REHABILITATION FOR REDEVELOPMENT:
An Approach to the Conversion of Old Office Buildings to Housing

by
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Bachelor of Architecture
University of Notre Dame
May 1979

Submitted to the Department of Architecture
in partial fulfillment of the requirements for the degree of
MASTER OF SCIENCE IN ARCHITECTURE STUDIES

at the
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
June 1984

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May 11, 1984

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MASSACHUSETTS INSTITUTE
OF TECHNOLOGY

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ABSTRACT

This thesis contends that the rehabilitation of existing building stock is a viable alternative to new construction in the production of housing. Principally, the thesis proposes that old office buildings, built between 1900 and 1930, be rehabilitated and converted for residential use. A specific approach to this rehabilitation and conversion is recommended.

A survey was conducted in San Antonio, Texas, of the existing old office buildings within the central business district, in order to identify and define a particular type of building potentially suitable for conversion to housing. The identified building type is described and analyzed. Two examples were selected from the survey for further analysis.

The approach recommended for the conversion of the building type consists of two phases, design and construction. In both, recognition of a separation between the public and private spheres in housing production is crucial. Four Levels of Construction are defined, both to aid in the demarcation of these two spheres of authority, and to identify logical stopping-points in the construction of a housing support and individual dwelling units. Within the design phase, the SAR methodology of housing support design is adapted for application to an existing office building structure.

To demonstrate this application of the design methodology, and to provide some basis for an evaluation of the suggested approach, the two selected building examples have been taken through the design process in a step-by-step sequence. Based on this demonstration, an assessment is made of the suitability of the building type for this kind of conversion, of the appropriateness of the design methodology in this application, and of the approach in general.

Thesis Supervisor: Nabeel Hamdi
Title: Assistant Professor of Housing Design

PREFACE

This thesis evolved from a personal desire to grapple with two somewhat disparate issues, whether together or individually. In the end, I was able to combine the two, not for the sake of convenience, but rather because I had an idea that relied on both.

My initial desire was to develop a useful means of providing quality, economical housing through private development. I was convinced, rightly or not, that the difficulties encountered in public housing are inescapable, and for the most part, insoluble by mere architectural design. On the other hand, I have seen many a developer who was able to produce an affordable product through sheer ingenuity and determination.

The other issue that concerned me was building preservation. The revolutionary days of preservation in the Sixties, with old ladies in tennis shoes chaining themselves to endangered historical buildings, are long gone. But there is still a tendency to discount the value of our more mundane old buildings, and a more alarming tendency to just flatten them if they stand in the way of the city's tax base.

The city needs more than revenue and impressive skyscrapers. It also needs life, in the form of people who live and work there, who are there because they want to be there. And it needs to be reminded of what it was, how it came to be. Why it is.

Why not both? Would not one idea buttress the other, a sort of symbiotic solution? Herein, then, is a proposal for creating affordable housing through the preservation of one of our yet abundant resources, old buildings. It is essentially an idea, untried, untested.

D.M.H.
Boston
May 1984

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Glossary

"...housing rehabilitation may then be conceived of as any positive investment in an indivisible structure which increases the output of housing services while leaving the basic structural shell of that building intact."

D. Gordon Bagby

1. Diamonstein, 26.

2. Bureau of National Affairs, 14:0011.

The terms listed below have been subjected to both overuse and misuse. Even the meanings given to these terms tend to vary widely from one source to another. Consequently, the definitions, as they are intended within this thesis, are presented here in the attempt to avoid confusion.

1. ADAPTIVE REUSE

Adaptive reuse is the continued use of an existing building for purposes other than that for which it was originally designed and constructed, usually granting an extended life to a building which would be otherwise endangered. The term implies a sensitive and sympathetic adaptation of the building for its new use, complementing rather than impairing the existing structure and its surroundings. It almost always involves some alteration, especially installation of modern conveniences and up-to-date HVAC systems.[1] Adaptive reuse describes the end result of the project, not the particular process or technique used. The work can involve from simple cosmetic repair to major redesign.

2. CONSERVATION

While conservation is sometimes used with reference to individual buildings (see PRESERVATION), it most commonly refers to neighborhoods. It is the physical and economic stabilization of a neighborhood, usually involving comprehensive plans to maintain and improve the many characteristics of a neighborhood. Neighborhood conservation may include not only the rehabilitation of buildings, but also the improvement of municipal services and facilities, resulting in increased local job opportunities and businesses.[2]

3. CONVERSION

Conversion is simply the adaptation of an existing structure to a different use. Synonymous with adaptive reuse, it is less descriptive.

1. George Stephen, Remodeling Old Houses, (New York: Alfred A. Knopf, 1972), 8.

2. Bureau of National Affairs, 14:0012.

3. Stephen, 10.

4. PRESERVATION

The general term, preservation, is often used to indicate any process whereby a building is saved from destruction, or preserved. In this sense, everything from historic restoration to extensive redesign is a form of preservation. In its strictest sense, however, it refers to the retention of, with slight repair, a building's original condition and appearance. A new or more appropriate use of the building may be found, but the general character and appearance of the building will remain essentially unchanged.[1]

Historic preservation is a specialized form of preservation, in which the historic characteristics of a building are salvaged or replaced (see RESTORATION) in the process of making general repairs and halting further deterioration.[2] Strict historic preservation is very costly and time-consuming, and unlike general preservation, the result is essentially a museum.

5. RECONSTRUCTION

Simply meaning to rebuild or construct again, this term can be associated with any form of rehabilitation, from restoration to redesign.

6. RECYCLING

Recycling is a general term meaning the refitting of an existing building for a new or different use. As with its synonym, adaptive reuse, recycling implies some alteration of the building, but it does not indicate the degree of reconstruction or rehabilitation involved.

7. REDESIGN

At the opposite end of the rehabilitation scale from preservation is building redesign. This term assumes an adapted reuse of a building, in which the existing structure, while being the major element determining the finished product, is radically altered. The end result can be a building that either appears to be newly built or is unrecognizable as the old structure.[3]

1. Ed Sharp, The Old House Handbook for Chicago and Suburbs, (Chicago: Chicago Review Press, 1979), 21.

8. REDEVELOPMENT

Redevelopment is the revitalization, primarily economic in nature, of older neighborhoods, especially commercial areas. It refers to the process of neighborhood recovery or regeneration brought about by a series of demographic and economic changes. Indicating a more radical result than conservation, redevelopment tends to attract new investors and residents hoping to participate in the rebirth of a neighborhood. Accompanying redevelopment are usually increased property values, taxes, and rents, often stimulating economic revival of neighboring areas.[1]

9. REHABILITATION

Rehabilitation means literally making habitable or useful again. It is a very general term, referring to a whole range of possible approaches to building preservation. Rehabilitation is the repair or reconstruction of a building to deter physical and technological obsolescence, involving more than routine minor improvements or property maintenance. As a general category, building rehabilitation can involve anything from strict historic preservation to substantial redesign. However, in its most commonly accepted usage, rehabilitation denotes a process of repair of deterioration and improvement of the basic service systems, while maintaining the general character of the building. It usually implies an introduction of new elements into the existing structure that are not historical.

10. RENEWAL

Renewal, unlike redevelopment, is used to describe neighborhood change of a physical nature only, usually implying the destruction of existing buildings for the construction of new ones.

Urban renewal, especially, has gained a bad connotation by being the name given the program created by the Housing Act of 1949 to deal with the problem of rapid deterioration of urban ares. Urban renewal provided federal assistance for demolition and new construction, but it eventually became synonymous with bulldozing to make room for low income housing projects. Despite its failures, urban renewal was one

of the first housing programs to recognize that the quality of housing depended not only on the physical structure, but also on the general facilities of the neighborhood. It provided funding for basic utilities, neighborhood facilities, and open space land.[1]

11. RENOVATION

While being often confused with rehabilitation, renovation is actually a specific form of rehabilitation. Used correctly, it refers to a very careful process of salvaging as much as possible of a building as it exists, while removing or replacing those elements that are unwanted, unneeded, or beyond repair. The most important aspect of building renovation is the thorough examination and inventory of the existing structure and its various components to determine exactly what is to be saved and what is not.[2]

12. RESTORATION

Restoration is very similar to historic preservation, and like the latter, it is a very specific form of rehabilitation. It is somewhat more restrictive than historic preservation in that, rather than preserving any previous historic state of a building, it restores or returns the building to its exact original appearance and condition at the time of its construction. A true restoration is only practical on a building of outstanding historical or architectural significance which is intended to be a museum, as it is extremely expensive and precludes the addition of any modern conveniences.[3]

1. Bureau of National Affairs, 14:0012.

2. Bagby, 2.

3. Sharp, 90.

CHAPTER 1 : Introduction

1.1 background

1.2 proposal for an approach

"Once upon a time, buildings were built to last. The old New England proverb, 'Use it up, wear it out, make it do, or do without' applied to buildings as much as to other scarce resources. But somewhere along the way the idea took hold that America's architecture was a commodity that could and should be shed as quickly as clothes to meet current fashions."

Gene Bunnell

1. Bureau of National Affairs, 14:0012.

2. Stella, ed., 111.

1.1 Background

During the 1940s, a combination of forces and events spelled disaster for the urban centers of many American cities. The interstate highway system had made the wide open spaces of the suburbs accessible. The availability of FHA and VA mortgage insurance,[1] together with the opportunity of owning large plots of land and detached single-family houses, made the suburbs too enticing a prospect to ignore.

As families left the cities for the suburbs, seeking more space and lower taxes, many businesses followed, placing an ever higher tax burden on those business and property owners who chose to stay. This now-famous exodus of the middle class continued through the 1960s and even into the 1970s. The migration to the suburbs precipitated a countermigration of minority and low income population to the city centers. The poor physical state of the urban centers was initially a direct result of the departure for the urban periphery and later became its cause. Raynor M. Warner explains,[2]

> Mass transit was neglected; inner-city crime increased; downtown commercial areas declined; and business sought more secure and less expensive locations outside the city. Redlining by banks and unrealistic insurance premiums often made staying in the city impossible even for those who wished to do so.

The city's tax base was slowly drained away with the population. Less and less money was put back into property and infrastructure.

1. Stella, 111.

2. Newmark and Thompson, 208.

3. Diamonstein, 16.

4. Stella, 1.

Downtowns were left with large numbers of buildings which were underutilized and physically neglected. Property value and physical condition declined, and with these declined the image of the downtown.

The history or urban renewal in this country, beginning with the Housing Act of 1949, demonstrated a profound misunderstanding of and inability to deal appropriately with the problems facing the major urban centers.[1] By the early 1970s, it had become obvious that many of the concepts behind urban renewal were ill-conceived. Vital elements of urban neighborhoods had often been ignored or overlooked, or even eliminated.

