing them for parking space, recreational areas, and other appropriate community uses. It appears unnecessary to clear the dumps since the contaminants are deep in the soil. The dumps could be stabilized by normal Anaconda Copper Mining Company methods, graded and then landscaped with subgrade planters to provide an attractive visual barrier between the dump area and the Uptown. There are already several garden plots in the uncontaminated section of the dump area and new plots would complement additional landscaping.

It is unlikely that Butte could support another high maintenance green space or park area. A low maintenance exercise or jogging course and a multi-use, all-season recreation area, which provides a sled run and dirt bike track built on large tailing piles and an ice skating/roller skating rink facility are more economically feasible. With such improvements, the walking tour of historic Uptown could be expanded to include a bicycle tour of sites in the study area such as the Berkley Pit, the Belmont Mine, and the Helsinki Bar.

Entries

Just as there is a need to solve the problems of empty spaces and poorly defined edges throughout the central business district, improved access and entrance into Uptown could enhance the visual perception as well as the function of the area.

For example, when one drives up Arizona Street, the single greatest carrier of traffic into the central business district, the warehouse district and the 1930s Silver Bow Homes are well defined as viable support areas to the central business district. However, once past the Silver Bow Homes, a two-block stretch characterized by car lots and abandoned buildings separates the residential area from the central business district. These buildings should be rehabilitated or “mothballed” (See Preservation Considerations section for “moth-balling” techniques) and trees should be planted on the east side to define the edge.

South Montana Street is the second largest thoroughfare into the central business district and defines the edges of the central business district at the corner of Silver and Montana Streets where two churches form a gateway. Montana Street could be improved by rehabilitating residences and commercial buildings along its route and by adding signs at the bottom of Montana Street hill to indicate the entry to historic Uptown Butte.

Entering the central business district from East Park Street, one drives along the western edge of the Berkley Pit before turning into the central business district. The buildings on the south side of Park, except for two underused commercial structures, are vacant. The north side of Park has a mix of occupied, as well as unoccupied,
deteriorated commercial and residential structures. Upon reaching Arizona Street, where Park Street becomes one-way from the west, one encounters one-way signs, even though the apparent edge of the central business district is still one block away. The result is a feeling of being detoured from Uptown before reaching it. By beginning the one-way traffic flow at Wyoming instead of Arizona, maintaining natural vegetation along the vacant spaces, and by "mothballing" or rehabilitating the remaining buildings along East Park, direct access to the central business district would be provided, and the space around it would be better defined.

The last important access street into the central business district is Main Street. While Main does not provide convenient access from either the Interstate or the Harrison Avenue strip, it is an important route from Front Street and the neighborhoods south of the central business district, and it is the main route to the central business district from the residential neighborhoods of Walkerville and Centerville to the north. Driving up Main one goes through several significant historic commercial neighborhood areas, whose presence could be improved through rehabilitation.
However, once past Butte High School, one enters the southern fringe of the central business district where vacant and/or deteriorated historic buildings and vacant lots predominate. The block between Silver and Mercury is the most unsightly. This visual condition could be improved by rehabilitating or "mothballing" the structures on the west side of Main. North Main, between the central business district and Centerville, is an interesting drive, which offers a variety of historic housing types and an excellent view of several headframes and related mining activities. However, as one approaches the northern edge of the central business district, vacant land and parking lots detract from the visual cohesion of the central business district. It is suggested that a parking and landscaping scheme similar to that for Centennial Square be implemented for this portion of North Main, thereby providing a much needed sense of definition for the northern edge of the central business district.

Intersection of Arizona and Park Streets. Initiating one-way traffic one block west would create better access to the central business district.

Subsidence Zone

The subsidence zone, a significant neighborhood area for the historic district, also affects the central business district. Because of the effects of mining in the area during the 1940s, the ground is subjected to subsidence or sinking. Many who own buildings in the zone signed waivers releasing Anaconda Mining Company from liability resulting from subsidence, and banks have been reluctant to make loans for new construction in the area. It now appears, however, that subsidence has ceased, and many of the homes remain structurally sound and could be rehabilitated to provide decent housing. Urban renewal (clearance and new construction) or clearance for a mobile home park, as some plans have suggested, does not seem to be the most advantageous use of the zone's resources.

The Emma Mine site, a vacant city block area between the central business district and the subsidence zone, needs some treatment to eliminate the sense of abandonment between the central business district and the subsidence zone. Suggestions for improving the area include making it into an urban park or a recreational vehicle camp site. Decisions regarding the site should include a careful analysis of the projected reuse to insure the site will be a year-around amenity to the community.
Preservation Concerns

By looking at buildings and spaces in Uptown, HCRS was able to define some of the widespread problems that exist and to suggest some reasonable solutions. An overview of the condition and occupancy of all Uptown buildings helped the team to uncover the reasons for the problems and to seek feasible solutions. The difficulties in Uptown are accentuated by popular attitudes citizens hold about their community. For instance, abandoned and neglected buildings, charred structures, vacant lots, and a lack of signs to direct visitors to Uptown give the impression that nothing is happening there—that Uptown is abandoned, burned, and lost to visitors as well as to residents. Taking effective measures to deal with these problems could insure a more stable future for Butte. The following sections outline and describe some of the measures: “mothballing” buildings, fire control, application of the Tax Reform Act of 1976, energy conservation, and new construction.

“Mothballing”

A significant problem associated with underused buildings is the image of decline and decay their presence imparts to the surrounding community. Because full use of all Uptown buildings is unlikely in the near future, “mothballing” is an important strategy for preservation and for improving the visual image an area conveys. “Mothballing” is a preventive measure of minor repairs and stabilization of underused structures. It will encourage citizens to view used space as a potential asset, especially in Butte where valuable historic structures are only partially occupied. Unused floors can be made to look occupied, and taxes can be adjusted to account for unused space in excess of demand. Insurance rates are also lower for stabilized structures than for vacant unmaintained structures. “Mothballing” efforts should be incorporated into the functions of the Urban Revitalization Agency, and all “mothballing” should be subject to certification on a state level based on the Secretary of Interior’s “Protection Standards.” Tax incentives for rehabilitation in the 1976 Tax Reform Act may be applied to “mothballing” and reapplied if substantial rehabilitation is undertaken. Community Development Block Grant (CDBG) monies may also be applicable.

Fire Prevention

A very serious concern involving vacant, underused, and “mothballed” structures is the threat of arson and accidental fire. Unoccupied structures make attractive targets for vandals. In cooperation with the Community Development Agency, the Planning Board, and the Building Inspector’s Office, the HCRS team proposed a comprehensive Fire Control Project to complement the “mothballing” program. The main thrust of the project is to protect historic resources. Although “mothballing” will help to preserve the structures in a passive way, the active components seek to involve the community in the project. The methods used to implement the active portion of the project include educating the public to the importance of arson control and fire prevention, instituting an arson...
reward program, and assisting owners and occupants of buildings that have present or potential fire related problems to determine what those problems are and how they may be remedied.

To accomplish the goals of the Comprehensive Fire Control Project, a four-point goal work program was established, which included strictly enforcing state and local fire codes, instituting new fire codes requiring early warning fire alarm systems, a continuing education program to make citizens aware of the fire prevention program, and an arson reward program, sponsored by the Butte Uptown Association, to provide incentives for citizens to report arson cases. Recently, Butte's business community has established a joint vandalism/reward fund.

Tax Benefits

A primary function of the HCRS project was to demonstrate the Tax Reform Act of 1976. Because Butte's entire central business district is listed on the National Register of Historic Places, many property owners in Uptown are now eligible for tax benefits for rehabilitation that meets the Secretary of Interior's "Standards for Rehabilitation" for historic buildings. The historic preservation provisions of the Tax Reform Act of 1976 serve as an incentive for investors to rehabilitate historic structures by allowing the owner to amortize rehabilitation costs over a 60-month period. As an alternative to amortization, the Tax Act also allows owners of historic properties to use accelerated methods of depreciation for expenses incurred when they substantially rehabilitate their depreciable properties.

The Tax Act provides disincentives for demolition of historic properties as well as incentives for their rehabilitation. Owners of certified historic structures cannot deduct from their income money expended for demolition or for any loss sustained on account of its demolition. Instead, the cost of demolition must be capitalized and added to the basis of the property. This defers and reduces the tax benefit.

Furthermore, tax deductions taken on new construction on the site can be depreciated only on a straight line basis. In Butte's historic Uptown each building is considered to be of historic value unless the Secretary of the Interior has certified that the structure does not contribute to the district.

In addition to the 1976 Tax Act, the Revenue Act of 1978 provides a 10% investment tax credit to encourage the rehabilitation of older buildings. Like the Tax Reform Act incentives, the Revenue Act of 1978 has guidelines for eligibility. For example, the building must be at least twenty years old, and any rehabilitation must be certified by the Department of Interior. The credit applies to rehabilitation for industrial or commercially used factories, shops and hotels but cannot be used in connection with residential rental properties such as apartments.

The Revenue Act of 1978 allows a building owner to deduct 10% of the qualified rehabilitation expenses directly from taxes owed. The investment tax credit cannot be used with the historic preservation amortization provision; however, it can be used with the accelerated depreciation provision.

It must be remembered that the tax aspects of the Tax Reform Act of 1976 and the Revenue Act are complex, and individuals should consult legal counsel or the appropriate local Internal Revenue Service office for assistance in determining what benefits can be received from these laws.
Energy Conservation

Energy conservation plays an important role in the rehabilitation of historic buildings in two ways. The reuse of a building saves large quantities of energy, which are embodied in the materials and the energy used in the initial construction of the building. Secondly, an “energy rehab” of an historic building encourages the continued use of the building by lowering heating fuel cost to approximately that of a new, energy-conserving building. Butte’s cold climate (average 9,600 degree days per year) offers particularly large opportunities for fuel savings.

In cases where there is good solar exposure and where solar equipment will not harm the historic exterior of the buildings, solar energy may be used to further lower fuel costs. Rapidly rising fuel costs make energy conservation and the use of solar energy vital components for insuring the survival of Butte’s historic buildings. Rehabilitation tax and energy conservation incentives brighten an already persuasive financial picture for conservation.

Analysis of the potential for energy conservation is included in Appendix A-1. That energy conservation can save a substantial amount of money and represents a powerful investment incentive is evidenced by a case study of the Carpenters’ Union Hall. The renovation of the Carpenters’ Union Hall into office space will save approximately $1,800 by this approach over the minimum “energy rehab” work. These savings come. The full “energy rehab” involves, in addition to the measures recommended in the minimum “energy rehab,” insulating the walls above and below ground to an R-19 insulation value and the roof to about R-40. The total cost of this work (including the minimum “energy rehab” work) is estimated at $36,000. The estimated annual fuel cost is approximately $3,200, for an annual savings of $7,299 (at 1979 fuel prices) over the cost of heating the building as it stands now. Put simply, an investor can recapture the total $36,000.00 cost of energy rehab in five years. The annual savings of $1,800 by this approach over the minimum “energy rehab” results from the reduction of heat loss through the wall and roof areas of the Carpenters’ Union Hall by a factor of about 5.

The full “energy rehab” is recommended for the Carpenters’ Union Hall because it offers an attractive return on investment and because it insures continued use of this historic building. The minimum “energy rehab” is suggested only if insufficient investment capital is available for alternative. The minimum “energy rehab” should be regarded as a temporary measure that will eventually be supplemented by the additional full “energy rehab” measures. Otherwise, with rapidly escalating fuel costs, the minimally rehabilitated structure may become too expensive to operate.

New Construction

Regardless of “mothballing” efforts, tax incentives for rehabilitation, or the valuable design elements found in historic structures, new buildings will be constructed in Uptown Butte. New construction is a visible sign of a healthy economy and part of Butte’s movement toward the future; however, new construction must be sensitive to historic structures. Modern design elements should build on Butte’s history, not negate it through obtrusive

(See Appendix A-1 for assessment of the energy conservation benefit of rehabilitating the Carpenters’ Union Hall.)
Historic signs not only indicate past commercial activity but also are an important visual legacy and should be preserved.

or faddish design. It is recommended that new construction comply with specific design guidelines to insure compatibility of character in terms of size, scale, color, materials, and relationship to the streetscape. Because of the diversity of building types and styles in the Butte district, compatibility does not entail a rigid set of design standards. Rather, compatibility means the architect should respond to the design constraints set by the geography, the adjacent buildings and the history of the district. Large buildings should be multi-story rather than sprawling single-story structures.

Buildings of all sizes should be attached, when appropriate, to existing buildings and should front directly on the sidewalk. Rhythm and texture of the facades and materials should unite the overall pattern of the facade with individual elements through carefully handled detailing. New buildings can therefore enhance the quality of the district by providing an attractive and visually compatible environment for residents and visitors.

New construction in an historic district can also contribute to the economic viability of a district by establishing an important trend for reinvestment in the older commercial section and by creating activity in the district. Such investment and activity is currently happening in Uptown on the old Pennsylvania Block. A Butte Heritage Mural has been painted on the retaining wall at the west end of the 200 foot wide lot, a city park has been established, and the New York Life Insurance Company has plans to construct a new office facility on the east end of the site. During the summer, the HCRS team worked with New York Life to suggest design considerations that would complement the historic environment and take advantage of the park and the mural.