One of these vital elements that urban renewal disposed of rather indiscriminately was the existing building stock, destroying with it entire neighborhoods and communities.[2] Whole sections of urban centers were bulldozed, leaving behind either wasteland or huge, monolithic housing projects,[3] where previously had stood those physical elements, as termed by Kevin Lynch, "the image of the city." This wholesale destruction served only to accelerate those processes of deterioration it was intended to halt. Warner remarks,[4]

> Our social structure is embodied in buildings from county courthouses to downtown storefronts. Buildings are the physical shells which have formed neighborhoods, shaped social contacts, and molded patterns of doing business to such a degree that to alter them today tears our economic and social fabric.

With the failures of the late 1960s and early 1970s came the

1. Diamonstein, 15.

2. Ibid., 14.

3. Ibid., 21.

4. Stella, 1.

rediscovery of preservation. From being merely a fad in the 1960s, building preservation and rehabilitation has come a long way in twenty years, to the point of being a major element of city planning. But preservation is not exactly a new phenomenon. Sherban Cantacuzino states,[1]

> Because their structure tends to outlive their function, buildings have continuously been adapted to new uses - a fact which has enabled generation after generation to derive a sense of continuity and stability from their physical surroundings.

In fact, says John Morris Dixon,[2]

> This re-use and reworking of architecture is historically normal; failing to do so was aberrant.

Preservation has now become a heartily accepted activity in the real estate, design, and construction industries. The value inherent in the existing building stock of this country has been recognized, in both its economic and psychosocial aspects. The experience of recent urban redevelopment indicates that the recycling of these older buildings is accomplishing what new construction cannot.[3] With the ever increasing scarcity of land and economic resources, the adaptive reuse of existing structures has distinct advantages. Cities have tremendous assets tied up in their buildings, as Warner points out,[4]

> ...over the decades America's buildings have become extraordinary storehouses of our natural resources, of wood, stone, mortar, and steel, as well as of the energy used to assemble them. At the same time, they have become repositories of cultural and social resources.

The social and environmental advantages of recycling have been demon-

strated: our image of the city remains unimpaired, as do the myriad personal, social, and cultural associations created by the physical building fabric.

As urban renewal eliminated primarily housing stock, our city centers still contain many thousands of old buildings, many of them vacant or only partially occupied, with no consistent local policies for dealing with them.[1] Little demand is to be expected for these buildings as they were originally used. Laurence Reiner explains,[2]

> Many of these structures were built before the turn of the century, and they were built to last. There are warehouses, railroad stations, factories, row houses, apartment houses, hospitals,... They are there because progress or economics has passed them by or made them unprofitable to operate in their present condition.

It is now commonly accepted that building preservation must be profitable for it to be viable at all.[3] At least it must be profitable financially in order for private developers to pursue it willingly. And indeed, building preservation has become a booming business, but the end results have often been detrimental to those who had found some benefits in the decline of the physical and economic state of the urban cores, namely, the low income population. It is precisely the successes by the private sector, and some public/private joint ventures, that have given rise to a relatively new problem in the recycling of the older urban building stock, termed gentrification. After so many years of out-migration of population, the urban centers have finally seen a reversal of that trend. The downtowns have been redis-

1. Diamonstein, 16.

2. Reiner, ix.

3. Ibid., xi.

covered. Rapidly increasing property values and an influx of new businesses and services catering to a higher income group are now reclaiming the city centers from those who have resided there for the past several decades.[1]

The need to provide housing through the rehabilitation of old building stock is becoming acute. The alternatives are few. Huge numbers of housing units, says planner Gene Bunnell,[2]

> ...are being lost each year through misguided local policies, apathy and neglect. This loss comes at a time when demand for housing is increasing and when the housing industry has not been able to meet this demand through new construction. Even if sufficient numbers of new housing units could be constructed each year, the increased cost of new construction has made most new units too expensive for the average family or household.

Warner believes that,[3]

> The recycling and continued use of existing buildings can usually be justified on economic grounds alone. The shell of an office or factory building, including the foundation, supporting structure, and outer enclosure, represents a substantial cost in construction dollars and time.

Old structures can often be acquired at very low cost. Demolition costs are avoided. Rehabilitation of existing buildings is usually faster than new construction.[4] And due to their typically sound construction, older buildings cost no more to operate once they have been renovated.[5]

1. Diamonstein, 22.
2. Bunnell, 8.
3. Stella, 5.
4. Bunnell, 10.
5. Stella, 6.

Recycling has other advantages over new construction. It is more labor-intensive, and can thus provide more jobs than new construction.[1] Old buildings have intrinsic qualities and amenities that are more marketable than those of new buildings.[2] Funds are available through federal, state, and local agencies for preservation projects. In addition to these advantages are the previously mentioned social and cultural benefits of recycling.

Reminds Barbaralee Diamonstein,[3]

> The point of the effort is nothing less than to preserve our past, to provide an anchor for our collective memory.

1. Bunnell, 8.

2. Ibid., 10.

3. Diamonstein, 13.

1.2 Proposal for an approach

In the urban centers of many larger United States cities, there stand many vacant or underutilized structures (office buildings, warehouses, factories, schools, hotels, etc.) for which little demand as originally used is foreseeable. Each of these buildings eventually will arrive at a crossroads: the decision will have to be made whether to rehabilitate or demolish them. Of these structures, a predominant type is the medium-rise office building, built during the early 1900s. These buildings, having been abandoned for newer downtown office towers or for suburban office and commercial centers, nevertheless still possess a wealth of utility, physical space, and in some cases, historical or architectural significance.

At the same time, the gentrification of many city centers is now well underway. The downtowns have been rediscovered for their color, excitement, and activity, in addition to their more practical advantages, such as public transportation and proximity to employment and services. This return to the city centers by people of middle and upper income levels, together with the continuing destruction of older building stock to allow for new downtown development projects, is creating a housing shortage in the urban cores. The remaining housing is becoming accessible to only the more affluent population.

The old building stock of the urban cores has a tremendous potential for alleviating this housing shortage. Old office buildings,

constructed in the years 1900 to 1930, are possibly well-suited to rehabilitation and conversion to housing. With exceptions due to exhorbitant land values or inappropriate land use, it should be feasible, physically and economically, to convert these office buildings to housing.

One very promising strategy for accomplishing this conversion in the uncertain and changing housing market of the typical urban core is the concept of "supports," as developed by Stichting Architecten Research (SAR), of Holland, over the past twenty years. The design methodology presented by SAR,[1] though developed for application in new housing construction, could very well be adapted for use in designing the conversion of old office buildings to housing.

The proposal here is for an approach to this conversion that recognizes differing levels of control, or decision-making authority, in housing construction. By clearly defining the levels over which the resident has ultimate control, the possibility exists for more economical, flexible, and desirable residential accommodation. In addition, the rehabilitation of existing old office buildings further enhances the possibility of aesthetic, economical housing.

1. As presented in: Habraken, et al., Variations.

CHAPTER 2 : The Building Type

2.1 context: San Antonio

2.2 office building survey

2.3 description of the building type

"Probably the most neglected resource of this country is its stock of old buildings."

Laurence E. Reiner

2.1 Context: San Antonio

The city of San Antonio, Texas, was chosen as the context from which to select actual building examples for analysis for two reasons in addition to its being a major U.S. city. The city's central business district contains an abundance of viable old building stock and the city has demonstrated a concerted effort to recognize the value of and rehabilitate this old building stock. Though the actual context chosen here has little direct consequence on the approach presented, it nevertheless serves to illustrate the tremendous potential of the old building stock contained within the major U.S. city.

From 1900 until the Depression, the city of San Antonio expanded and construction proceeded at a phenomenal rate. By 1930, buildings were being erected with heights of thirty floors. The expressway system was begun in 1945 and further expanded in 1949, almost doubling the population of San Antonio between 1940 and 1950. By 1965, the city covered 160 square miles. The 1980 U.S. Census determined that the city had a population of 785,000, making it the eleventh largest city in the country.

Today, San Antonio is a sprawling metropolitan area of 268 square miles at the intersection of three interstate highways and several state highways. Low and moderate income residential development exists to the east, west, and south of the central business district (CBD), while commercial and middle to high income residential develop-

ment has spread for considerable distance to the north.

Given the present size of the city of San Antonio, the CBD is remarkably small. The actual core of the CBD is a densely-built area approximately one-half mile square, bounded by Martin Street on the north, Market Street on the south, Flores Street on the west, and Alamo Plaza on the east. (see map of Existing CBD Land Use in the following section) The building stock within this core consists of a large assortment of old office, hotel, and civic buildings, and relatively few residential buildings. Many of these buildings are listed on the National Register of Historic Places. Most of the older office buildings were built between 1900 and 1934. Recent additions to the downtown building stock are several high-rise office buildings and city-owned parking garages, most having been built since 1970.

The 1972 publication, "Development of the Central City District," by the San Antonio Renewal Program, remarks,[1]

> While the core areas of many large cities have apparently declined past the point of no return, San Antonio's Central Business District and frame are still viable.... However, San Antonio's central city has experienced the exodus of large numbers of its population to new suburban areas. This has had the effect of decentralization of business and services. The downtown district is left with scars of physical obsolescence, and under-utilized and under-developed areas.

During the late 1960s and early 1970s, many old buildings within the CBD had been destroyed by private speculators to allow for the

1. Central City Development Team, 3.

construction of parking facilities, in response to what was perceived to be a serious downtown parking problem. Eventually, this perception was seen to be exaggerated, and a growing concern over this wholesale destruction of building stock led to the initiation of cooperation between the public and private sectors.

In 1975, Centro 21 was established as a downtown revitalization task force with the goals of developing downtown housing, transportation, parking, and amenities, rehabilitating old or historic buildings, and enhancing the image of the downtown in general. Since its conception, Centro 21 has been quite successful. A trend to rehabilitate older downtown structures had become apparent by the late 1970s. Centro 21 has developed and implemented various successful experimental redevelopment projects in the San Antonio CBD, financed jointly by local investors and grants from the Department of Housing and Urban Development.

2.2 Office building survey

As part of this study, a survey of old office buildings was conducted in January of 1984 within the San Antonio CBD to determine the amount of the existing building stock that is potentially suitable for conversion to housing. After an initial survey to obtain some familiarity with the range and number of old building types in existence within the CBD, a specific building type was identified and defined. The definition of this type is as follows:

> A building, originally designed and constructed for office accommodation, built between 1900 and 1930, with steel-reinforced concrete structural frame, and masonry facade, having from five to fifteen floors, and less than 15,000 square feet of gross area per floor.

Buildings that fit this definition, and were judged to have configurations suitable for housing, were identified and located. Their inclusion in this list of appropriate buildings was not based on market value or present availability. Some of the identified buildings were vacant and deteriorated, while others were partially occupied, and still others were newly renovated and fully occupied. The purpose of the survey was to demonstrate the number of existing buildings of the stated type that are potentially available and suitable for rehabilitation and conversion to housing.

The survey identified 16 buildings (see Table 2.1), ranging in height from six to fourteen floors, and ranging in total leasable floor area from 25,000 to 130,000 square feet. (The locations of the

identified buildings are shown on the map, Existing CBD Land Use.) They total approximately one million square feet of leasable floor area. This list of buildings is not intended to be a complete or finite one, but rather to be indicative of the amount of office building stock in the San Antonio CBD that could theoretically be utilized as housing.

Two buildings were selected for detailed analysis, the Travis Building and the Maverick Building. Both buildings are of typical height and floor area. Neither building is particularly distinguished in appearance, nor do they have any outstanding peculiarities (with the possible exception of the Maverick's rhomboid plan). In fact, both are rather average in all respects.

Whereas one building example would be sufficient to demonstrate the proposed approach and methodology, two building examples allow, in addition to this, a comparison. Furthermore, the Travis Building has a relatively simple configuration, while the Maverick's is more complex.

1. Numbers correspond to the building locations on the Existing CBD Land Use map, next page.

2. Sources:
"1981 Office Directory," and
"Office Buildings 1983," by the San Antonio Chamber of Commerce.

3. Presently named American Security Life Building

4. Estimated.

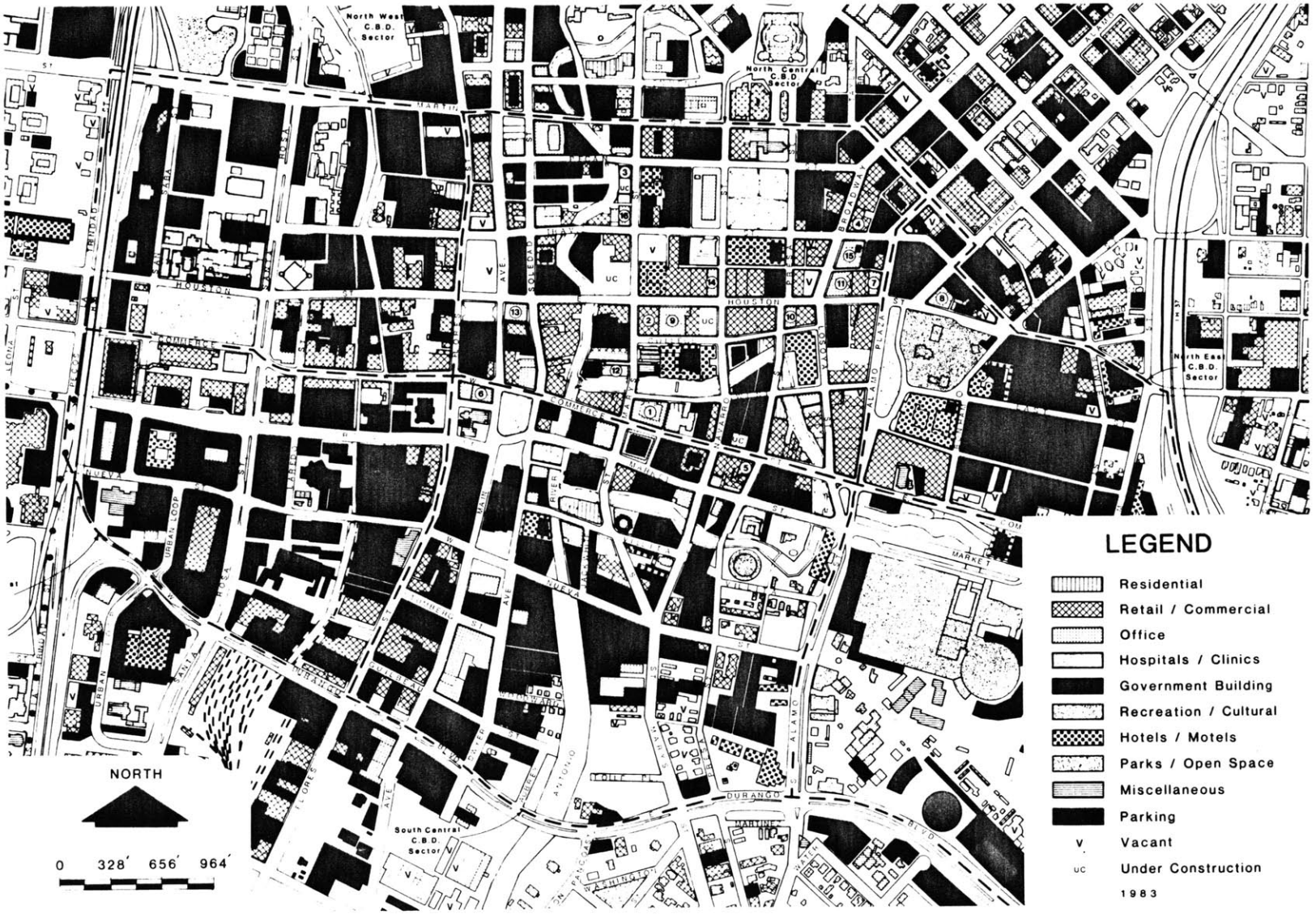
5. Buildings selected for analysis in this study.

Table 2.1

Survey of Buildings

no.[1]	building	location	date built[2]	no. flrs.	leasable space[2]
1.	Aztec	211 E. Commerce	1926	10	25,123
2.	Brady	200 E. Houston	1915	8	40,000
3.	Builders' Exchange[3]	152 E. Pecan	1925	10	36,000
4.	Calcasieu	214 Broadway	1914	6	50,000[4]
5.	Commerce	316 E. Commerce	1920	8	37,416
6.	Frost (Main Plaza)	114 W. Commerce	1922	12	73,131
7.	Gibbs	105 N. Alamo	1908	8	35,000
8.	Landmark	705 E. Houston	1926	13	130,000
9.	Majestic	212 E. Houston	1929	14	65,000
10.	Maverick[5]	606 N. Presa	1923	9	58,000
11.	New Moore	110 Broadway	1904	6	101,000
12.	Petroleum Commerce	210 N. St. Mary's	1926	6	70,000
13.	Rand	110 E. Houston	1912	8	69,600
14.	South Texas	603 Navarro	1914	12	105,000
15.	Three Americas	118 Broadway	1905	6	87,000
16.	Travis[5]	405 N. St. Mary's	1923	10	45,000

EXISTING CBD LAND USE



1. L.A. Community Design Center, 24.

2. McLaughlin, "Evaluating Renovation Projects," 73.

3. L.A. Community Design Center, 24.

4. Stella, 1.

2.3 Description of the building type

The previous section presented the definition of the building type being investigated for use as housing in this study. This building type is fairly common in larger cities across the United States. These are substantial buildings, constructed of non-combustible materials. They represent a great structural resource. In general, these buildings would require minimal modification to bring them up to current building code and fire safety standards.[1]

These office buildings typically have a concrete skeletal frame, concrete floor slabs, and a masonry (very often brick) facade with operable (often wood double-hung) windows. They have been built with relatively low floor-to-floor heights, one or more stairwells, and two or more elevators. Typically, these buildings have been designed with "L", "U", "H", or "E" shapes in plan,[2] with wings usually not more than 100 feet long or 50 feet deep. The floor areas tend to range between 6000 and 15,000 square feet.

Probably the most important characteristic of these buildings, however, is their sturdy and high quality construction, usually with superb craftsmanship and much greater attention to detail than that of contemporary structures.[3] These buildings embody a tremendous amount of creativity, imagination, and human effort, in addition to the great volumes of natural resources and energy that went into their creation.[4] They represent an irreplaceable aesthetic and cultural

legacy of the beginning of this century.

While old office buildings represent a huge amount of usable floor space, they are unlikely to ever be in very great demand again as office space.[1] They were designed for use by commercial tenants requiring small amounts of space, usually from 200 to 2000 square feet. Their designs also provided natural light and ventilation to the whole interior of the buildings.[2] The state of concrete construction technology limited the structural spans, resulting in structural bays of from 12 to 20 feet. Contemporary office buildings house tenants occupying hundreds of thousands of square feet, with huge, open floor plans, and lighting and mechanical systems relying very little on natural light or ventilation.

These buildings are too small and inflexible to be of great value as modern office space.[3] But more importantly, they no longer have the impressive image necessary to communicate the status of corporate occupants. Even though they are solidly and superbly built, and some are even architectural masterpieces, they are not big enough, or tall enough, or slick enough to present the desired visual image of the successful corporation.

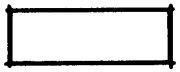
An image that these buildings are capable of projecting is one of residential accommodation. In fact, it is often their limitations on use as office space that make them desirable for housing, with their floor-to-floor heights of 10 to 12 feet, and seldom more than twelve

1. L.A. Community Design Center, 28.

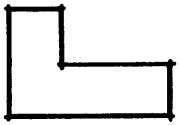
2. McLaughlin, "Evaluating Renovation Projects," 73.

3. L.A. Community Design Center, 28.

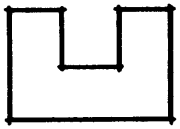
GENERIC SHAPES:



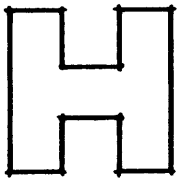
rectangular



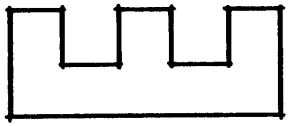
L-shaped



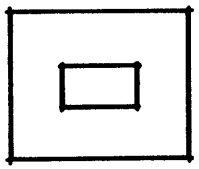
U-shaped



H-shaped



E-shaped



light-well

floors. Their facades are refined and ordered compositions with regularly spaced, operable windows of residential scale.

The classical proportions of the building facades, especially the lower floors, and the masonry materials provide an impression of solid construction. These buildings were crafted of natural materials, with an eye for detail. They are dignified, often elegant structures that impart a sense of strength and security.

The illustrations at the left demonstrate the range of generic shapes these buildings take in plan. Originally designed to have twenty-foot deep office spaces on both sides of an interior corridor, they are rarely over 50 feet deep. Most interior spaces have access to natural light and ventilation. The stairs and elevators are usually adequate for serving residential purposes, though some buildings have only one stair, making a second stair mandatory under most building codes. The low floor-to-floor heights are still more than adequate for residential occupancy, even if a service plenum must be provided for mechanical and utility systems. These office buildings typically have a first floor height greater than that of the upper floors to accommodate street level retail occupancy. As this street level space is not usually suited to residential use given the active commercial nature of the CBD environment, it is best reserved for retail and commercial uses.