Tourism

Although tourism accounts for a portion of Butte’s economy, more attention should be focused on developing the trade and on providing information for the tourist in Butte. Surrounding the urban environment are mountains that offer an abundance of recreational activities including skiing, sledding, snowmobiling, hiking, fishing, and hunting. Butte enjoys very little of the activity generated by these recreational opportunities but could do more to advertise itself as part of these recreational opportunities. Butte could also capitalize on the fact that it is strategically located between Glacier National Park and Yellowstone National Park. A series of tourism pamphlets or other forms of advertising in these parks would draw tourists to Butte as a stopover point.

An HCRS survey of visitors in Butte revealed several interesting factors that should be considered in an overall tourist plan. Many tourists were frustrated by the lack of directional signs on Interstate 90 and on city thoroughfares. New signs on I-90 now direct tourists to exit at Montana Street for the historic district. Yet, additional inter-city signs should be placed at locations to direct visitors to specific sites.
Another complaint tourists registered was the lack of a centrally located tourist information center. Since the Chamber of Commerce moved to Harrison Avenue on the Flats, there is no visitors center in the central business district to serve tourists' needs. With the development of the Jacobs House as a tourist center, this problem will be remedied. A walking route of the historic district will also provide visitors with a structured and informative tour of the important historic sites. Although "Old Number One," a streetcar that tours the city, the pit, and the mining museum, provides an interesting view of Butte, it does not take on or discharge passengers along its route in the historic district. At least one pick-up point within the district would draw some attention to Uptown.

Regional advertising, more external and internal directional signs, a centrally located information center, structured or suggested tours and at least one boarding point for "Old Number One" within the district will help to attract visitors to Butte and make their stay more meaningful and interesting.
1928 photograph of the north side of Park Street.

Courtesy of Owen Smithers.
Conclusion

The opportunities for the rehabilitation and reuse of historic structures in the Uptown section of Butte are clear. Realizing these opportunities will require a sustained commitment, community involvement, and capital. The citizens, government, and the new Urban Revitalization Agency have demonstrated their willingness to reinvest in the Uptown district and to achieve their objective of revitalization. There are many perspectives from which the revitalization can be approached. Several have been discussed in this report; others will emerge with time and study. As the revitalization efforts progress, general themes and hard unifying elements will coalesce to give the renewal a matured focus and to attract new investors.

For the last 50 years, Butte has suffered from a depressed economy, population decline, and the vacillating economics of the mining industry. The combination of these factors has manifested positive and negative returns. In retrospect, Butte is fortunate not to have undergone large scale urban renewal. Too often, urban renewal has destroyed history instead of using it wisely. The historic environment that gives Butte its distinctive character has been preserved and will now serve as a favorable base from which to build. Efforts to “mothball” vacant and underused structures, to halt arson and vandalism, to promote tourism, and to support compatible new design will encourage the rehabilitation in Uptown. No single venture will make the change in Butte; but, as a collective endeavor, the revitalization project can capitalize on the momentum and determination of the citizens in this unique western city.

The Hennessey Building (1898) with its rich architectural detail was considered Butte's most elegant store.
View showing the concentration of urban, residential, and industrial elements, which give Butte its unique character.
APPENDICES

APPENDIX A-1
Energy Conservation and Solar Studies
by National Center for Appropriate Technology
P.O. Box 3838, Butte, Montana 59701

Contents
Energy Rehabilitation for the Carpenters’ Union Hall
Energy Rehabilitation for the Metals Bank Building
Energy Rehabilitation for the Stephens’ Block
Energy Conservation for the Large Glass Show-Window in the Hennessey Building
A Note on Energy-Conserving Features in Historic Buildings

Energy conservation is a national priority! The efficient use of energy to heat and cool this country’s building stock is of no less importance than the wise use of automobile fuel. What role can historic preservation play in this effort? Clearly, a major one! For the last five years, new construction has been highly conscious of energy efficiency in new construction. Yet, the fact remains that the vast majority of this Nation’s buildings were built before we were so energy conscious. Many of these are historic and many, like the buildings in Butte, Montana, are of national significance. Can these significant historic buildings be made energy efficient while preserving their historic integrity? The answer is “yes”! However, great care must be used to guarantee that the unique character that makes these structures historic and significant is not irreparable damaged in an effort to make the building more energy efficient. Energy efficiency and historic preservation can co-exist! Not all energy efficiency treatments may be appropriate for all buildings. Usually a compromise will have to be worked out. However, it must be remembered that there are two issues of equal importance in the decisionmaking: 1) to make the building more energy efficient, and 2) to preserve this Nation’s historic resources for the generations to come.

The energy-improving examples contained in this report are case specific. That is, they apply only to the structures here and should not be perceived as blanket solutions for improving energy efficiency in all historic buildings. For instance, the use of a trombe wall is an advocated treatment for the Stephens’ Block. This may be a wholly appropriate energy solution for this building, but in no way should this be understood as an endorsement of the installation of trombe walls on all historic buildings. Trombe walls radically alter the visual integrity of historic buildings, often covering whole facades. They should be limited to secondary or tertiary facades and never installed on a primary facade or over significant architectural features. The State Historic Preservation...
Office of each State or the National Park Service, should be consulted if there are any questions on the appropriateness of a proposed energy treatment of an historic building. The Secretary of Interior's "Standards for Rehabilitation" are, as always, an excellent guideline and should be consulted on all rehabilitation questions and not limited to energy-efficiency rehabilitation alone.

While the HAER team was in Butte during the summer of 1979, the National Center for Appropriate Technology (NCAT) was contracted to produce these case studies. Andy Shapiro, the chief field team member from NCAT, is the primary author of these energy conservation and solar case studies. Joyce Trueblood, of the HAER Field Team, assisted in completing the studies. Other members of the NCAT Research and Development Division who assisted in these case studies are: Dave Nawroki, PhD. Solar Section Leader; Gilles Favard, Solar Engineer/Solar Section; and, Fred Quivik, Building Recycling Specialist, Building Technology Section.
ENERGY REHABILITATION FOR THE CARPENTERS' UNION HALL

I. Heat Loss and Fuel Bill Calculations
   A. As the Building Now Stands.
   D. Cost Estimates for “Energy Rehab’s.”

II. “Pro Forma” Analysis of the Full “Energy Rehab” Based on 5-year Investor Horizon.

III. Assessment of the Energy Conservation Benefit of Restoring the Carpenters’ Union Hall Over Constructing a New Building for the Same Use.

IV. Solar Heated Hot Water for a Restaurant in Carpenters’ Union Hall.
I. Heat Loss and Fuel Bill Estimates for the Carpenters' Union Hall.¹

A. As the Building Now Stands

<table>
<thead>
<tr>
<th>Part of Building</th>
<th>Construction</th>
<th>&quot;A&quot;</th>
<th>&quot;U&quot;</th>
<th>Annual Loss [U.A. (24) (9600)]</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brick wall, 1st &amp;</td>
<td>16&quot; thick structural brick, lath &amp;</td>
<td>6,806</td>
<td>.18</td>
<td></td>
<td>13</td>
</tr>
<tr>
<td>2nd floors</td>
<td>plaster</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brick wall, 3rd</td>
<td>12&quot; thick structural brick, lath &amp;</td>
<td>3,324</td>
<td>.22</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>floor</td>
<td>plaster</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basement wall, above</td>
<td>24&quot; granite</td>
<td>1,065</td>
<td>~.5</td>
<td></td>
<td>6</td>
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<tr>
<td>ground</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Basement wall, below</td>
<td>24&quot; granite plus earth</td>
<td>1,250</td>
<td>~.15</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>ground</td>
<td></td>
<td></td>
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<tr>
<td>Roof</td>
<td>built-up roof, 1&quot; wood decking,</td>
<td>3,350</td>
<td>.25</td>
<td></td>
<td>9</td>
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<tr>
<td></td>
<td>joists, lath &amp; plaster</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Windows &amp; doors</td>
<td>Single-glazed, loose fitting</td>
<td>1,864</td>
<td>1</td>
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<td>19</td>
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<td>Volume</td>
<td>Air infiltration²</td>
<td>172,000</td>
<td></td>
<td>~ 1,000 x 10⁶</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>volume</td>
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</tr>
<tr>
<td></td>
<td>172,000 ft.³</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Totals</td>
<td></td>
<td></td>
<td>2,255 x 10⁶</td>
<td>100</td>
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</tbody>
</table>

Assuming a 60% seasonal boiler efficiency and assuming that the average cost per mcf is $2.75 (non-residential rates are declining block rates) current, estimated fuel bill will be about $10,300 at current prices.

\[
\text{BTU burned} \times \frac{1}{\text{mcf}} \times \frac{1}{10^6} \times 2.75 = \text{10,335} \text{ (average year mcf delivered BTU)}
\]

¹All calculations are in 1979 costs and dollars.

²Heat loss to infiltration determined as follows:

\[
172,000 \times \frac{1}{\text{air-charge hour}} \times \frac{24}{\text{day}} \times \frac{9600}{\text{year}} \times \frac{.025}{\text{°F} \cdot \text{day}} \approx \frac{1,000}{\text{year}} \times 10^6
\]

³It should be emphasized that due to uncertainties in estimating infiltration rates, boiler efficiencies, and insulative values, the estimated fuel bill has roughly a 30% uncertainty.

Note that the heat capacity of the air is increased by a factor of 1.4 to account for minimal humidification of the incoming air.
B. With Minimum “Energy Rehab” (**” denotes treated parts of building).

<table>
<thead>
<tr>
<th>Part of Building</th>
<th>Construction</th>
<th>“A” (Area-ft.²)</th>
<th>“U” (BTU/ft.²-hr.°F)</th>
<th>Annual Loss [U.A. (24) (9600)] BTU</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brick wall, 1st &amp; 2nd floors</td>
<td>16” thick brick, lath &amp; plaster</td>
<td>6,806</td>
<td>.18</td>
<td>282 × 10⁶</td>
<td>18</td>
</tr>
<tr>
<td>Brick wall, 3rd floor</td>
<td>12” thick brick, lath &amp; plaster</td>
<td>3,324</td>
<td>.22</td>
<td>168 × 10⁶</td>
<td>11</td>
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<tr>
<td>Basement wall, above ground</td>
<td>24” granite</td>
<td>1,065</td>
<td>~ .5</td>
<td>128 × 10⁶</td>
<td>8</td>
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<td>Basement wall, below ground</td>
<td>24” granite plus earth</td>
<td>1,250</td>
<td>~ .15</td>
<td>44 × 10⁶</td>
<td>3</td>
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<tr>
<td>Roof</td>
<td>Built-up roof, 1” wood decking, joists, lath &amp; plaster</td>
<td>3,550</td>
<td>.25</td>
<td>204 × 10⁶</td>
<td>13</td>
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<tr>
<td>*Windows</td>
<td>Second-glazing added</td>
<td>1,864</td>
<td>.56</td>
<td>241 × 10⁶</td>
<td>15</td>
</tr>
<tr>
<td>*Volume</td>
<td>Air infiltration cut in half. Weather-stripping added to all windows and doors. All openings caulked inside and out.</td>
<td>~ 500 × 10⁶</td>
<td></td>
<td>Total</td>
<td>1,567 × 10⁶ BTU</td>
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*Night-Setback
Thermostat
Sets thermostat back from 68° to 55° for 12 hours per day, reducing the heating degree days and thus the heat loss by 15%, or by 235 × 10⁶ BTU

Total 1,332 × 10⁶ BTU

The annual average heating bill is thus estimated at about $6,300 per year at current 1979 fuel prices. Note that with the declining block rate structure for gas prices, the average cost per mcf of gas is higher for the more energy conserving buildings. See the note under IA regarding uncertainty in this figure.

The annual savings at present fuel costs, of the Minimum “Energy Rehab” over the annual fuel cost for the uninsulated building is:

$10,300 - $6,300 = $4,000

<table>
<thead>
<tr>
<th>Part of Building</th>
<th>Construction</th>
<th>“A” (Area-ft²)</th>
<th>“U” (BTU/ft²·hr·°F)</th>
<th>Annual Loss [U.A. (24) (9600)] BTU</th>
<th>Percent of Total</th>
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<td>*Brick Wall, 1st and 2nd floor</td>
<td>16&quot; brick, 3/4&quot; air-space, foil-backed 2&quot; foam “R-max”</td>
<td>6,806</td>
<td>.054</td>
<td>85 × 10⁶</td>
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<td>*Brick wall, 3rd floor</td>
<td>12&quot; brick, same treatment as above</td>
<td>3,324</td>
<td>.057</td>
<td>44 × 10⁶</td>
<td>5</td>
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<tr>
<td>*Basement wall, above ground</td>
<td>24&quot; granite, same treatment as brick</td>
<td>1,065</td>
<td>.065</td>
<td>16 × 10⁶</td>
<td>2</td>
</tr>
<tr>
<td>*Basement wall, below ground</td>
<td>24&quot; granite, same treatment as brick, plus earth</td>
<td>1,250</td>
<td>~ .05</td>
<td>14 × 10⁶</td>
<td>2</td>
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<tr>
<td>*Roof</td>
<td>Built up roof, air-space plus 10&quot; rockwool added over acoustic drop ceiling in southern portion of 3rd floor, and over existing ceiling in north portion.</td>
<td>3,350</td>
<td>.023</td>
<td>19 × 10⁶</td>
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<td>*Windows and doors</td>
<td>Second glazing added</td>
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<td>241 × 10⁶</td>
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<td>*Volume</td>
<td>Weatherstripping added to all doors and windows. All openings caulked inside and out. Air infiltration cut in half.</td>
<td>Total</td>
<td>~ 500 × 10⁶</td>
<td>919 × 10⁶</td>
<td>54</td>
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</tbody>
</table>

*Night-Setback Thermostat | 12 hour daily setback from 68° to 55° reduces heat load by 15%, or by 138 × 10⁶ BTU | Total | -138 × 10⁶ | 781 × 10⁶ BTU |

\[
\text{BTU burned per year} = \left(\frac{781 \times 10^6}{10^6}\right) \times \frac{1}{6} \times \frac{1}{10^6} \times 2.97 = $3,866
\]

The estimated annual average heating bill is about $3,900 per year at current 1979 fuel prices. See the note under IA regarding uncertainties in this figure.

The annual savings, at present fuel costs, of the Full “Energy Rehab” over the annual fuel cost for the uninsulated building is:

\[
$10,300 - $3,900 = $6,400
\]

Full “Energy Rehab”

1) Insulating Brick Wall—10,130 ft.² (see sketch)
   a) remove window trim and sill—½ hr. per window × 50 windows × $15 per hour labor $ 375
   b) install furring strips—42 ft.² of wall × 10,130 ft.² 4,255
   c) install ½” sheetrock bonded to 2” polyurethane foam, price includes taping and sanding $1.18/ft.² 11,950
   d) install wider window casing and sill and replace trim $1,202, casings $324, labor $972 2,498
   e) stuff insulation between floor joists at exterior walls 500

   (Subtotal $19,600)

2) Install inner storm windows—low-cost, rigid clear plastic which fits into plastic extrusion which is tacked and taped to trim and sill. $30/window + 1½ hours labor 8 $15 × 61 windows

   (Subtotal $ 3,202)

3) Insulate Basement—2,315 ft.²
   a) install furring strips—60¢/ft.² $ 1,400
   b) install polyurethane backed gypsum board (as above)—$1.18/ft.² 2,731
   c) build up window casings and trim (as above) 344

   (Subtotal $ 4,500)

4) Insulate Roof—3,550 ft.²
   a) repair, weatherstrip, and insulate attic access hatch $ 200
   b) install 8 @ 16” diameter rotary gravity ventilators @ $150.00 1,200
   c) hang drop-ceiling in south portion of third floor 2,400 ft.² @ $1.25 installed 3,000
   d) blow in 10” mineral wool over drop ceiling and existing ceiling in north portion of third floor 50¢/ft.² 1,800

   (Subtotal $ 6,200)

5) Install Night-Setback Thermostat

   (Subtotal $ 80)

6) Install weatherstripping and weatherstripped thresholds
   on 4 doors @ $115 460
   on 61 opening windows @ $40 2,440

   (Subtotal $ 3,000)

7) Caulk all window and door frames, inside and outside, 70 openings × ¾ hr. labor per opening × $15/hr. $ 800
    butyl caulk, about $1.00 per opening 100
    close off and double glaze 2 of the sets of double doors on the facade, leaving exterior intact. 500

   (Subtotal $ 1,400)

Grand Total $38,000

Minimum “Energy Rehab”

1) Install inner storm windows—low cost, clear plastic film on shade rollers. Film rolls down for winter and adheres to double-sided tape on trim and sill. $6/window + 1 hour labor @ $15 per hour. 61 windows $ 1,300

2) Install Night-Setback Thermostat

   80

3) Install weatherstripping and weatherstripped thresholds
   on 4 doors @ $115 460
   on 62 windows @ $40 2,440

4) Caulk all windows and doors (as in 7 above) 1,400

   $ 5,680

Grand Total $38,000
II. Full “Energy Rehab,” “Pro Forma” Analysis using 5-year investor horizon.

<table>
<thead>
<tr>
<th>Years</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Outflows</td>
<td>[7,600(^1)]</td>
<td>[3,100]</td>
<td>[3,100]</td>
<td>[3,100]</td>
<td>[3,100]</td>
</tr>
<tr>
<td>+[3,100(^2)]</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nominal Inflows</td>
<td>6,400(^3)</td>
<td>7,040</td>
<td>7,744</td>
<td>8,518</td>
<td>9,370</td>
</tr>
<tr>
<td>Discounted(^4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outflows</td>
<td>[10,700]</td>
<td>[2,480]</td>
<td>[1,984]</td>
<td>[1,587]</td>
<td>[1,270]</td>
</tr>
<tr>
<td>Discounted Inflows</td>
<td>6,400</td>
<td>5,632</td>
<td>4,956</td>
<td>4,361</td>
<td>3,838</td>
</tr>
</tbody>
</table>

\[\sum_{n=1} (\text{Discounted Outflows}) = [18,021]\]

\[\sum_{n=1} (\text{Discounted Inflows}) = 25,187\]

Sum of 5-year out and in = 7,166 = Net Present Value of Full Energy Rehab.

Cost/Benefit ratio = \(\frac{\text{total discounted inflow}}{\text{total discounted outflow}}\) = 1.4

Assumptions:
1. Downpayment of 20% of $38,000 Full “Energy Rehab” costs.
2. Approximate annual payment on 20 year loan on 80% of $35,500 at 12% interest.
3. First year fuel savings, fuel escalation @10%/year.
4. Discounted flows = \(\frac{P}{(1 + i)^n}\) where 
   \(P = \) nominal flow
   \(i = \) discount rate = 25%
   \(n = \) number of years after 1st year
III. Assessment of the Energy Conservation Benefit of Restoring the Carpenters’ Union Hall over Constructing a New Building for the Same Use.


The method is useful, and demonstrates the utility of saving existing buildings. A limitation, of course, is that building owners and prospective developers are generally not interested in whether more or less energy is consumed by retaining an old building, but rather are generally more interested in return on investment. However, the analysis should be useful for policymakers.

The entire process for the “Concept Model” analysis is not reproduced here, but rather only those numbers and assumptions necessary to use the model as it is outlined in the above-mentioned publication. The reader interested in further detail is referred to the book itself.

“Concept Model” Analysis of the Energy Savings due to Renovation of the Carpenters’ Union Hall, instead of demolishing it and building a new structure:

1. Embodied Energy Investment = [14,000 ft.² floor area × 1640 M BTU/ft²] = 230 × 10⁸ BTU

2. Demolition Energy Required = [14,000 ft.² floor area × 10,000 BTU/ft²] = 1.4 × 10⁹ BTU

3. Embodied Energy Investment in Renovation¹ = [14,000 ft.² floor area × 1640 M BTU/ft² × .01] = 23 = 10⁸ BTU

4. Annual Operation Energy
   for Rehabilitation Carpenters’ Union Hall = [14,000 ft.² floor area × 65 M BTU/ft² × 1] = 9.1 × 10⁸ BTU

5. Embodied Energy Investment in New Construction = [14,000 ft.² floor area × 1640 M BTU/ft²] = 230 × 10⁸ BTU

6. Annual Operational Energy for New Construction = [14,000 ft.² floor area × 65 M BTU/ft²] = 9.1 × 10⁸ BTU

   Energy Saved by Renovation of the
   Carpenters’ Union Hall = #2 - #3 + #5 = 208 × 10⁸ BTU

Annual operational energy does not affect this picture, since operational energy of the rehabilitated building is the same as that for new construction.

It is interesting to note that this is enough energy to heat the fully insulated Carpenters’ Union Hall for 27 years!

1. It should be noted that 0.1 used for F, (“fraction of materials and construction of the existing historic building that is being replaced or added in the renovation process”) is extremely subjective and should be treated as having a 50% uncertainty.

2. Note this is fairly close to 7.8 × 10⁸ calculated in the Heat Loss Estimate for the “Full Energy Rehab.” These calculations assume that the “full energy rehab” is undertaken.
ENERGY REHABILITATION FOR THE METALS BANK BUILDING

I. Heat Loss and Fuel Bill Calculations
   A. As the Building Now Stands.
   B. For the Building with Minimum “Energy Rehab.”
   C. For the Building with Full “Energy Rehab.”
   D. Cost Estimates for “Energy Rehab’s.”

II. “Pro Forma” Analysis of the Full “Energy Rehab” based on 5-year Investor Horizon.

III. Assessment of the Energy Conservation Benefit of Restoring the Metals Bank Building over Constructing a New Building for the Same Use.

#### A. As the Building Now Stands

<table>
<thead>
<tr>
<th>Part of Building</th>
<th>Construction</th>
<th>&quot;A&quot; (Area-ft.²)</th>
<th>&quot;U&quot; (BTU/ft.²-hr.-°F)</th>
<th>Annual Loss [U.A. (24) (9600)]</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brickwall</td>
<td>16&quot; thick structural brick lath &amp; plaster</td>
<td>21,458</td>
<td>.18</td>
<td>890 × 10⁶</td>
<td>15</td>
</tr>
<tr>
<td>Basement Wall above ground</td>
<td>24&quot; granite</td>
<td>210</td>
<td>~.5</td>
<td>24 × 10⁶</td>
<td>21</td>
</tr>
<tr>
<td>Basement Wall below ground</td>
<td>24&quot; granite plus earth</td>
<td>750</td>
<td>~.15</td>
<td>26 × 10⁶</td>
<td>21</td>
</tr>
<tr>
<td>Roof</td>
<td>Build-up roof, concrete slab, air gap, lath and plaster</td>
<td>5,934</td>
<td>.22</td>
<td>300 × 10⁶</td>
<td>65</td>
</tr>
<tr>
<td>Windows &amp; Doors</td>
<td>Single glazed</td>
<td>8,620</td>
<td>1</td>
<td>1986 × 10⁶</td>
<td>33</td>
</tr>
<tr>
<td>Volume</td>
<td>Air infiltration¹</td>
<td>Volume 488,566</td>
<td></td>
<td>2814 × 10⁶</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TOTAL 6041 × 10⁶</td>
<td>100</td>
</tr>
</tbody>
</table>

Assuming a 60 percent seasonal boiler efficiency and assuming that the average cost per mcf is $2.40 (non-residential rates or declining block rates) current, estimated fuel bill will be about $27,700 at current prices.

\[
\text{BTU burned mcf} = \frac{6041 \times 10^6 \times 1 \times 1 \times 2.40 = 24.164}{\text{average year}}
\]

Note: It should be emphasized that due to uncertainties in estimating infiltration rates, boiler efficiencies and insulative values, the estimated fuel bill has roughly a 30 percent uncertainty.

¹Heat loss to infiltration determined as follows:

\[
\text{ft.}^3 \times \text{change} \times \text{hours} \times \text{°F} \times \text{days} \times \text{BTU} = \text{BTU}
\]

Note: The handbook value of 0.018 BTU/ft³ °F with the heat capacity of air is increased by a factor of 1.4 to 0.025 BTU/ft³ °F to account for minimal humidification of the incoming air.
B. With Minimum “Energy Rehab” (‘*’ denotes treated parts of building).

<table>
<thead>
<tr>
<th>Part of Building</th>
<th>Construction</th>
<th>“A” (Area-ft.²)</th>
<th>“U” (BTU/ft.²-hr.°F)</th>
<th>Annual Loss [U.A. (24) (9600)] BTU</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brickwall</td>
<td>16” thick structural brick lath &amp; plaster</td>
<td>21,458</td>
<td>.18</td>
<td>890 × 10⁶</td>
<td>24</td>
</tr>
<tr>
<td>Basement Wall above ground</td>
<td>24” granite</td>
<td>218</td>
<td>~.5</td>
<td>24 × 10⁶</td>
<td>1</td>
</tr>
<tr>
<td>Basement Wall below ground</td>
<td>24” granite plus earth</td>
<td>750</td>
<td>~.15</td>
<td>26 × 10⁶</td>
<td>1</td>
</tr>
<tr>
<td>Roof</td>
<td>Built-up roof, slab, air gap, lath &amp; plaster</td>
<td>5,934</td>
<td>.22</td>
<td>300 × 10⁶</td>
<td>8</td>
</tr>
<tr>
<td>*Windows and Doors</td>
<td>Low-cost, plastic film, inside second glazing added</td>
<td>8,620</td>
<td>56</td>
<td>1,112 × 10⁶</td>
<td>30</td>
</tr>
<tr>
<td>*Volume</td>
<td>Air infiltration cut in half, Weather-stripping added to all windows and doors, All openings caulked inside &amp; out</td>
<td>5,934</td>
<td></td>
<td>~1,407 × 10⁶</td>
<td>37</td>
</tr>
</tbody>
</table>

\[
\text{Total Annual Loss: } \sum \text{Annual Loss} = 3,759 \times 10^6
\]

\[
\text{Percent of Total: } \frac{\sum \text{Annual Loss}}{\text{Total Annual Loss}} = \frac{3,759 \times 10^6}{3,195 \times 10^6} = 100\%
\]

\[
\begin{align*}
\text{BTU burned} & \quad \text{mcf} & \quad \$ & \quad \$
\hline
3,195 \times 10^6 & \quad \frac{1}{1} & \quad \frac{1}{10^6} & \quad 2.46 & \quad 13,100
\end{align*}
\]

\[
\text{Year: delivered } \frac{\text{BTU}}{\text{year}} \quad \text{mcf} \quad \text{BTU} \quad \text{year}
\]

The annual heating bill is thus estimated at about $13,000 per year at current fuel prices. Note that with the declining block rate structure for gas prices, the average cost per mcf of gas is higher for more energy conserving buildings. See the note under I regarding the uncertainty in this figure.