The nature of this building type does pose several obstacles to

conversion for residential use. These buildings must be brought up to present standards of building construction and fire safety. Due to the substantial nature of these buildings, the only major obstacle to this upgrading is likely to be posed by the electrical, mechanical, and plumbing systems. And as the condition of, or lack of these services (especially plumbing), will be the most fundamental aspect of the structural rehabilitation, and will require substantial repair or replacement anyway, this renovation should in itself bring these systems up to standard. Economy of building operation and energy efficiency will be another hurdle of the rehabilitation, and renovation of the electrical, mechanical, and plumbing systems will favor this efficiency of operation.[1]

1. Stella, 6.

CHAPTER 3 : The Approach

"Most of the accumulated wealth in this country is in the cities. Most of it still has useful life and all of it is an urban concern that has historic meaning, social value, as well as economic utility. To say that a lot of the housing and the building and the public places cannot be saved efficiently is not to say that you randomly demolish them. If there is one thing we have learned through urban renewal, it is that the development process is a very delicate and selective one and probably is best served through carefully saving as much as can be saved while creating environments for new investment."

Robert W. Maffin

3.1 Statement of the approach

The primary goal of the approach presented here is the production of economical, flexible housing through the sensitive rehabilitation and conversion of the old medium-rise office building. The two aspects of this goal are not antithetical. Rehabilitation has many advantages over new construction, among them various economies (see Section 1.1), and the building type being investigated here has a number of characteristics that allow for the accommodation of housing (Section 2.3).

It is the intent of this thesis to propose an approach to the design and construction of the rehabilitation and conversion of the building type to facilitate the goal stated above. This approach requires the recognition of differing levels of control, or decision-making authority, within housing construction. At some project-determined level of control, a line of separation must exist between public control (community, building developer, etc.) and private control (the individual resident).

N. J. Habraken describes this concept as two distinct "spheres of responsibility," [1]

> A dwelling always exists in two spheres: the sphere of the community, that is the public sphere; and the sphere of the individual, that is the private sphere.
>
> The concept of supports and detachable units recognizes the two spheres.
> The support is the product made in the public sphere,

1. Habraken, "Participation of the Dweller," 1.

made for the community.
The detachable units are products about which the dweller can make decisions.

For the design phase of this approach, it is proposed that the SAR methodology of housing support design be adapted for application to the building type. Its adaptation for use here lies primarily in the design of a housing support within the existing structural shell of a particular building. Significant exterior alterations of a given building will be assumed to be out of the question for reasons of historic preservation.[1] Major structural changes will likewise not be considered, for their likely prohibitive expense and to confine the scope of this study to the building type as it is usually found. Application of the design methodology to the two selected building examples is presented in Chapter 4.

The construction phase of the approach must contend with two main areas of construction: the preservation or renovation of the building structure and exterior shell, and the redesign of the building interior . Accomplishment of the former will depend upon compliance with established local preservation guidelines and building codes, while the success of the latter will depend upon the designer, the particular building, the housing market, and local building codes. For the execution of the latter, it is proposed that four distinct levels of construction be recognized and clearly demarcated, that all interior reconstruction be standardized and mass-produced to the degree possible, and that the building developer's participation in the construc-

1. While not all buildings of this type are of major architectural or historic significance, project funding from public agencies (which can often make the difference between project financial success and failure) and even the continued existence of the building may depend upon federal, state, or local designation as historic.

tion of individual dwelling units be minimized.

The overall project sequence for implementing this approach will be: the survey and inspection of the building selected for conversion; the analysis of the building's suitability for residential use and the subsequent design of the conversion by the application of the SAR methodology of support design; the establishment of the division between support and detachable units; building preservation and interior reconstruction; and occupancy by the residents. This process is further delineated in Section 3.3.

3.2 Decision-making

The division between the public and private spheres of control, the support and detachable units, must be determined for each rehabilitation project. It is not an obvious nor automatic distinction. In fact, even with clearly established lines of separation, the issue becomes easily confused by outside parties (such as preservation groups, local building inspection, etc.) and internally by building management and resident self-help construction.

In order to identify the possible lines of separation between the public and the private "spheres of responsibility," four distinct Levels of Construction in housing production have been defined for this type of conversion project, based on responsibility or authority to control, the associated building elements, the construction methods and materials corresponding to these elements, and the types of labor or technical skills involved. The four levels are: 1) Temporary, 2) Service, 3) Semi-permanent, and 4) Permanent. The definitions of these levels follow.

1. Temporary

The lowest level of construction, it is made up of those building elements that are readily changed. These elements are easily constructed, changed or modified with a limited degree of effort, expertise, or expense. These are elements that have the least effect on the ultimate quality of the housing.

2. Service

This level of construction is made up of those elements that it is feasible to change, if so desired, with a moderate degree of effort, expertise, or expense. Within this level are primarily service or utility elements that must be in good working condition to ensure quality housing.

3. Semi-permanent

The third level of construction is characterized by infrequent change. The building elements within this level may be changed, if necessary, as they are not integral or essential to the building structure, but change is unlikely. Change within this level is apt to be costly, difficult, and time-consuming; it will generally only be necessary for reasons of building safety or operation.

4. Permanent

This highest level of construction includes those elements that will rarely, if ever, change. They will change only in special circumstances for purposes of building rehabilitation, efficiency, safety or code compliance. Such change may involve serious modification of the building.

Associated with these Levels of Construction are levels of control and building inspection. (See Table 3.1) These levels are related to the degree to which the construction of the corresponding building elements can affect the health and safety of the individual

resident and the safety and well-being of the community. A further breakdown of these four levels into their respective building elements reveals the type of construction and the type of labor required at each of the levels (see Table 3.2).

With the establishment of these four Levels of Construction, the possible locations of the division between what is to be considered the support and what is to be considered detachable are more evident. This division may occur between any two levels. The decision as to where the division line falls will be based on several project-specific factors (this is not to say that this division cannot shift later) such as the type of housing ownership,[1] the type of residents expected, the type of building management planned, and local building codes. Once the separation between the public and private spheres has been clearly marked, the building owner and the appropriate public authorities must take responsibility for the support and the individual resident must take responsibility for what is detachable.

The recognition of the four Levels of Construction has a second purpose. Inherent in this distinction among the four levels and their differing requirements of construction skill and capabilities are the associated degrees of participation possible by the resident in the actual construction by the building developer and subsequent construction by the resident.

Within the realm of his control, the detachable units, the resi-

1. In the case of traditional rental housing (which is <u>not</u> being suggested here), <u>all</u> four levels would be considered the support.

   While this thesis is not prepared to discuss the various possibilities of housing tenure, it is presented under the assumption that the arrangement for ownership within the given project provides a legal basis for individual resident participation in construction, such as condominium or cooperative ownership, or perhaps some sort of participatory rental agreement.

dent has the authority to determine the degree to which the construction of his dwelling unit is carried out. He may decide to take over the construction at any Level of Construction within the scope of the detachable units. To avoid both expensive interior construction[1] and the predetermination of the nature or organization of a resident's dwelling unit, construction by the building developer within individual dwelling units should be minimal. The four Levels of Construction provide clearly defined potential stopping-points for construction by the developer.

1. The differences in individual dwelling unit layouts and the nature of material finishes would necessarily create a labor-intensive stage of the work, and preclude any real standardization of construction.

Table 3.1

Levels of Construction

LEVEL	DEFINITION	CONTROL	INSPECTION
Permanent **4**	Rarely changes: elements change only in special circumstances for purposes of rehabilitation, safety, code compliance, or building efficincy	public authorities building owner	building code local ordinance prservation agencies
Semi-permanent **3**	Infrequently changes: elements may be changed, but change is apt to be costly, time-consuming, or difficult	building owner	building code local ordinance building owner
Service **2**	Feasibly changes: elements may be changed, if desired, with a moderate degree of effort, expertise or expense	resident (outside inspection)	building code local ordinance
Temporary **1**	Readily changes: elements are easily changed or modified, with a limited amount of effort, expertise or expense	resident	resident

Table 3.2 (continued on next page)

Construction Level Breakdown

LEVEL	BUILDING ELEMENT	TYPE OF CONSTRUCTION	TYPE OF LABOR REQUIRED
4	building structure	structural masonry poured-in-place concrete	heavy construction structural repair, improvement, or modification
	building shell	structural masonry structural concrete framing with masonry facade roofing: membrane, tile, slate, metal windows: wood or steel entrances and storefronts	restoration, repair, replacement masonry cleaning, tuckpointing insulation and weatherproofing plastering and fireproofing roof repair, insulation, flashing window/storefront repair, retrofit
3	building circulation	stairs: steel, concrete stairwells: concrete, masonry elevators: hoist, hydraulic elevator shafts: concrete, masonry fire escapes	structural concrete, masonry work stair/elevator repair, replacement stairwell and elevator shaft construction, modification, or repair
	building infrastructure	HVAC: furnaces, chillers, condensors fans, ductwork, dampers, mixers ELEC: conduit, wiring, panelboards, switchgear, motors, transformers MECH: boilers, pumps, tanks, piping, sprinklers, standpipes, controls	major mechanical, electrical, and plumbing installation, repair, or replacement
	service cores	core walls: masonry, concrete, or steel framed vertical chases, access panels preassembled components	masonry, concrete, or light frame construction rough plastering
	party walls	wall construction: masonry, concrete, wood or light steel framed preassembled wall components sound attenuation coordination with electrical	masonry, concrete, or light frame construction preassembled panel anchorage sound insulating rough plastering

LEVEL	BUILDING ELEMENT	TYPE OF CONSTRUCTION	TYPE OF LABOR REQUIRED
2	utility fixtures	plumbing fixtures, accessories plumbing fixture connections, fittings, trim tub and shower doors, enclosures	simple plumbing, service, and fixture connection anchoring, waterproofing, trimming and caulking
	electrical distribution and fixtures	electrical conduit, wiring, panels, junction boxes electrical outlet boxes, switches, receptacles light fixtures and accessories	simple electrical wiring and connections outlet, receptacle, and switch anchoring and connection fixture mounting and trimming
	HVAC distribution and fixtures	HVAC ducting and fittings, trim grilles and vents thermostats	simple ductwork, insulating, taping grille and vent mounting thermostat installation
1	partitioning and doors	metal or wood stud partitioning wallboard sheathing: gypsum board, paneling, prefinished, etc. doors: wood or plastic, solid or hollow core	light framing wallboard installation, joint work wood or vinyl trimwork door and frame installation
	built-in furniture	countertops and cabinetry storage cabinets and shelving built-in tables, desks, seating, etc. woodwork interior window trim	rough and finish carpentry millwork, sawing, sanding anchoring, nailing, gluing
	finishes	walls: plaster, plastic laminate, wall coverings, tile, paint floors: tile, wood, ceramic tile, resilient flooring, carpet ceilings: plaster, paint, suspended hardware, trim, accessories	lathing and plastering, texturing, taping, painting tiling, gluing, nailing, tacking cutting, leveling plastic laminate installation hardware installation
	appliances	residential kitchen, bath, laundry appliances	minor utility connections

1. Reiner, 9.

2. Ibid., 1.

3. Ibid., 51.

4. Ibid., 23.

3.3 Implementation

The implementation of this approach would consist of two phases, design and construction. The sequences of both of these phases are presented here in outline form.