The annual savings at present fuel costs, of the Minimum “Energy Rehab” over the annual fuel cost for the uninsulated building is:

\[
\$27,700 - 13,100 = 14,600.
\]

<table>
<thead>
<tr>
<th>Part of Building</th>
<th>Construction</th>
<th>“A” (Area-ft.²)</th>
<th>“U” (BTU/ft.²-hr.°F)</th>
<th>Annual Loss [U.A. (24) (9600)] BTU</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Brickwall</td>
<td>16” thick 3/4” airsplace, foil backed 2” foam “R-max”</td>
<td>21,458</td>
<td>.054</td>
<td>267 x 10⁶</td>
<td>9</td>
</tr>
<tr>
<td>*Basement Wall above ground</td>
<td>24” granite same treatment as brick</td>
<td>210</td>
<td>.065</td>
<td>3 x 10⁶</td>
<td>&lt;1</td>
</tr>
<tr>
<td>*Basement Wall below ground</td>
<td>24” granite same as brick, plus ground</td>
<td>750</td>
<td>~.05</td>
<td>9 x 10⁶</td>
<td>&lt;1</td>
</tr>
<tr>
<td>*Roof</td>
<td>Built-up roof, air space, plus 10” blown in insulation, lath and plaster</td>
<td>5,934</td>
<td>.023</td>
<td>31 x 10⁶</td>
<td>1</td>
</tr>
<tr>
<td>*Windows and Doors</td>
<td>Rigid plastic inner storm windows added</td>
<td>8,620</td>
<td>.56</td>
<td>1,112 x 10⁶</td>
<td>39</td>
</tr>
<tr>
<td>*Volume</td>
<td>Air infiltration cut in half. Weather-stripping added to all windows and doors. All openings caulked inside &amp; out.</td>
<td></td>
<td></td>
<td>~1,407 x 10⁶</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2,829 x 10⁶</td>
<td></td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>*Night-Setback Thermostat</td>
<td>Sets thermostat back from 68° to 55° for 12 hours per day, reducing the heating degree days and thus the heat loss by 15%, or by 564 x 10⁶ BTU</td>
<td></td>
<td></td>
<td>-424 x 10⁶</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2,405 x 10⁶</td>
<td></td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

\[
\text{BTU burned per year} = 2,405 \times \frac{1}{10^6} \times \frac{1}{10^6} \times 2.46 = 9,860
\]

The estimated annual heating bill is about $9,900 per year at current fuel prices. See note under I regarding uncertainties in this figure.

The annual savings, at present fuel costs, of the Full “Energy Rehab” over the annual fuel cost for the uninsulated building is:

\[
\$27,700 - $9,900 = $17,800.
\]
D. Cost Estimate for Full “Energy Rehab.”

Full “Energy Rehab”
1) Insulating Brick Wall—21,454 ft.² (see sketch)
   a) remove window trim and sill—
      ½ hr. per window × 250 windows × $15 per hr. labor $ 1,875
      b) install furring strips—42¢/ft.² of wall × 21,454 ft.² 9,010
      c) install ½” shetrock bonded to 2” polyurethane foam,
         price includes taping and sanding $1.18/ft.² 25,315
      d) install wider window casing and sill and replace
         trim, $3,250 material, $3,750 labor 7,000
         (Subtotal $43,200)

2) Install inside storm windows—low-cost, rigid clear
   plastic which fits into plastic extrusion which is
   tacked and taped to trim and sill
   $30/window + 1½ hrs. labor @ $15/hr. × 250 windows (Subtotal $13,125)

3) Insulate Basement—960 ft.²
   a) install furring strips—60/ft.² 576
   b) install polyurethane—back gypsum board (as above) $1.18/ft.² 1,133
   c) build up front casings and trim (as above) 2,000
   (Subtotal $3,709)

4) Insulate Roof—5,934 ft.²
   a) install 14 @ 16” diameter rotary gravity ventilators @ $150.00 2,100
   b) insulate attic access 100
   c) blow in 10” mineral wool over existing ceiling 50¢/ft.² 2,967
   (Subtotal $5,167)

5) Install Night Setback Thermostat
   (Subtotal 80)

6) Install weather stripping and weather stripped thresholds
   on 7 doors @ 115
   on 250 windows @ 40
   805
   (Subtotal $10,805)

7) Caulk all window & door frames, inside and outside (as above)
   (Subtotal 3,675)

8) Double glaze basement store fronts, 915 ft.² @ 9.90/ft.²
   (Subtotal 9,059)
   TOTAL $88,740

Minimum “Energy Rehab.”
1) Install inner storm windows—low-cost, clear plastic film
   on shade rollers. Film rolls down for winter and adheres
   to double-sided tape on trim and sill. $6/window + 1 hr. labor
   @ $15 per hour, 250 windows $ 5,250

2) Install Night Setback Thermostat
   80

3) Install weatherstripping and weather stripped thresholds
   —on 9 doors @ $115
   on 250 windows @ $40
   1,035
   (Subtotal 10,000)

4) Caulk all windows and doors (as in 7 above)
   TOTAL $29,099
Loan = $70,942 or $71,000

<table>
<thead>
<tr>
<th>Years</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Outflows</td>
<td>[17,748]</td>
<td>[10,020]</td>
<td>[10,020]</td>
<td>[10,020]</td>
<td>[10,020]</td>
</tr>
<tr>
<td>Nominal Inflows</td>
<td>14,304</td>
<td>15,734</td>
<td>17,308</td>
<td>19,038</td>
<td>20,942</td>
</tr>
<tr>
<td>Discounted Outflows</td>
<td>[27,768]</td>
<td>[8,016]</td>
<td>[6,413]</td>
<td>[5,130]</td>
<td>[4,104]</td>
</tr>
<tr>
<td>Discounted Inflows</td>
<td>14,304</td>
<td>12,587</td>
<td>11,077</td>
<td>9,747</td>
<td>8,578</td>
</tr>
</tbody>
</table>

\[
\sum_{n=1}^{5} (\text{Discounted Outflows}) = (46,431)
\]

\[
\sum_{n=1}^{5} (\text{Discounted Inflows}) = 56,293
\]

Sum of 5-year out and in = 9,862 = Net present value of Full “Energy Rehab”

Cost/Benefit ratio = \[
\frac{\text{Total discounted inflow}}{\text{Total discounted outflow}} = 1.21
\]

1. Down payment of 20 percent of 88,740 Full “Energy Rehab” costs.
III. Assessment of the Energy Conservation Benefit of Restoring the Metals Bank Building over Constructing a New Building for the Same Use.


The entire process for the “Concept Model” analysis is not reproduced here, but rather only those numbers and assumptions necessary to use the model as it is outlined in the above-mentioned publication. The reader interested in further detail is referred to the book itself.

“Concept model” Analysis of the Energy Savings due to Renovation of the Metals Bank Building, instead of demolishing it and building a new structure:

1. Embodied Energy Investment = [41,540 ft.\(^2\) floor area \times 1640 M\ BTU/ft.\(^2\)]
   = 680 \times 10^8 BTU

2. Demolition Energy Required = [41,540 ft.\(^2\) floor area \times 12,000 BTU/ft.\(^2\)]
   = 5 \times 10^8 BTU

3. Embodied Energy Investment in Renovation\(^1\)
   = [41,540 ft.\(^2\) floor area \times 1640 M\ BTU/ft.\(^2\) \times .10]
   = 68 \times 10^8 BTU

4. Annual Operation Energy for Rehabilitated Metals Bank\(^2\)
   = [41,540 ft.\(^2\) floor area \times 65,000 BTU/ft.\(^2\) \times 1]
   = 27 \times 10^8 BTU

5. Embodied Energy Investment in New Construction
   = [41,540 ft.\(^2\) floor area \times 1640 M\ BTU/ft.\(^2\)]
   = 680 \times 10^8 BTU

6. Annual Operational Energy for New Construction
   = [41,540 ft.\(^2\) floor area \times 65,000 BTU/ft.\(^2\)]
   = 27 \times 10^8 BTU

Therefore:

Energy Saved by Renovation of the Metals Bank
= #2 - #3 + #5
= 617 \times 10^8 BTU

Annual operational energy does not affect this picture, since operational energy of the rehabilitated building is the same as that for new construction.

It is interesting to note that this is enough energy to heat the fully insulated Metals Bank for 15 years.

1. It should be noted that 0.1 used for \(F^1\) (“fraction of materials and construction of the existing historic building that is being replaced or added in the renovation process”) is extremely subjective and should be treated as having a 50% uncertainty.

2. Note this is fairly close to 24 \times 10^8 calculated in the Heat Loss Estimate for the “Full Energy Rehab.” These calculations assume that the “full energy rehab” is undertaken.
ENERGY REHABILITATION FOR THE STEPHENS’ BLOCK

I. Heat Loss and Fuel Bill Calculations
   A. As the Building Now Stands.
   B. For the Building with Minimum “Energy Rehab.”
   C. For the Building with Full “Energy Rehab.”
   D. Cost Estimates for “Energy Rehab’s.”

II. “Pro Forma” Analysis of the Full “Energy Rehab” Based on 5-Year Investor Horizon.

III. Assessment of the Energy Conservation Benefit of Restoring the Stephens’ Block Over Constructing a New Building for the Same Use.

IV. Recommendations Regarding a Passive Retrofit for the Stephens’ Block.

V. Energy Conserving Skylights in the Stephens’ Block and Curtis Music Hall.

A. As the Building Now Stands

<table>
<thead>
<tr>
<th>Part of Building</th>
<th>Construction</th>
<th>&quot;A&quot; (Area-ft.²)</th>
<th>&quot;U&quot; (BTU/ft.²-hr. °F)</th>
<th>Annual Loss [U.A. (24) (9600)] BTU</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brickwalls</td>
<td>12&quot; thick structural brick, lath, &amp; plaster</td>
<td>8,100</td>
<td>.22</td>
<td>410 \times 10^6</td>
<td>21</td>
</tr>
<tr>
<td>Basement</td>
<td>Stone</td>
<td>1,290</td>
<td>.15</td>
<td>45 \times 10^6</td>
<td>2</td>
</tr>
<tr>
<td>Roof</td>
<td>Plaster, Lath, Air, Roofing</td>
<td>4,000</td>
<td>.25</td>
<td>230 \times 10^6</td>
<td>12</td>
</tr>
<tr>
<td>Windows &amp; Doors</td>
<td>Single glazed, leaky</td>
<td>1,680</td>
<td>1.0</td>
<td>387 \times 10^6</td>
<td>20</td>
</tr>
<tr>
<td>Infiltration</td>
<td>Air¹</td>
<td>151,000</td>
<td>1.2</td>
<td>25 \times 10^6</td>
<td>1</td>
</tr>
<tr>
<td>Skylights</td>
<td>Glass</td>
<td>107</td>
<td></td>
<td>25 \times 10^6</td>
<td>1</td>
</tr>
<tr>
<td>Totals</td>
<td></td>
<td></td>
<td></td>
<td>1,966 \times 10^6</td>
<td>100</td>
</tr>
</tbody>
</table>

Assuming a 60% seasonal boiler efficiency and assuming that the average cost per mcf is $2.75 (non-residential rates are declining block rates) current, estimated fuel bill will be about $9,000 at current prices.

\[
\text{BTU burned mcf} = \frac{1966 \times 10^6 \times \frac{1}{6}}{10^6} \times 2.75 = \frac{9011}{10^6} \\
\text{Note: It should be emphasized that due to uncertainties in estimating infiltration rates, boiler efficiencies, and insulative values, the estimated fuel bill has roughly a 30% uncertainty.}
\]

¹Heat loss to infiltration determined as follows:

\[
\text{ft.}^3 \times \text{change hours} \times \text{°F days} \times \text{BTU} \times \text{BTU} = 869 \times 10^6 \\
\text{Note that the heat capacity of the air is increased by a factor of 1.4 to account for minimal humidification of the incoming air.}
\]
B. With Minimum “Energy Rehab” ("*" denotes treated parts of building).

<table>
<thead>
<tr>
<th>Part of Building</th>
<th>Construction</th>
<th>“A” (Area-ft.²)</th>
<th>“U” (BTU/ft.²-hr.°F)</th>
<th>Annual Loss [U.A. (24) (9600)]</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brickwalls</td>
<td>12” thick structural brick, lath, and plaster</td>
<td>8,100</td>
<td>.22</td>
<td>410 $10^6$</td>
<td>30</td>
</tr>
<tr>
<td>Basement</td>
<td>Stone</td>
<td>1,290</td>
<td>.15</td>
<td>45 $10^6$</td>
<td>3</td>
</tr>
<tr>
<td>Roof</td>
<td>plaster, lath, and built-up roofing</td>
<td>4,000</td>
<td>.25</td>
<td>230 $10^6$</td>
<td>17</td>
</tr>
<tr>
<td>*Windows &amp; Doors</td>
<td>Weather stripping, plastic-film, inner storm window</td>
<td>1,680</td>
<td>.56</td>
<td>217 $10^6$</td>
<td>16</td>
</tr>
<tr>
<td>*Infiltration</td>
<td>Weather stripped &amp; caulked</td>
<td>151,000</td>
<td></td>
<td>435 $10^6$</td>
<td>32</td>
</tr>
<tr>
<td>Skylight</td>
<td>Untreated</td>
<td>107</td>
<td>1.2</td>
<td>25 $10^6$</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td></td>
<td></td>
<td>1,362 $10^6$</td>
<td>100</td>
</tr>
</tbody>
</table>

\[
\text{Annual Loss} = 410 \times 10^6 - 202 \times 10^6 = 208 \times 10^6 \text{ BTU}
\]

\[
\frac{1,160 \times 10^6}{\text{year}} \times \frac{1}{6} \times \frac{1}{10^6} \times 2.84 = 5,491 \text{ mcf year}
\]

The average annual heating bill is thus estimated at about $5,500 per year at current 1979 fuel prices. Note that with the declining block rate structure for gas prices, the average cost per mcf of gas is higher for the more energy conserving buildings. See the note under I A regarding uncertainty in this figure.

The annual savings at present fuel costs, of the Minimum “Energy Rehab” over the annual fuel cost for the uninsulated building is:

\[
9,000 - 5,500 = 3,500
\]

<table>
<thead>
<tr>
<th>Part of Building</th>
<th>Construction</th>
<th>“A” (Area-ft.²)</th>
<th>“U” (BTU/ft.²-hr.°F)</th>
<th>Annual Loss [U.A. (24) (9600)] BTU</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>*Brickwalls</td>
<td>16&quot; brick, ¾&quot; air space, foil-backed 2&quot; foam “R-max”</td>
<td>8100</td>
<td>.054</td>
<td>101 x 10⁶</td>
<td>13</td>
</tr>
<tr>
<td>*Basement</td>
<td>Stone, same treatment as brick</td>
<td>1290</td>
<td>.05</td>
<td>15 x 10⁶</td>
<td>2</td>
</tr>
<tr>
<td>*Roof</td>
<td>Plaster &amp; lath, build-up roof, 10&quot; of rock wool blown into attic space</td>
<td>4000</td>
<td>.023</td>
<td>21 x 10⁶</td>
<td>3</td>
</tr>
<tr>
<td>*Windows &amp; Doors</td>
<td>Weatherstripped &amp; caulked, second layer of glazing</td>
<td>1680</td>
<td>.56</td>
<td>217 x 10⁶</td>
<td>28</td>
</tr>
<tr>
<td>*Infiltration</td>
<td>Weatherstripping &amp; caulking</td>
<td></td>
<td></td>
<td>451 x 10⁶</td>
<td>55</td>
</tr>
<tr>
<td>*Night-Setback</td>
<td>Sets thermostat back 68° to 55° for 12 hours per day, reducing the heating degree days &amp; thus the heat loss by 15% or by 118 x 10⁶ BTU</td>
<td></td>
<td></td>
<td>-121 x 10⁶</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>805 x 10⁶</td>
<td>101</td>
</tr>
</tbody>
</table>

\[
\frac{684 \times 10^6 \text{ BTU}}{\text{year}} \times \frac{1}{6} \times \frac{1}{10^6} \times 2.90 \, \text{mcf} \times \text{year} = \frac{\$}{\text{mcf}} \times \frac{\$}{\text{BTU}} = \$3,306
\]

The average annual heating bill is thus estimated at about $3,310 at 1979 fuel prices. See the note under IA regarding uncertainty in this figure.
The estimated annual average heating bill is about $3,300 per year at current 1979 fuel prices. See the note under IA regarding uncertainties in this figure.

The annual savings, at present fuel costs, of the Full “Energy Rehab” over the annual fuel cost for the uninsulated building is about $5,700 per year.

\[ 9,000 - 3,300 = 5,700 \]


Full “Energy Rehab”

1) Insulating Brick Wall—7,000 ft.\(^2\) (see sketch)
   a) remove window trim and sill \(\frac{1}{2}\) hr. per window \(\times\) 70 windows \(\times\) $15 per hour labor \(=\) \$525
   b) install furring strips 42¢/ft.\(^2\) of wall \(\times\) 7,000 ft.\(^2\) \(=\) 2,940
   c) install \(\frac{1}{2}\)" sheetrock bonded to 2" polyurethane foam-price includes taping and sanding $1.18/ft.\(^2\) \(=\) 8,260
   d) install wider window casing and sill and reinstall trim and casings, $1,260 labor, $540 materials \(=\) 1,800
   e) stuff insulation between floor joists at exterior walls \(=\) 500
   (Subtotal \$14,025)

2) Install inner storm windows—low-cost, rigid clear plastic which fits into plastic extrusion which is tacked and taped to trim and sill. $30/window + 1\frac{1}{2} \) hours labor @ $15/70 windows (Subtotal \$3,675)

3) Insulate Basement—1,290 ft.\(^2\)
   a) install furring strips—60¢/ft.\(^2\) \(=\) \$780
   b) install polyurethane—backed gypsum board (as above) $1.18/ft.\(^2\) \(=\) 1,520
   (Subtotal \$2,300)

4) Insulate Roof—4,000 ft.\(^2\)
   a) repair, weatherstrip and insulate attic access hatch \(=\) \$100
   b) install 10 @ 16" diameter rotary gravity ventilators @ $150 \(=\) 1,500
   c) blow in 10" mineral wool over ceiling in third floor, 50¢/ft\(^2\) \(=\) 2,000
   (Subtotal \$3,600)
5) Build New Skylights*
   a) 6' × 12' opening over stairs
   b) 5' × 7' opening over light-well

   $ 750
   $ 500
   (Subtotal $ 1,250)

* See “Energy Conserving Skylights for Stephens’ Block and Curtis Music Hall”

6) Install Night-Setback Thermostat

   (Subtotal $ 80)

7) Install weatherstripping and weatherstripped thresholds
   on 4 doors @ $26
   on 70 opening windows @ $21

   104
   1,470
   (Subtotal $ 1,654)

8) Caulk all window and door frames, inside and
   outside, 74 openings × ¾ hr. labor per opening
   × $15/hr. Butyl caulk, about $1.00 per opening

   $ 830
   100
   (Subtotal $ 930)

9) Reglaze storefront display windows on first floor
   with insulating (double) glass

   (Subtotal $ 4,534)

Grand Total $31,968

Minimum “Energy Rehab”

1) Install inner storm windows—low cost, clear plastic film on
   shade rollers. Film rolls down for winter and adheres to
   double-sided tape on trim and sill. $6/window + 1 hour labor
   @ $15 per hour.
   70 windows

   $ 1,470

2) Install Night-Setback Thermostat

3) Install weatherstripping and weatherstripped thresholds
   on four doors @ $26
   on 70 windows @ $21

4) Caulk all windows and doors (as in 8 above)

Grand Total $ 4,054
II. Full “Energy Rehab,” “Pro Forma” Analysis using 5-Year Investor Horizon.

<table>
<thead>
<tr>
<th>Years</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Outflows</td>
<td>(6400)</td>
<td>3370</td>
<td>3370</td>
<td>3370</td>
<td>3370</td>
</tr>
<tr>
<td>Nominal Inflows&lt;sup&gt;a&lt;/sup&gt;</td>
<td>5690</td>
<td>6259</td>
<td>5885</td>
<td>7573</td>
<td>8330</td>
</tr>
<tr>
<td>Discounted&lt;sup&gt;b&lt;/sup&gt; Outflows</td>
<td>(9770)</td>
<td>(2696)</td>
<td>(2157)</td>
<td>(1725)</td>
<td>(1380)</td>
</tr>
<tr>
<td>Discounted&lt;sup&gt;b&lt;/sup&gt; Inflows</td>
<td>5690</td>
<td>5007</td>
<td>4406</td>
<td>3877</td>
<td>3412</td>
</tr>
</tbody>
</table>

\[ \sum_{n=1}^{5} (\text{Discounted Outflows}) = (17,728) \]

\[ \sum_{n=1}^{5} (\text{Discounted Inflow}) = 22,392 \]

Sum of 5-year out and in = $6,669 = \text{Net present value of Full “Energy Rehab”}

Cost/Benefit ratio = \( \frac{\text{total discounted inflow}}{\text{total discounted outflow}} \) = 1.26

Assumptions: 20% equity 80% debt
1. Downpayment of 20% of $32,000 Full “Rehab” Costs.
2. Approximate annual payment on 20 year loan on 80% of $32,000 at 12% interest.
3. First year fuel savings, fuel escalation of 10%/year.
4. Discounted flows = \( \frac{P}{(1 + i)^n} \) where \( P \) = nominal flow
   \( i \) = discount rate = 25%
   \( n \) = number of years after 1st year
III. Assessment of the Energy Conservation Benefit of Restoring Stephens' Block over Constructing a New Building for the Same Use.


The entire process for the “Concept Model” analysis is not reproduced here, but rather only those numbers and assumptions necessary to use the model as it is outlined in the above-mentioned publication. The reader interested in further detail is referred to the book itself.

“Concept Model” Analysis of the Energy Savings due to Renovation of the Stephens’ Block, instead of demolishing it and building a new structure.

1. Embodied Energy Investment in the existing building = (12,255 ft.\(^2\) floor area × 940 M/BTU/ft.\(^2\)) = 115 × 10\(^8\) BTU

2. Demolition Energy Required = (12,255 ft.\(^2\) floor area × 15,500 BTU/ft\(^2\)) = 1.9 × 10\(^8\) BTU

3. Embodied Energy Investment in Renovation = (12,255 ft.\(^2\) floor area × 650 M/BTU/ft.\(^2\)) = 7.9 × 10\(^8\) BTU

4. Annual Operating Energy for Rehab’d Stephens’ Block = (12,255 ft.\(^2\) floor area × 58 M/BTU/ft.\(^2\) × 1) = 7.0 × 10\(^8\) BTU

5. Embodied Energy Investment in New Construction = (12,255/ft.\(^2\) floor area × 940 M/BTU/ft.\(^2\)) = 115 × 10\(^8\) BTU

6. Annual Operational Energy for New Construction = (12,255 ft.\(^2\) floor area × 58 M/BTU/ft.\(^2\)) = 7.0 × 10\(^8\) BTU

Energy Saved by Renovation of the Stephens’ Block = #2 - #3 + #5 = 109 × 10\(^8\) BTU

Annual operational energy does not affect this picture, since operational energy of the rehabilitated building is the same as that for new construction.

It is interesting to note that this is enough energy to heat the fully insulated Stephens’ Block for 16 years!

1. It should be noted that 0.1 used for F, (“fraction of materials and construction of the existing historic building that is being replaced or added in the renovating process”) is extremely subjective and should be treated as having a 50% uncertainty.

2. Note this is fairly close to 6.8 × 10\(^8\) calculated in the Heat Loss Estimate for the “Full Energy Rehab.” These calculations assume that the “full energy rehab” is undertaken.
TYPICAL CONSTRUCTION DETAILS FOR TROMBE WALL

SECTION DETAIL
1½" = 1'-0"
IV. Recommendations Regarding a Passive Retrofit for the Stephens' Block

The south-facing brick wall on the second and third stories of the Stevens' Block has an unobstructed view of the sky (the first floor wall is covered by an adjacent building). The contribution of solar heat through this untreated brick wall, and the contribution that retrofitting this wall as a trombe wall (see sketch) would make to the heating of the fully-insulated building, were both investigated. Is it worth installing glazing over the wall for solar gain? Should the wall be insulated or is the solar heat gain through the untreated wall enough to effectively increase the insulative value of the wall so that insulation is not warranted?

The SUNCAT computer model was used to simulate the wall as it exists and a retrofit in which the wall would be triple-glazed and thermocirculation vents would be installed. The SUNCAT model performs detailed calculations, simulating temperatures throughout the system every six minutes (in this case) and delivers monthly and annual performance summaries. The simulations were run using Great Falls, Montana weather data, as this is the closest data available. It should be noted, however, that Great Falls has approximately 7,700 degree days per year average, while Butte has about 9,600. Since Butte is colder than Great Falls, performance of systems built in Butte can be expected to be somewhat less than that modeled using Great Falls data.

The simulation of the unglazed brick wall showed that the sun contributes enough heat to the brick to yield an effective R-value of 4.9. The steady-state R-value of the 12” brick wall is about 3.3 (excluding solar influences). The decrease in effective conductivity through the wall due to the sun’s heat is 32%. In other words, the sun contributes about 18,000 BTU’s per square foot of wall per year. (In this simulation, the absorptivity of the wall surface was assumed to be 0.7.)

Unfortunately, the increase in R-value of the untreated brick wall due to solar effects is not enough to justify the lack of insulation. The cost of insulating the walls to about R-20 is about $2.00 per square foot (R-20 means that about 0.05 BTU’s per square foot per hour per °F are lost through the insulated wall). The uninsulated wall loses heat at a rate of about 20 BTU/ft.²/hr.°F, taking solar gain into account. The savings, then, is $0.15 per ft.² per hour per °F. On an annual basis, in Butte, with a 60% efficient gas furnace and current cost of gas of $2.90 per mcf, the insulation is worth 17¢ per square foot per year:

\[
\text{BTU} \times \frac{\text{°F days}}{9600} \times \frac{\text{hr.}}{24} \times \frac{\text{mcf}}{10^6} \times \frac{\text{efficiency}}{0.6} \times \frac{\text{$}}{2.90} = \frac{\text{17¢}}{\text{ft.² year}}
\]

The heat loss through one square foot of uninsulated wall costs 23¢ per year; the loss through the insulated wall costs 6¢ per year.