DESIGN PHASE

1. identification of project building
2. analyses of neighborhood and housing market
    a. determination of neighborhood viability[1]
    b. identification of targetted housing market[2]
3. building survey[3]
    a. professional inspection and detailed study of the building structure and components
    b. determination of building adaptability
4. zoning and building code study[4]
    a. determination of building code requirements
    b. zoning compliance, or application for zoning variance
5. analysis of building suitability for housing
6. housing support design

    (design methodology sequence is presented in Chapter 4)

CONSTRUCTION PHASE

1. detailed inventory of building structure

    the determination of specifically which building elements are to be removed, which are to be replaced, and which are to be

repaired, based on the building inspection, documentation, preservation guidelines, and the design of the housing support

2. complete, detailed construction drawings and specifications
   the planned construction materials and methods, clearly and completely spelled out to allow for standardization and to prevent unexpected and costly changes on the job
3. wreckout
   the removal of all non-loadbearing interior elements, with the exception of those elements marked for salvage
4. preservation of the exterior building shell
   the repair and renovation of facades and other exterior elements to the extent possible
5. renovation of interior elements
   the repair and reconstruction of those interior elements of the building that are to be saved, such as entries, elevator lobbies, stairwells, circulation spaces, etc.
6. upgrading of building infrastructure
   the repair, replacement, or introduction of the necessary utilities and mechanical systems
7. housing support construction
   the construction of the building interior through the completion of all elements considered to be part of the support
8. dwelling unit construction
   the completion of dwelling units to the appropriate Level of Construction determined as a stopping-point for construction
9. acquisition of certificate of occupancy by developer

CHAPTER 4 : Design Methodology

"Nothing is fixed; in time everything is moved. What makes something immobile is its usefulness, weight, continuity of structure, disturbance caused, and the time and energy required to move it."

Thomas A. Markus

4.1 The methodology sequence

The methodology recommended for the design of the rehabilitation and conversion of the old office building to housing follows rather closely the SAR methodology of housing support design, with adaptations necessitated by the fact that, in this application, an existing structure is being converted to a support rather than having been built for that purpose originally.

For purposes of introduction[1] and explanation of the steps involved in this process, they are here presented and described in the suggested sequence (though the sequence is flexible).

1. Documentation

This initial step is a physical survey of the building under investigation, involving photographs, as-built construction drawings, and inspections by various construction professionals. It is an inventory of the present condition of the building and its various components, systems, and materials. The end result is the determination of those building elements that are permanent or vital to the rehabilitation and conversion.

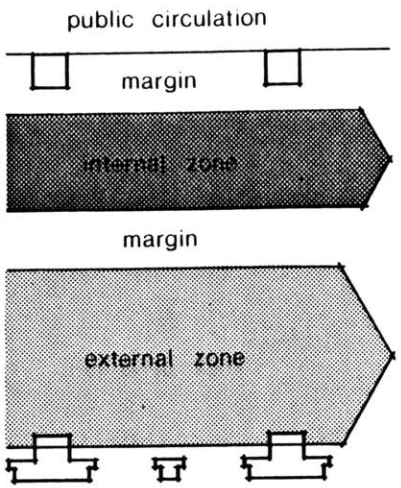
2. Circulation

From the initial documentation, an assessment of the soundness, condition, and efficiency of the existing circulation system is made to determine those circulation elements that are to remain: stairs,

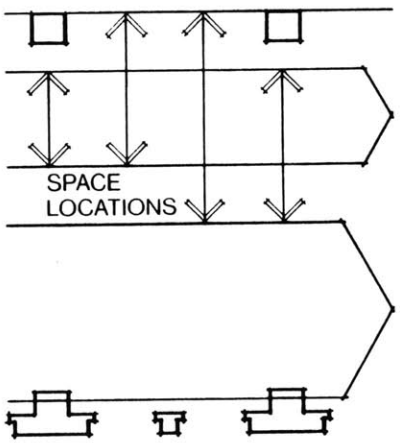
1. If the reader is not familiar with this support design methodology, and seeks a more complete understanding of that process, he is referred to:

Habraken, et al. Variations.

1. Habraken, Variations, 52.



Zoning analysis



Zoning analysis

elevators, entries, lobbies, corridors, etc. Based on building codes, fire safety, building efficiency, and expected volume, the new circulation system for the building is then established, utilizing existing elements, eliminating unneeded elements, and if necessary, adding new ones.

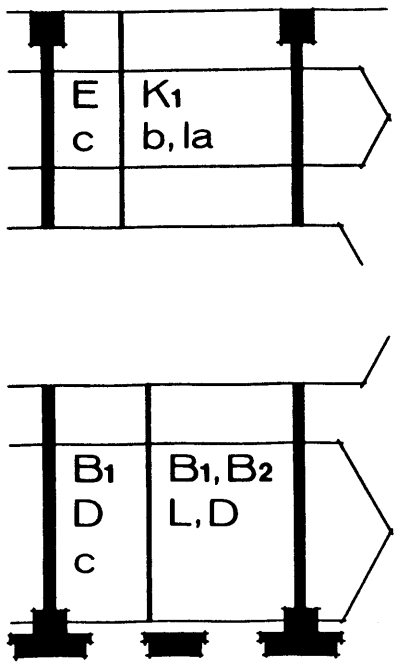
3. Zoning analysis

"Within a support two areas can be distinguished: one on the perimeter and one totally internal. Each of these is suitable to a different purpose." [1] Once the public circulation has been established in a typical floor plan, the remaining space designated for private dwelling units must be zoned into these two types of areas, one of which is along the exterior building wall (see illustration). The external zone will be used for general and special purpose spaces (living, dining, bedrooms, etc.), and must be of sufficient width to accommodate these uses. The internal zone will be used primarily for service spaces (bathrooms, kitchens, laundry, etc.), and will contain the necessary service cores for such uses. As the limits of these two zones are not rigid, a margin of the appropriate width will exist between the zones. Finally, the zoning analysis will indicate the possible positions of spaces in relation to these zones (illustration).

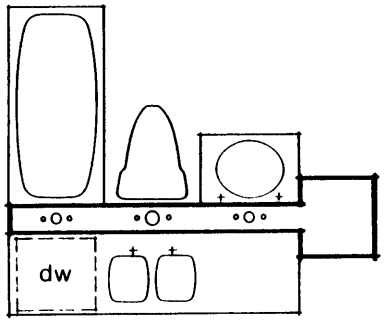
4. Party walls

The purpose of this step is to establish the possible locations of party walls, considering anchorage possibilities, structural elements, and the exterior building wall. The result will demonstrate

1. Habraken, Variations, 66.



Sector analysis



Service cores

the range and number of potential dwelling sizes and shapes.

5. Sector analysis

"Structural components will often cut across zones. In analyzing various layout possibilities, the utility of that part of a zone between structural members has to be evaluated. This portion of a zone is called a sector."[1] The zones established in the zoning analysis will be broken up by both structural elements and dwelling unit party walls, as established by the previous step. The combinations of spaces possible within the particular sector, and hence its usefulness, are established in a sector analysis. It explores the various ways in which a sector can be subdivided into useful spaces by partitioning perpendicular to the exterior building wall (see illustration). Note the abbreviations used for the various types of spaces.

6. Service cores

The optimum number of service cores must be determined and their design developed. The location of the cores will be based primarily on the zoning analysis, and the routing of utilities through the building. Other criteria affecting the service cores are: the number of service spaces and individual fixtures served, the metering of utilities, the number of utilities provided through the cores, and the economy of utility lines and connections.

7. The support

The support may, and often does, include elements in addition to

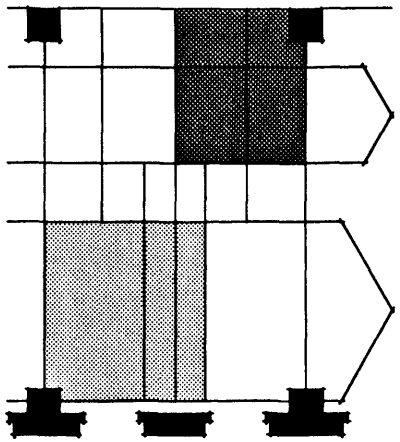
1. Habraken, Variations, 89.

those of the service cores, such as interior partitions or walls along the public corridor. These elements will generally be included for two primary reasons: they occur repeatedly in the many variations of dwelling unit layout, and rather than limiting flexibility, they tend to aid in the organization of spaces.

The support, as initially constructed, may out of necessity, include some elements that belong to other Levels of Construction. The provision of these elements within the support (such as bath or kitchen fixtures) does not alter their established level of control, however. Local ordinances or building codes may require such elements as prerequisites for dwelling unit occupancy.

8. Basic Variations

"To determine the utility of a sector it is necessary to list all the basic variations that it can accommodate. This can be done by indicating which functions can be placed in which sectors in a diagram of the sector group."[1] A basic variation is the generic organization of a certain group of spaces within a group of sectors, or dwelling unit. A basic variation is one of the various, essentially unique, spatial organizations possible.



Basic variations

Determining the basic variations is a means of evaluation of the support. It gives a clear idea of the number of possible variations that exist for given dwelling unit, and as a result, the degree of flexibility provided.

SPACE SYMBOLS:

E entry

K_1 kitchen for cooking only

K_2 kitchen with eating area

L living room

D dining room

B_1 single bedroom

B_2 double bedroom

B_3 master bedroom

b bathroom

la laundry

st storage

c circulation

9. Dwelling units

The final stage in the design of the housing support is to develop specific dwelling unit designs based on the possible layouts established by the basic variations. This is, in effect, a test of the feasibility of the basic variations. Demonstrated in this stage, also, are the potential stopping-points of construction within the dwelling units.

4.2 Example: the Travis Building

The following remarks refer to drawings 1 through 9 of the demonstration of the support design methodology for the Travis Building.

1. Documentation

This building has a small, simple plan with a modified "U" shape. Though the existing circulation elements are off-center, they are close together. The structural bays are square and regular in size.

2. Circulation

The additional stair made necessary by the building code actually balances and organizes the circulation system. A rather useless space is created between the new stair and the elevators, however.

3. Zoning analysis

The two-zone organization of the plan wraps neatly around the central circulation core. However, the overall depth of the combined zones and margins is restricted, resulting in a very narrow margin between the zones.