The cost would be $2.00 per square foot for insulation, yielding a simple payback (no fuel rate escalation) of about 11 years. This is quite reasonable, and would pay back more quickly if fuel escalation is taken into account. (It should be noted that insulating the non-south-facing walls will pay back more quickly, since they do not benefit as much from solar gain.) Given the choice between insulating and not insulating the wall, insulating is the cost-effective choice. Also, the application of Historic Preservation Provisions of the Tax Reform Act and/or energy related tax treatments can reduce the payback period substantially.

The simulation of the trombe wall retrofit of the second and third floor south wall yielded some provocative results. The simulated retrofit consisted of three layers of glazing, a black paint on the bricks, and thermo-circulation vents at each floor (totalling 1% of the glazed areas) with backraft dampers. It was also assumed that the solar heat could be circulated through the entire building instead of just heating the southern rooms. The model predicted that an average of 64,240 BTU per square foot of glazing per year would be delivered to the heated space by thermocirculation plus conduction through the wall. The uninsulated wall would lose about 47,020 BTU per square foot per year. The net benefit of the retrofit then, is the sum of the solar gain and what would be lost through the uninsulated wall, or about 111,260 BTU/ft² year.
On an annual basis, one square foot of retrofit yields about 54¢ per year in solar heat, assuming a gas furnace with 60% seasonal efficiency and $2.90 per mcf of gas:

\[
\frac{11,260 \times 1 \times 1}{10^6 \times 6} \times 2.90 = .54
\]

If the performance of the retrofit is downgraded by 10% to take into account Butte’s colder climate, the annual value of one square foot of retrofit at current fuel prices is about 49¢. A reasonable estimate of cost for such a retrofit is about $10 per square foot. This yields a simple payback of about 20 years.

Even without the assumption of increased fuel price escalation, the payback period of 19 years is not unreasonable. The Stephens’ Block has been standing at least nine times that long, and, given a good physical and energy rehabilitation, there is reason to expect it will be useful for many years to come. The problem is in the investors’ “horizon” (the number of years in which the investor must recoup his investment). Investors generally will not accept such a long payback period.

In summary, the cost of building and the annual cost of operating one square foot of the south wall of the Stephens’ Block are as follows:

<table>
<thead>
<tr>
<th>Cost per ft.² of Installation</th>
<th>Annual Operating Cost per ft.²</th>
</tr>
</thead>
<tbody>
<tr>
<td>No insulation, no solar</td>
<td>0</td>
</tr>
<tr>
<td>Insulation to R-20</td>
<td>$2</td>
</tr>
<tr>
<td>Passive trombe wall solar retrofit</td>
<td>$10</td>
</tr>
</tbody>
</table>

What investments these figures encourage or discourage are largely functions of the investors’ horizon, discount rates, and fuel escalation rates. Both the insulation and the solar retrofit have good investment potential.

1 The use and appropriateness of trombe walls in historic structures is a project-specific matter. Refer to the introduction to this section for guidance.

2 Developed by Larry Palmer and Terry Wheeling, National Center for Appropriate Technology, Box 3838, Butte, Montana 59701, (406) 494-4572.
### NCAT Passive Solar Model Version 2.4

Developed by Terry Wheeling & Larry Palmiter, NCAT, Butte, MT. Running in FORTRAN 5 on Data General Eclipse C-330 under AOS V2.01

---

**Stephens' Block with Trombe and Appliances**

#### Building Description

**Stephens' Block with Trombe**

<table>
<thead>
<tr>
<th>Glass Area</th>
<th>Day-U Values-NGT</th>
<th>Open-Hours-Close</th>
</tr>
</thead>
<tbody>
<tr>
<td>1054.00</td>
<td>.4400</td>
<td>.4400</td>
</tr>
</tbody>
</table>

#### 2 Zone Loss Coefficients

<table>
<thead>
<tr>
<th>Zone</th>
<th>Ambient Loss Coef</th>
<th>To Zone 1 Ground Loss Coef</th>
<th>Ground Room Rate</th>
<th>Appliance Heat Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.0000</td>
<td>.0000</td>
<td>.0000</td>
<td>0.0</td>
</tr>
<tr>
<td>2</td>
<td>2902.0000</td>
<td>.0000</td>
<td>.0000</td>
<td>10000.0</td>
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</tbody>
</table>

#### 1 Mass Conduct Density Spec Heat

<table>
<thead>
<tr>
<th>Type</th>
<th>Mass</th>
<th>Mass Thick</th>
<th>Surf Back Loss Coef</th>
<th>Back Shade Coef</th>
<th>Zone Cntl Of Nodes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1054.00</td>
<td>1.5000</td>
<td>2.3530</td>
<td>1.4600</td>
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</tbody>
</table>

#### Run Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0000</td>
<td>Fraction of Radiation to Air</td>
</tr>
<tr>
<td>0.0500</td>
<td>Fraction of Radiation Lost</td>
</tr>
<tr>
<td>0.0000</td>
<td>Shutter Control Switch (0,1,2,3)</td>
</tr>
<tr>
<td>2.0000</td>
<td>Convective Loop Code (0=NO,1=FAN,2=Free,NBF)</td>
</tr>
<tr>
<td>0.0000</td>
<td>Forc Convection Heat Transfer COEF,BTU/HRF</td>
</tr>
<tr>
<td>8.0000</td>
<td>Wall Height Between Free Convection Vents</td>
</tr>
<tr>
<td>105.0000</td>
<td>Area of one row of vents (Square feet)</td>
</tr>
<tr>
<td>1.0000</td>
<td>Time Increment (HR)</td>
</tr>
<tr>
<td>1.0000</td>
<td>First Day (Jan 1 = 1)</td>
</tr>
<tr>
<td>365.0000</td>
<td>Last Day (Jan 1 = 1)</td>
</tr>
<tr>
<td>68.0000</td>
<td>Initial Storage Node Temperatures (F)</td>
</tr>
<tr>
<td>68.0000</td>
<td>Initial Zone Air Temperatures (F)</td>
</tr>
<tr>
<td>11.0000</td>
<td>Initial Ambient Air Temperature (F)</td>
</tr>
<tr>
<td>0.0000</td>
<td>Day with Maximum ground temp (Jan 1 = 1)</td>
</tr>
<tr>
<td>0.0000</td>
<td>Average Ground Temperature (F)</td>
</tr>
<tr>
<td>0.0000</td>
<td>Ground Temperature Amplitude (Hi-Avg)</td>
</tr>
<tr>
<td>1.0000</td>
<td>First Line of Input Data File to be read</td>
</tr>
<tr>
<td>0.0000</td>
<td>Summary Output Switch (0=Per Mon,1=Per Run)</td>
</tr>
<tr>
<td>0.0000</td>
<td>Machine Readable Output Switch (0=NO,1=Yes)</td>
</tr>
<tr>
<td>0.0000</td>
<td>Hourly Output Switch (0=NO, 1=Yes)</td>
</tr>
</tbody>
</table>

**Files:** In: Stevetromb Out: Model.Out

\[
\frac{(\text{Sq. Ft. Glass})}{(\text{Bldg. Load})} = 0.3632 \quad \text{Sq. Ft.} \cdot \text{HR} \cdot \text{F}/\text{BTU}
\]

\[
\frac{(\text{Heat Capacity})}{(\text{Sq. Ft. Glass})} = 34.20000 \quad \text{BTU}/\text{Sq. Ft.}
\]
Energy Summary for Total (BTU/Sq. Ft. Glass/Day)

Appliance = 227.70

<table>
<thead>
<tr>
<th>Mo.</th>
<th>Absorbed Solar</th>
<th>Absorbed Auxiliary</th>
<th>Required Ambient</th>
<th>Heat From Ambient</th>
<th>Heat South Wall Glass Loss</th>
<th>Heat Vented</th>
<th>Rest of Bldg. Loss</th>
<th>Total Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>458.63</td>
<td>2489.75</td>
<td>.00</td>
<td>.12</td>
<td>326.26</td>
<td>2849.98</td>
<td>3176.24</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>525.07</td>
<td>2107.15</td>
<td>.00</td>
<td>.00</td>
<td>333.31</td>
<td>2529.02</td>
<td>2862.33</td>
<td></td>
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Total Useful Heat Delivered (BTU/Sq. Ft. Glass) = 64,086. BTU/Year.
V. Energy Conserving Skylights in the Stephens' Block and Curtis Music Hall

The dilapidated condition of the skylights in the Stephens' Block and the Curtis Music Hall offers the opportunity to install energy-efficient replacements (see sketch) by properly orienting the glass in the skylights, by using four layers of glass, and by heavily insulating the solid portions of the skylight. The skylights actually admit more heat from the sun than they lose to the cold outside air. Additional energy is saved that would have to be used for electric lighting if the skylights were roofed over and insulated.

The unique character of the sunlit hallways and stairs and light wells in the buildings can also be preserved. The new skylights would admit less illumination than the old ones, but would admit enough to retain a bright ambiance in the buildings.

The energy-conserving skylights, given the incentives offered in the Preservation Tax Act, represent an attractive investment in energy conservation. If 40% of the cost of the skylights can be deducted from taxes, the net installation cost of $500 for one skylight could be reduced to $300. The annual benefit of the skylight of about $58 per year (at current 1979 fuel prices) offers a simple payback of slightly over 9 years. The cost of installing multiple skylights over the large light well in the Curtis Music Hall, which is about 6 times the size of the light wells in the Stephens' Block, would probably be close to 6-times the cost of the simple skylight. Benefits would increase in similar proportions, offering the same attractive investment.

An analysis of one 6' x 12' skylight is presented here in some detail, including calculations for heat loss and solar heat gain, for electrical lighting energy displaced by the skylights, and for the number of light bulbs displaced by sunlight. Costs for each of these and the cost of construction of the skylight are then estimated and these costs and benefits (not including Tax Act benefits) are compared. Sketches of the skylight with details for the glazing are also included.
I. Available sunlight averages about 1522 BTU per sq. ft. per day on a tilt of 68° facing south for the months of September through May in Butte. Transmission of the 4 layers of glass is estimated at 50%. Annual solar gain, then, for 24 ft.² of 4 layers of glass is about $5.0 \times 10^6$ BTU:

\[
\begin{align*}
24 \times 1,522 \times 0.50 \times 270 & = 5.0 \times 10^6 \text{ BTU/heating season} \\
\end{align*}
\]

Annual heat loss through the glass is about $1.4 \times 10^6$ BTU:

\[
\begin{align*}
24 \times 1,522 \times 24 \times 9,600 & = 1.4 \times 10^6 \text{ BTU/heating season} \\
\end{align*}
\]

Heat loss through the solid portions of the skylight are approximately the same as those through the roof area if the skylight were omitted and the hole roofed over.

II. For the location of the skylight over the stairs in the Stephens' Block, about 200 watts of lighting would be needed to replace the skylight: one 80 w. fluorescent at the top of the stairs, one 40 w. at mid-stairs, one 40 w. in the east-west hallway, and one 40 w. in the north hallway. Light fixtures are needed for night-time use with the skylight, so there is no savings in light-fixtures or installation. However, about 876 Kwh per year in electricity are saved. Daylight hours average 12 per day over the year, or 4,380 hours total.

\[
\begin{align*}
200 \times 4,380 \times 0.001 & = 876 \\
\end{align*}
\]

III. 40 watt fluorescent light bulbs are projected by the manufacturer to last 20,000 hours, or about 2.3 years. Since the bulbs are used one half of the time they need replacing only once every 4.5 years. 1.1 bulbs are saved per year by the skylight.

\[
\begin{align*}
\frac{5 \times \frac{1}{4.5}}{ \text{years} } & = 1.1 \text{ bulbs/year.} \\
\end{align*}
\]

The bulbs presently cost $1.36 each.
Cost/Benefit Summary for Energy-Conserving Skylight for the Stephens’ Block

Benefits
Solar heat gain = \(5.0 \times 10^6\) BTU per year
Heat Loss thru glass = \(1.4 \times 10^6\) BTU per year
(Loss through solid portions of skylight approximately equal heat loss through roof if skylight were boarded over and insulated.)
Net heat gain through skylight = \(5.0 \times 10^6 - 1.4 \times 10^6 = 3.6 \times 10^6\) BTU/year.
Cost of that heat, if it were supplied by natural gas is about $21.00 per year at current gas prices:

\[
\begin{align*}
\text{BTU} & \quad \text{mcf} & \quad \text{efficiency} & \quad \$ \\
3.6 \times 10^6 & \times & \frac{1}{10^6} & \times \frac{1}{.6} & \times 2.90 & = 17.40 \text{ per year}
\end{align*}
\]

Electricity displaced by sunlight = 876 kwh/year.
Cost of that electricity, at current prices is about $39 per year.

\[
\begin{align*}
\text{kwh} & \quad \$ \\
876 & \times .045 & = 39.42 \text{ per year (cost based on 1000 kwh/month consumption rate)}
\end{align*}
\]

Light bulb replacement costs displaced by sunlight are about $2 per year.

\[
\begin{align*}
\text{bulbs} & \quad \$ & \quad \text{replacement rate} \\
5 & \times 1.36 & \times \frac{1}{4.5} & = 1.51 \text{ per year}
\end{align*}
\]

Total benefit = (Cost of heat displaced) + (Cost of electricity displaced) + (Cost of bulbs displaced)
= $17 + $39 + $2
= $58 per year
Costs
Incremental cost of energy—conserving skylight over replacing skylight with insulated roof is about $500.

Cost/Benefit
With no savings due to the Historic Preservation incentives of the Tax Act, cost divided by annual benefit = $500 ÷ 58 = 8.6.

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<td>front cap 6’ - $10</td>
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Cost for replacing existing skylight with insulated roof

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Incremental Cost of “Solar Skylight” Over Insulated Roof

$750 - $247 = $503

Footnotes:
These are taken from clear day radiation tables multiplied by 1.1 to take Butte’s 5,700 ft. elevation into account, then multiplied by the percent of clear sky per month, then multiplied by 1.1 to take into account the skylight’s ability to transmit diffuse sun-energy, which typically is 10% of clear-day radiation.
ENERGY CONSERVATION FOR THE LARGE GLASS SHOW-WINDOWS IN THE HENNESSEY BUILDING

The Hennessy Building has large show-windows over much of the first floor and second floor facades on the north and west sides of the building. Only the first floor display windows are currently used by Hennessys, and a prospective new occupant of the store has indicated that they would like much smaller display windows, both to cut maintenance time for the displays and to save energy. The good condition and beautiful design of the windows—including curved, leaded, and cut glass—dictates leaving the glass in place, and seeking a solution to the problem in the interior of the building.

There are approximately 6000 ft.$^2$ of show-windows. There are actually 7000 ft.$^2$, but about 1000 ft.$^2$ of these have been insulated. The heat loss through these single glazed windows is probably somewhat less than handbook values for single glazing, since the glass is semi-isolated by partitions which separate the window display areas from the rest of the store. Many of these partitions, however, do not extend all the way to the ceiling. A heat loss factor—or U-value—of about .5 BTU/ft.$^2$ hr. °F, about the value for double glazing, is probably a good approximation of the actual heat loss. At that rate of heat loss, about 700 million BTUs are lost per year, at a value of about $3,000/year (assuming a furnace efficiency of 60 percent and gas at $2.80/mcf.)

\[
\begin{align*}
\text{ft.}^2 & \times \text{BTU} & \times \text{hr.} & \times \text{°F} & \times \text{days} & = \text{BTU} \\
6,000 & \times .5 & \times 24 & \times 9,600 & = 6.9 \times 10^8 \\
\text{ft.}^2 & \times \text{hr.} & \times \text{°F} & \times \text{day} & \times \text{year} & = \text{BTU} \\
\end{align*}
\]

\[
\text{BTU} \times \text{mcf} \times \text{efficiency} \times \$ \times \$ = 3,200
\]

\[
\begin{align*}
\text{year} & \times \frac{1}{10^6} & \times \frac{1}{.6} & \times 2.80 & = 3,200 \\
\end{align*}
\]

\[
\begin{align*}
\text{BTU} & \times 1.67 & \text{mcf} & \times \text{year} & \text{BTU} \\
1.00-6 & & & & \text{1.00-6}
\end{align*}
\]
Insulating 90 percent of this area—leaving about 500 ft.\(^2\) for display windows—to a U-value of 0.05 BTU/ft.\(^2\) hr. °F (R-19), and double-glazing and insulating the display areas would give an annual heat loss of about 70 million BTU per year, valued (as above) at about $330 per year.

\[
\text{ft.}^2 \times \text{BTU/hr.} \times 24 \times 9,600 = 6.3 \times 10^7 \\
\text{ft.}^2 \times \text{hr.} \times ^\circ \text{F} \times \text{day} \times \text{year} \times \text{year} = \text{BTU}
\]

\[
\text{ft.}^2 \times \text{BTU/hr.} \times 24 \times 9,600 = 0.8 \times 10^7 \\
\text{ft.}^2 \times \text{hr.} \times ^\circ \text{F} \times \text{day} \times \text{year} \times \text{year} = \text{BTU}
\]

TOTAL \(7.1 \times 10^7\)

The savings are approximated at about $2,900 per year.

Building an insulated partition about two feet inside the glass appears to satisfy several criteria of this particular problem. This allows leaving the facade intact. The glass can be either painted on the inside or not, as the store owner desires. Boxes for displays could be built and installed up against the glass. If the glass were left unpainted (as was recommended by one painting contractor since paint will tend to peel off the glass should condensation occur frequently), the partition could serve as an excellent location for a sign or logo for the store. The two-foot space would allow access for repainting or maintenance. The wall could be sheathed with gypsum board, giving the partition a good fire-rating.

A partition of 2 × 6's with 5\(\frac{1}{2}\)" glass-fiber insulation, \(\frac{3}{8}\)" gypsum board inside and out, and painting is estimated to cost $3 per ft.\(^2\). For 5500 square feet, this is a cost of $16,500. Building eight display boxes is estimated to cost $2,000. (See sketches.) The total is $18,500, counting the cost of the display boxes as an energy conservation cost. Dividing cost by first year savings yields a simple payback of about six years. (18,500 - 2900=6.2) If Historic Preservation Tax Act benefits can decrease the cost of the construction, the payback becomes even more attractive. Rapidly rising fuel costs will also make the investment more attractive.
APPENDIX A-2
PRELIMINARY “MOTHBALLING” CHECKLIST

This is a checklist for “mothballing” buildings. This list is broken down into singular architectural problems. The recognition of each one of these troubles in a building will offer a descriptive vocabulary, something very useful in solving these problems.

The four numbers in the right hand column act as a recognition list. Using these numbers, you can rate, or prioritize, the degree to which the problems exist. The number “0” means that the problem does not exist. The number “3” means that the problem is in an extreme state.

The list and numbering system will aid you in walking through your building and recognizing troubled areas. As problems are starting to be solved, go back and update your numerical listings to realize your progress.

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<tr>
<td>Deteriorated coping stones</td>
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**EXTERIOR WALLS:**

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</tbody>
</table>
### WOOD WALLS
- Exposed wood (unpainted) 0 1 2 3
- Paint peeling or chipping 0 1 2 3
- Water streaking 0 1 2 3
- Dry rot 0 1 2 3
- Mildew 0 1 2 3
- Damaged siding 0 1 2 3
- Termites 0 1 2 3

### CAST METAL
- Paint peeling 0 1 2 3
- Rust 0 1 2 3
- Settled water 0 1 2 3
- Water streaking 0 1 2 3
- Damaged flashing 0 1 2 3
- Chipped and cracked caulk 0 1 2 3

### WINDOWS:
#### EXTERIOR WINDOWS
- Broken locks 0 1 2 3
- Broken glass 0 1 2 3
- Damaged or aged plastic weatherization 0 1 2 3
- Windows boarded over 0 1 2 3
- Cracked mullions 0 1 2 3
- Deteriorated sills 0 1 2 3
- Metal portions rusting 0 1 2 3
- Caulking cracking 0 1 2 3
- Weatherstripping peeling 0 1 2 3
- Non-original replacement windows 0 1 2 3

### DOORS:
#### EXTERIOR DOORS AND ENTRIES
- Damaged locks 0 1 2 3
- Paint peeling or chipping 0 1 2 3
- Broken hinges 0 1 2 3
- Broken door knobs 0 1 2 3
- Loose door jamb 0 1 2 3
- Broken glass portions 0 1 2 3
- Misplaced wood detailing 0 1 2 3
- Collision damages 0 1 2 3
- Dry rot 0 1 2 3
- Rusted metal portions 0 1 2 3
- Non-original doors 0 1 2 3
CORNICES:

EXTERIOR CORNICES

- Damaged flashing 0 1 2 3
- Paint peeling or chipping 0 1 2 3
- Loose sections 0 1 2 3
- Deteriorated brick and/or mortar 0 1 2 3
- Misplaced detail work 0 1 2 3
- Rusting metal cornice 0 1 2 3
- Rotting, cracked, or split wood 0 1 2 3
- Damaged building connectors 0 1 2 3
- Animal and environmental debris 0 1 2 3

ATTICS:

UPPER FLOOR ATTIC SPACE

- Accumulated debris 0 1 2 3
- Water streaking or damage on exposed wood 0 1 2 3
- Dry rot 0 1 2 3
- Visible water entries 0 1 2 3
- Damaged roofing structure 0 1 2 3
- Rusting tension bars 0 1 2 3
- Collision damage 0 1 2 3
- Deteriorated attic vents 0 1 2 3
- Broken flooring 0 1 2 3
- Exposed wiring 0 1 2 3

THE INTERIOR:

INTERIOR ROOM AREAS

- Accumulated debris 0 1 2 3
- Bad plumbing joints 0 1 2 3
- Exposed wiring 0 1 2 3
- Plaster chipping and peeling 0 1 2 3
- Falling plaster 0 1 2 3
- Water streaking 0 1 2 3
- Paint chipping and peeling 0 1 2 3
- Electricity available 0 1 2 3
- Water available 0 1 2 3
- Gas available 0 1 2 3
- Buckled flooring 0 1 2 3
- Wainscotting damaged 0 1 2 3
- Broken interior glass 0 1 2 3
- Buckling walls 0 1 2 3
THE BASEMENT:

EXPOSED FOUNDATION WALLS
- Water streaking
- Removed/deteriorated mortar
- Misplaced stones or bricks
- Spalling on walls
- Structural reinforcement rusting
- Salt deposits on mortar or masonry

INTERIOR OF BASEMENT
- Floors pitting
- Rotting wood posts or beams
- Termites
- Settled water
- Rusting metal structures
- Painted walls peeling
- Wood floors buckling
A-3 The Revenue Act of 1978

The Revenue Act of 1978 provides a new tax incentive—a 10% investment tax credit—to encourage the rehabilitation of older buildings. The new incentive contains the following provisions:

1. The building must have been in use for 20 years or more and 75% or more of the existing external walls must remain in place as external walls after the rehabilitation.

2. The credit applies to buildings used for industrial or commercial purposes including factories, shops, and hotels, but it cannot be used in connection with rehabilitation of residential rental properties such as apartment houses.

3. The tax credit applies to expenses made after October 31, 1978. Acquisition costs do not contribute to the amount on which the credit is figured. The rehabilitation improvements must have a life of 5 years or more.

4. If the tax credit is to be used for a certified historic structure, the taxpayer must have the rehabilitation certified by the Department of the Interior. This certification requirement applies to individually listed National Register buildings and buildings within National Register and State and locally designated districts (when the statute creating the district has been certified) that have already been certified for significance.

5. The investment tax credit cannot be used with the historic preservation amortization provision (Sec. 191); however, it can be used with the historic preservation accelerated depreciation provision (Sec. 167(o)).

6. An investment tax credit can be used by certain lessees as long as the owner of the property consents to the use of the tax credit by the lessee. Lessees of government-owned buildings are not eligible for the tax credit. Unlike the tax incentives of Section 2124 of the Tax Reform Act of 1976 which are deductions from gross income to reach taxable income before figuring actual taxes owed, the investment tax credit is figured as 10% of qualified rehabilitation expenses and deducted directly from the taxes owed by the taxpayer. The attractiveness of the investment tax credit as compared with that of the Section 2124 provisions will depend entirely upon the taxpayer's individual situation.

As tax aspects of Section 2124 of the Tax Reform Act and the Revenue Act are complex, individuals should consult legal counsel or the appropriate local Internal Revenue Service office for assistance in determining the tax consequences of the provisions described above. Descriptions of tax consequences in this fact sheet are for general informational purposes only; regulations governing these provisions are being prepared by the Departments of the Treasury and Interior.
A-4 The Tax Reform Act of 1976

Important tax incentives for the preservation and rehabilitation of historic structures were established by Section 2124 of the Tax Reform Act of 1976 (Public Law 94-455). Signed into law October 4, 1976, the act amended the Federal Income Tax Code with provisions to stimulate preservation of historic commercial and income-producing structures by allowing favorable tax treatments for rehabilitations; and discourage destruction of historic buildings by reducing tax incentives both for demolition of historic structures and for new construction on the site of demolished historic buildings.

These preservation provisions permit owners of certain depreciable properties to amortize the costs of a rehabilitation over a five-year period or to depreciate the costs of a substantially rehabilitated structure at an accelerated rate.

To qualify for the tax incentives, property owners must complete a two-part Historic Preservation Certification Application and secure certifications from the Secretary of the Interior regarding the historic character of a structure, and the quality of the rehabilitation work performed on a structure.

Owners of properties listed in the National Register may also apply for certifications if the statutes under which the districts were established have been certified by the Secretary of the Interior. Historic Preservation Certification Applications are available from the appropriate State Historic Preservation Officer (SHPO).

Definitions of terms used in the act and the procedures for obtaining certifications are outlined below.

Historic Structures and Rehabilitations Affected by the Tax Reform Act

Preservation tax incentives are available for any project which the Secretary designates as a certified rehabilitation of a certified historic structure.

A certified historic structure is any structure, subject to depreciation as defined by the Internal Revenue Code, which is listed individually in the National Register of Historic Places; or located in a National Register Historic District and certified by the Secretary of the Interior as being of historic significance to the district; or located in an historic district designated under a statute of the appropriate State or local government if the statute is certified by the Secretary of the Interior.

A certified rehabilitation is any rehabilitation of a certified historic structure that the Secretary of the Interior has determined is consistent with the historic character of the property and/or the district in which the property is located.

The Internal Revenue Code limits depreciation deductions to structures used in a trade or business or held for the production of income, such as commercial or residential rental properties.