4. Party walls

The possible party wall locations (considered only at the structural grid for this study) create very regular, square sectors.

5. Sector analysis

This analysis indicates that the exterior wall does not significantly restrict the partitioning of the sector, and that two spaces can be placed within a single sector width.

6. Service cores

The shallowness of the building and the location of the interior columns along the public corridor prevent the placement of the cores at the columns. To allow for a two-sided service core, the core walls have been placed perpendicular to the exterior wall, with connections for utility fixtures on both sides. Some of the possible service space layouts are demonstrated.

7. The support

From the many dwelling unit variations, certain partitioning elements appear repeatedly and have been incorporated into the support. These elements occur at the service cores and the party wall locations.

8. Basic variations

All possible locations of spaces are indicated in the top left illustration. The grids of possible sector partitioning are shown for combinations of 1, 2, or 3 bays. The sum of these two types of information is the whole range of possible variations of the dwelling unit.

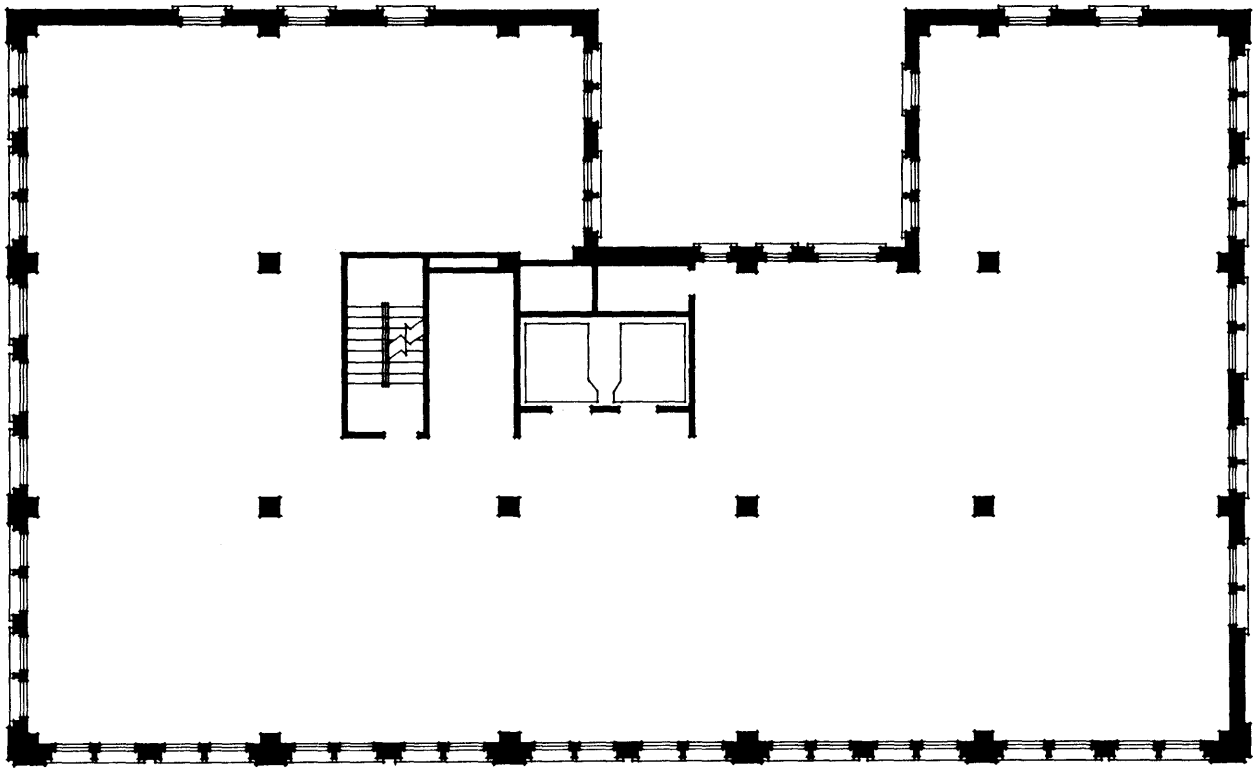
9. Dwelling units

Demonstrated in this step, in addition to specific dwelling unit layouts, is the possibility of terminating the construction by the developer before the completion of the dwelling unit interiors. Dwelling units are illustrated at completion of the second Level of Construction (9a) and at completion of the first level (9b).

TRAVIS BUILDING

TYPICAL FLOOR PLAN

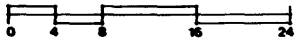
0 4 8 16 24 NORTH

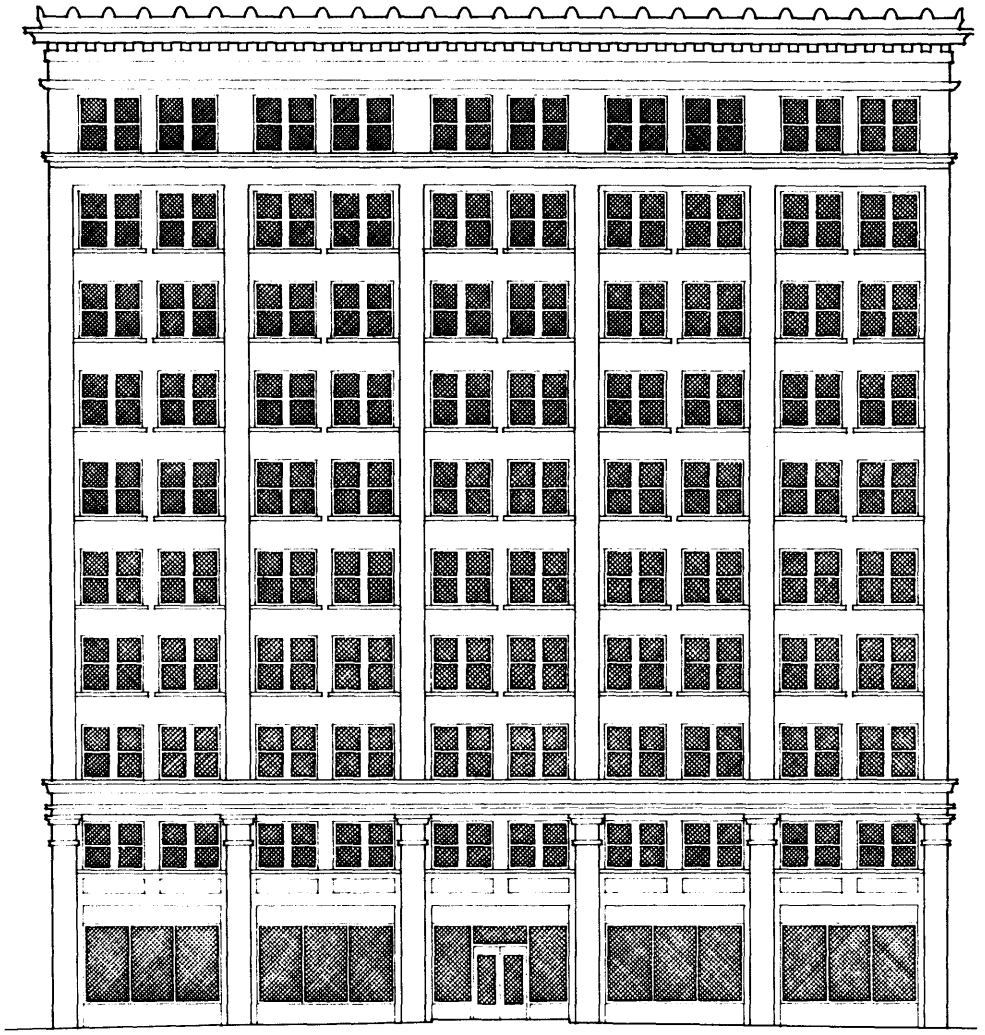


1: Documentation

TRAVIS BUILDING

FRONT ELEVATION

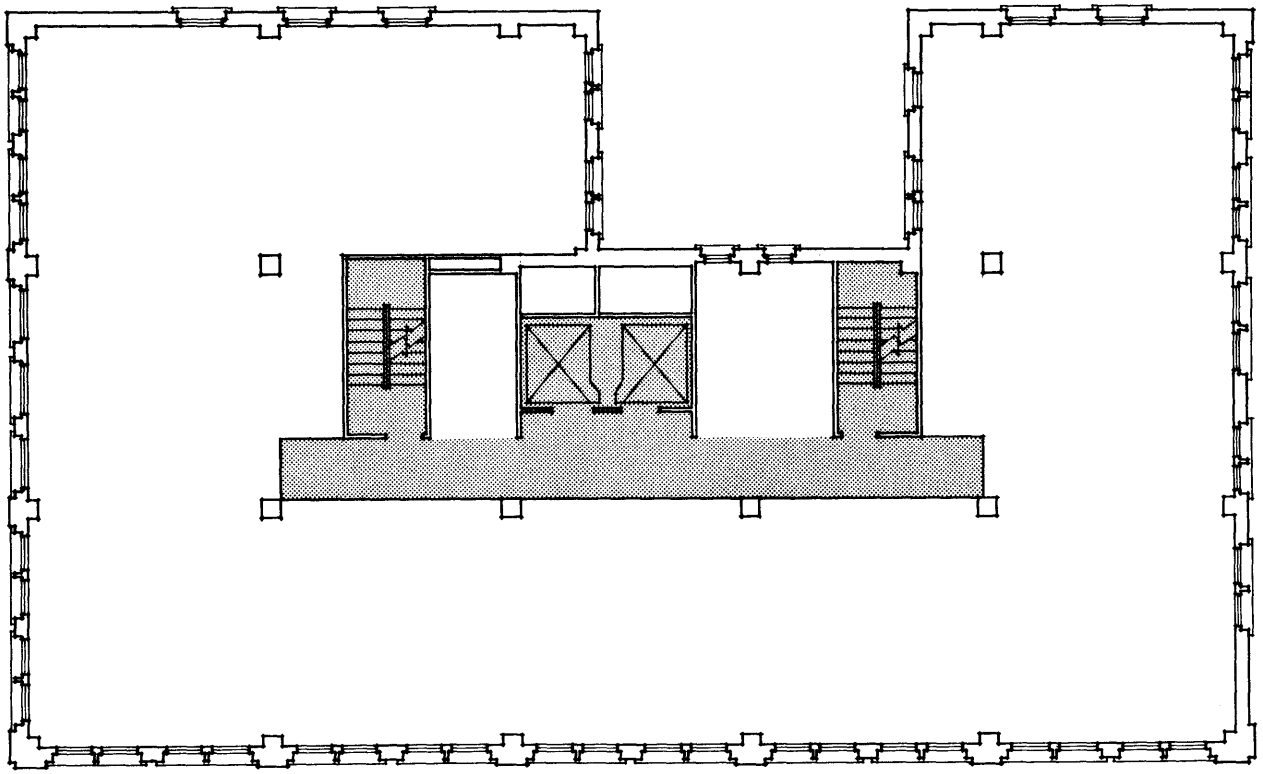




1: Documentation

TRAVIS BUILDING

TYPICAL FLOOR PLAN



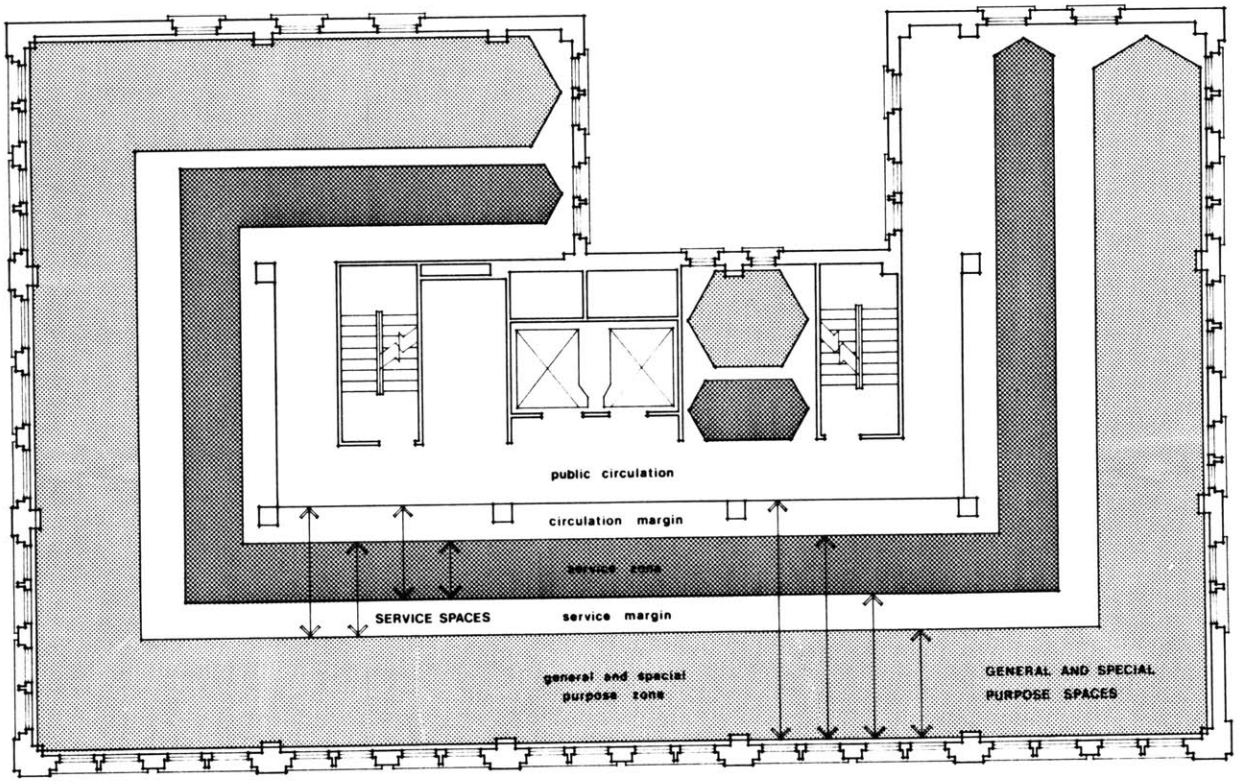
2: Circulation

TRAVIS BUILDING

TYPICAL FLOOR PLAN

0 4 8 16 24

NORTH



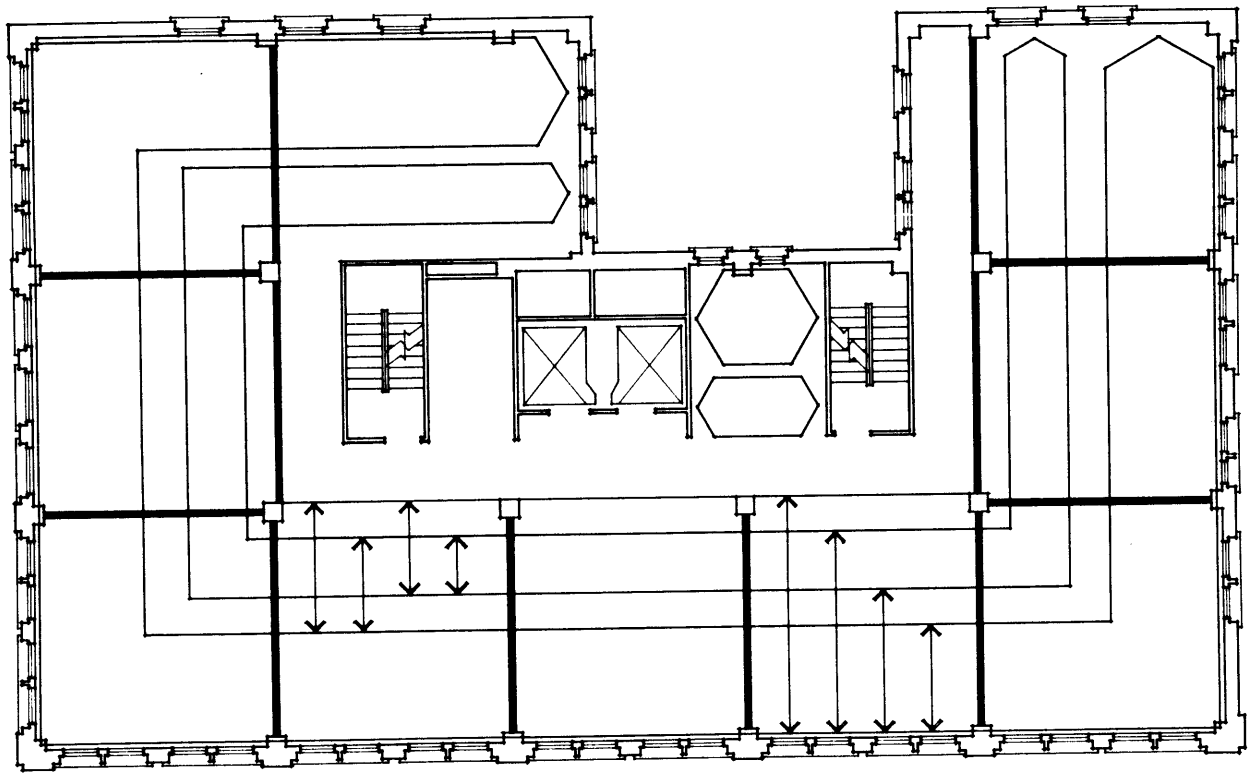
3: Zoning analysis

TRAVIS BUILDING

TYPICAL FLOOR PLAN

0 4 8 16 24

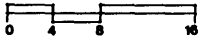
NORTH

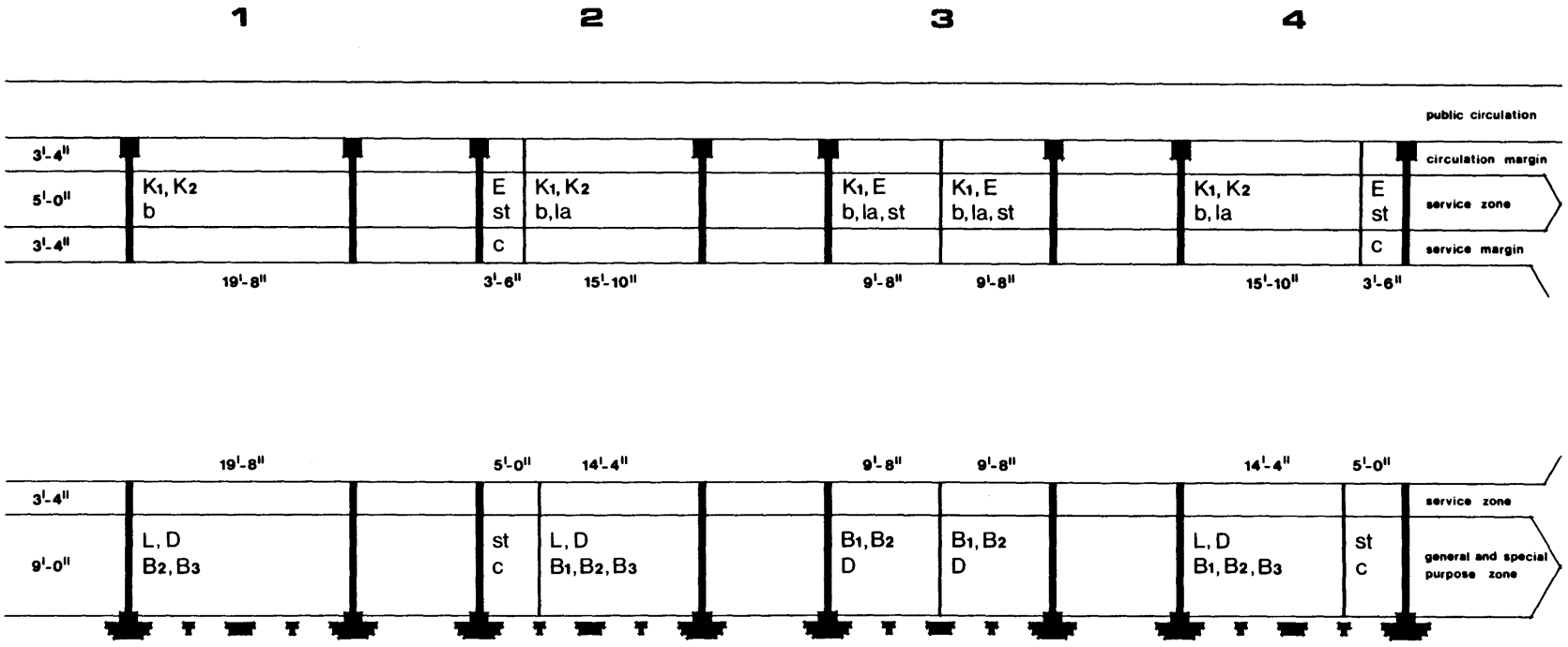