Certification of Historic District Statutes

A property located in a State or local, rather than National Register, historic district can qualify for the benefits of the tax incentives in the Act if the statute or ordinance creating the district has been certified by the Secretary of the Interior and if the property is certified as contributing to the significance of the district. To be eligible for certification, statutes establishing a district or districts must contain criteria which substantially achieve the purpose of preserving and rehabilitating buildings of historic significance to the district. At a minimum the statute should provide for a duly designated review body, such as a board or commission, with the power to review proposed alterations to structures within the designated districts.

The request for certification of a State or local statute must be made to the appropriate SHPO by an authorized representative of the governmental body which enacted the law. Documentation for the application must include copies of the statute and, in the case of local historic district statutes, copies of applicable state enabling legislation. The SHPO reviews the documentation and forwards it with a recommendation to the Department of the Interior. Notification of certification is sent directly to the authorized representative.
Certification of Properties Individually Listed on the National Register

All individually listed National Register properties are considered certified historic structures if they are subject to depreciation. Owners of these properties do not have to complete Part 1 of the Historic Preservation Certification Application. To determine whether a property is individually listed in the National Register, a property owner should first consult the cumulative listing of National Register properties in the Federal Register, which may be found in most large libraries. This list is published the first Tuesday of each February and is updated the first Tuesday of every month. If the Federal Register is unavailable, the owner should consult the appropriate SHPO.

Certification of Properties within Registered Historic Districts

To obtain certified historic structure designation for a structure within a registered historic district, the property owner must complete Part 1 of the Historic Preservation Certification Application. A registered historic district, as defined by the Department of the Interior, is either listed on the National Register of Historic Places or designated under a certified State or local statute.

The application is submitted to the SHPO, who reviews the historic significance of the building to the district in which it is located and forwards the application with a recommendation to the Department of the Interior for final evaluation. Notification of certification by the Department of the Interior is sent directly to the property owner.

Property owners may also request certification that a structure is not significant to a historic district by following the same process.

The significance of structures within historic districts is evaluated by the SHPO and the Department of the Interior in accord with the Standards for Evaluating Structures within Registered Historic Districts.

Certification of Rehabilitation Work

A property owner seeking certification of rehabilitation work involving a certified historic structure must complete Part 2 of the Historic Preservation Certification Application. Part 2 may be completed at any time during the course of the rehabilitation work, although owners are strongly encouraged to submit proposed work for approval prior to construction. The application must be signed by the property owner and submitted to the SHPO who reviews the information and forwards it with a recommendation to the Department of the Interior.

Notice of approval of proposed work or certification of completed work is sent directly to the property owner.

All rehabilitation projects which owners wish certified for purposes of the Tax Reform Act are reviewed and evaluated in accordance with the Secretary of the Interior’s “Standards for Rehabilitation.” These ten standards are broadly worded to guide the rehabilitation of all historic buildings, such as industrial complexes, warehouses, schools, commercial buildings, residences, and other structures. The underlying concern articulated in the standards is preservation of this significant historical and architectural characteristics of a structure in the process of rehabilitation.

Tax Incentives

The Tax Reform allows an owner of a certified historic structure to amortize the costs of a certified rehabilitation over a five year period, even if the expected life of the improvement exceeds five years.

The amortization provision applies to rehabilitation expenses incurred after June 14, 1976, and before June 15, 1981.

If a property qualifies as a substantially rehabilitated historic property, the owner instead may take accelerated depreciation by depreciating the adjusted basis of the entire rehabilitated structure at a faster rate than he otherwise would be allowed to use. A substantially rehabilitated historic property is any certified historic structure for which the cost of certified rehabilitation (during a 24-month period ending on the last day of any taxable year, less any amounts allowed as depreciation or amortization during this period) exceeds either $5,000 or the adjusted basis of the property, whichever is greater. The adjusted basis is generally the owner’s initial cost of the property plus the cost of prior improvements less amounts previously allowed to the owner as depreciation. The accelerated depreciation provision of the Act applies to expenses incurred after June 30, 1976, and before July 1, 1981.

Demolition Provisions

The Tax Reform provides that an owner or lessee of a certified historic structure cannot deduct expenditures or losses resulting from demolition of the structure. For the purpose of the provision regarding demolition costs, any structure located in a registered historic district will be treated as a certified historic structure unless the Secretary of the Interior has determined, prior to the demolition of the structure, that it is not of historic significance to the district. This provision of the Act applies to demolitions beginning after June 30, 1976, and before January 1, 1981.
The Act also prohibits the use of accelerated depreciation for any structure in whole or in part constructed, reconstructed, erected, or used on a site that was occupied by a certified historic structure that has been demolished or substantially altered other than by a certified rehabilitation. The provision concerning denial of accelerated depreciation applies to expenditures on construction, reconstruction, or erection of a structure after December 31, 1975, and before January 1, 1981.

The Secretary of the Interior’s Standards for Evaluating Structures within Registered Historic Districts

(a) A structure contributing to the historic significance of a district is one which by location, design, setting, material, workmanship, feeling and association adds to the district’s sense of time and place and historic development.

(b) A structure not contributing to the historic significance of a district is one which detracts from the district’s sense of time and place and historic development intrinsically; or when the integrity of the original design or individual architectural features or spaces have been irretrievably lost.

(c) Ordinarily structures that have been built within the past 50 years shall not be considered eligible unless a strong justification concerning their historical or architectural merit is given or the historical attributes of the district are considered to be less than 50 years old.

The Secretary of the Interior’s “Standards for Rehabilitation”

1. Every reasonable effort shall be made to provide a compatible use for a property which requires minimal alteration of the building, structure, or site and its environment, or to use a property for its originally intended purpose.

2. The distinguishing original qualities or character of a building, structure, or site and its environment shall not be destroyed. The removal or alteration of any historic material or distinctive architectural features should be avoided when possible.

3. All buildings, structures, and sites shall be recognized as products of their own time. Alterations that have no historical basis and which seek to create an earlier appearance shall be discouraged.

4. Changes which may have taken place in the course of time are evidence of the history and development of a building, structure, or site and its environment. These changes may have acquired significance in their own right, and this significance shall be recognized and respected.

5. Distinctive stylistic features or examples of skilled craftsmanship which characterize a building, structure, or site shall be treated with sensitivity.

6. Deteriorated architectural features shall be repaired rather than replaced, wherever possible. In the event replacement is necessary, the new material should match the material being replaced in composition, design, color, texture and other visual qualities. Repair or replacement of missing architectural features should be based on accurate duplications of features, substantiated by historic, physical, or pictorial evidence rather than on conjectural designs or the availability of different architectural elements from other buildings or structures.

7. The surface cleaning of structures shall be undertaken with the gentlest means possible. Sandblasting and other cleaning methods that will damage the historic building materials shall not be undertaken.

8. Every reasonable effort shall be made to protect and preserve archeological resources affected by, or adjacent to, any project.

9. Contemporary design for alterations and additions to existing properties shall not be discouraged when such alterations and additions do not destroy significant historical architectural or cultural material, and such design is compatible with the size, scale, color, material, and character of the property, neighborhood or environment.

10. Wherever possible, new additions or alterations to structures shall be done in such a manner that if such additions or alterations were to be removed in the future, the essential form and integrity of the structure would be unimpaired.
SEC. 2. THREE-YEAR EXTENSION OF PROVISIONS RELATING TO HISTORIC PRESERVATION.

(a) AMORTIZATION OF CERTAIN REHABILITATION EXPENDITURES.—Section 191 of the Internal Revenue Code of 1954 (relating to amortization of certain rehabilitation expenditures for certified historic structures) is amended by redesignating subsection (g) as subsection (h) and by inserting after subsection (f) the following new subsection:

"(g) APPLICATION OF SECTION.—This section shall apply with respect to additions to capital account made after June 14, 1976, and before January 1, 1984."

(b) DENIAL OF DEDUCTIONS FOR CERTAIN DEMOLITIONS.—Section 280B of such Code (relating to denial of deduction for demolition of certain historic structures) is amended by adding at the end thereof the following new subsection:

"(c) APPLICATION OF SECTION.—This section shall apply with respect to demolitions commencing after June 30, 1976, and before January 1, 1984."

(c) DEPRECIATION OF IMPROVEMENTS.—Subsection (n) of section 167 of such Code (relating to depreciation of improvements) is amended by adding at the end thereof the following new paragraph:

"(4) APPLICATION OF SUBSECTION.—This subsection shall apply to that portion of the basis which is attributable to construction, reconstruction, or erection after December 31, 1975, and before January 1, 1984."

(d) DEPRECIATION OF CERTAIN SUBSTANTIALLY REHABILITATED HISTORIC PROPERTY.—Subsection (o) of section 167 of such Code (relating to depreciation of substantially rehabilitated historic property) is amended by adding at the end thereof the following new paragraph:

"(3) APPLICATION OF SUBSECTION.—This subsection shall apply with respect to additions to capital account occurring after June 30, 1976, and before January 1, 1984."

(e) CONFORMING AMENDMENT.—The following provisions of section 2124 of the Tax Reform Act of 1976 are hereby repealed:

(1) paragraph (4) of subsection (a),
(2) paragraph (3) of subsection (b),
(3) paragraph (2) of subsection (c), and
(4) paragraph (2) of subsection (d).

SEC. 3. TWO-YEAR EXTENSION OF PROVISION FOR 60-MONTH DEPRECIATION OF EXPENDITURES TO REHABILITATE LOW-INCOME RENTAL HOUSING.

Subsection (k) of section 167 of the Internal Revenue Code of 1954 (relating to depreciation of expenditures to rehabilitate low-income rental housing) is amended by striking out "January 1, 1982" each place it appears and inserting in lieu thereof "January 1, 1984".
APPENDIX A-5

Survey of Visitors to the World Museum of Mining—July 1979

On Thursday, July 12, and Saturday, July 14, a total of 64 parties (approximately 200 people) were interviewed at the World Museum of Mining in Butte. They were questioned about the nature of their trip and how they learned of tourist facilities in the area. (Attached is a copy of the questionnaire used in this process. It should be understood that the questionnaire is loosely designed in order to allow tourists to comment openly.) The following data was compiled from the responses to our interviews.

Origin of Visitors:

<table>
<thead>
<tr>
<th>Butte</th>
<th>Montana</th>
<th>Out of State</th>
<th>Foreign</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>3</td>
<td>23</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>10</td>
<td>17</td>
<td>3</td>
</tr>
</tbody>
</table>

(Thursday)

(Saturday)

20 parties or 30% of the visitors were in Butte to visit friends or relatives. The remainder was passing through the area on their way elsewhere (between Glacier and Yellowstone, on a Pacific northwest tour, or a tour of Montana).

70% of those interviewed were spending the night in Butte with the following breakdown:
- 30%—with relatives
- 15%—in motels in the Butte area
- 20%—camping in area campgrounds
- 5%—from the local area

64% of those interviewed had learned of the World Museum of Mining and other Butte attractions through word of mouth. The remaining 36% learned of these attractions in the following manner:
- Signs on the roads
- The Chamber of Commerce
- Brochures distributed around the area (motels, restaurants, campgrounds)
- Old #1 Tour bus
- Highway Department brochures
- AAA
- Chamber map
- Roadside Geology

The major problem we identified was that visitors were not generally aware of directions to specific attractions in the Butte area. They remarked on the lack of directional signs and street signs. Information pamphlets were not as widely distributed as perhaps is necessary. They were generally pleased with the museum and the historic CBD.
TOURIST SURVEY—BUTTE'S WORLD MUSEUM OF MINING—1979

Where did you start your trip?

Where did you stay last night?

Where do you plan to stay tonight?

Would you consider/have considered staying in Butte (Comments)

How long is your entire trip?

What brought you to Butte?

What drew you to the Mining Museum specifically?

Comments:
APPENDIX A-6

Definition of Mining Terms

Block Caving—A method of caving in which a thick block of ore is partly cut off from surrounding blocks by a series of drifts, one above the other.
Caving—A stopping method in which the ore is broken by induced caving (collapsing).
Dumps—A place where the ore taken from the mine is tipped.
Headframe—The steel or timber frame at the top of the shaft which carries the sheave or pulley for hoisting rope and serves other purposes.
Open Pit Mine—A mine working or excavation open to the surface.
Open Pit Mining—Operation designed to extract minerals that lie near the surface. Waste, or oven-burden, is first removed, and the mineral is broken and loaded as in a stone quarry.
Subsidence—A sinking down of a part of the earth's crust.
Subsidence Area—The area affected by subsidence over areas where minerals have been removed (due to underground mining).
Subsidence Break—A fracture in the rocks overlying a coal seam or mineral deposit as a result of its removal by mining operations.
Tailings—The part, or parts, of any incoherent or fluid material, separated as refuse, or separately treated as inferior in quality.
Timbering—The operation of setting timber supports in mine workings or shafts.

This publication was prepared pursuant to Executive Order 11593 “Protection and Enhancement of the Cultural Environment,” which directs the Secretary of the Interior to “… develop and make available to Federal agencies and State and local governments information concerning professional methods and techniques for preserving, improving, restoring, and maintaining historic properties.”
The photographs, except where noted, were taken by Jet Lowe, N.A.E.R. photographer.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities to protect and conserve our land and water, energy and minerals, fish and wildlife, parks and recreation areas, and to insure the wise use of all these resources. The Department also has major responsibility for American Indian reservation communities and for people who live in island territories under US administration.