4: Party walls

TRAVIS BUILDING

TYPICAL BAYS





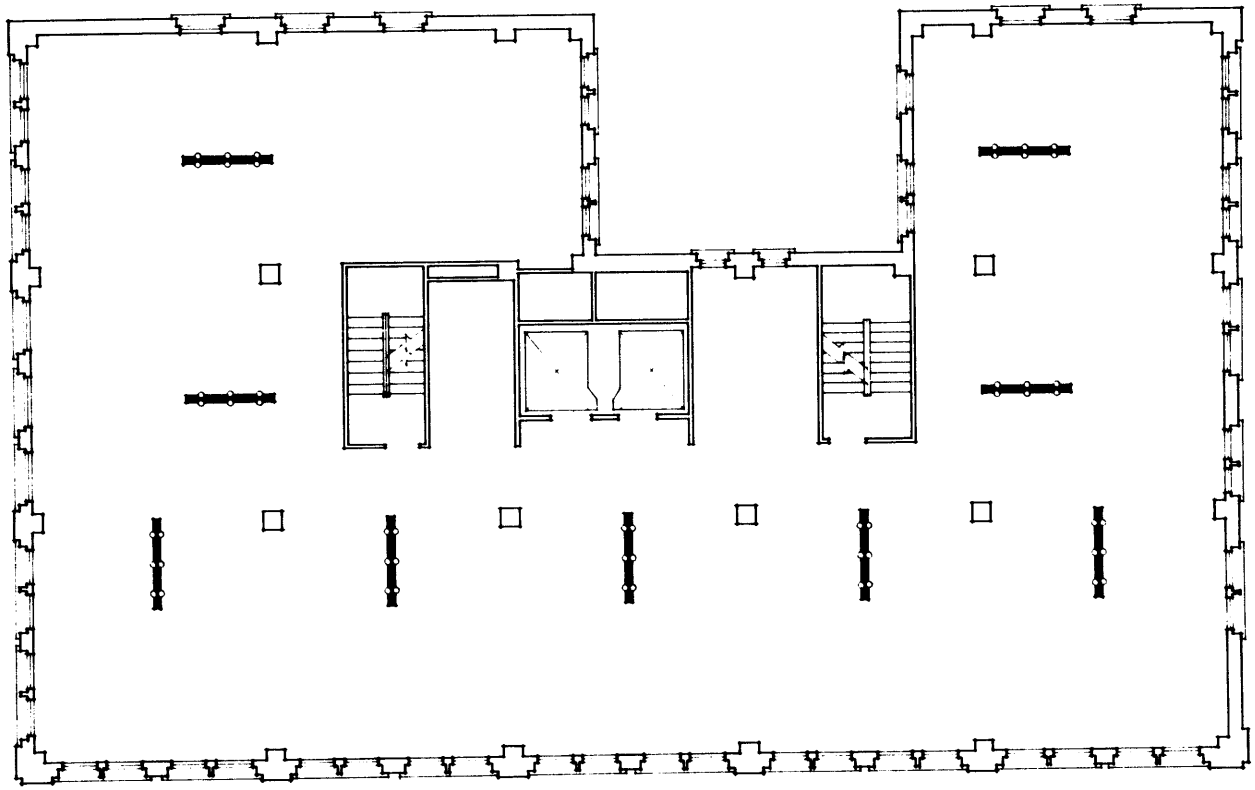
5: Sector analysis

TRAVIS BUILDING

TYPICAL FLOOR PLAN

0 4 8 16 24

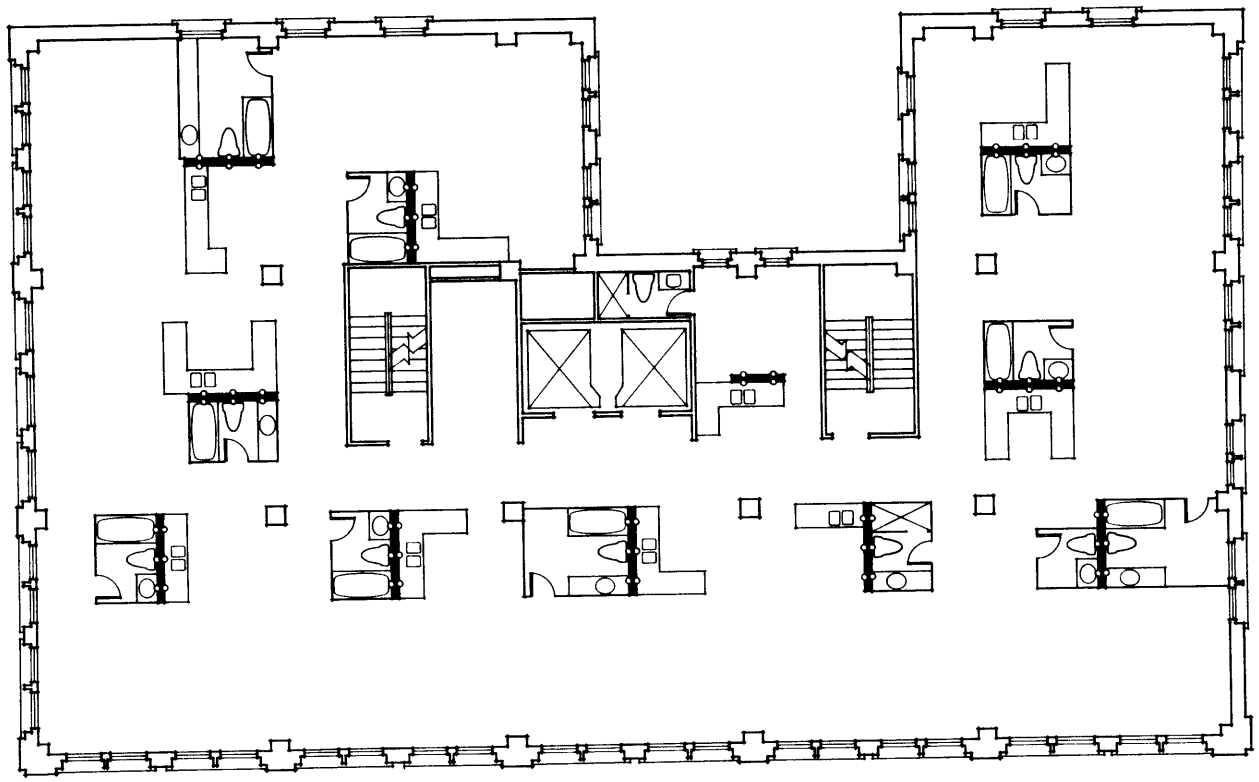
NORTH



6: Service cores

TRAVIS BUILDING

TYPICAL FLOOR PLAN



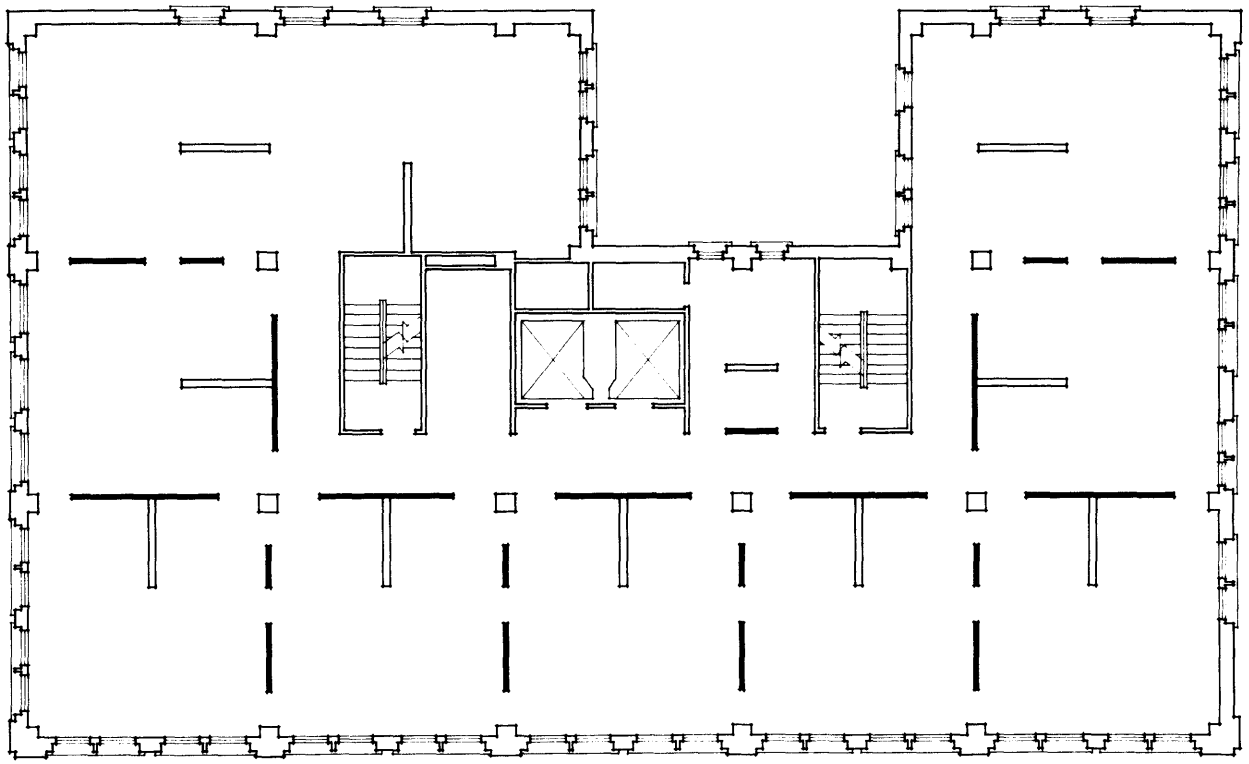
6: Service cores

TRAVIS BUILDING

TYPICAL FLOOR PLAN

0 4 8 16 24

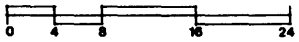
NORTH

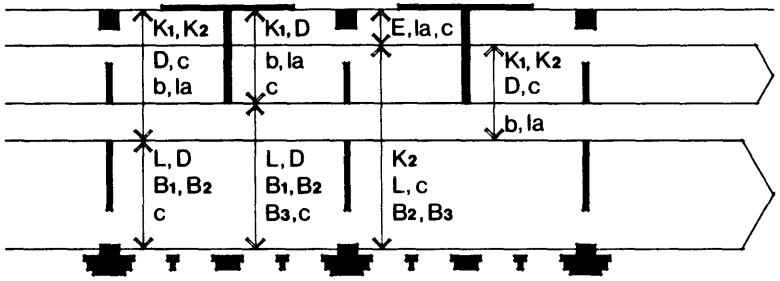


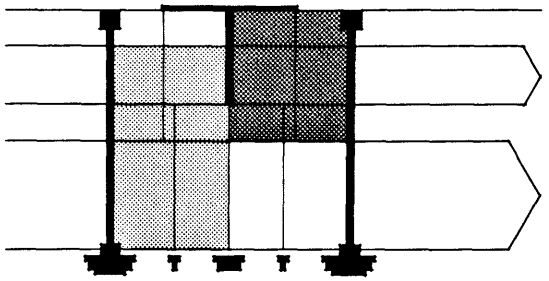
7: The support

TRAVIS BUILDING

BAY COMBINATIONS







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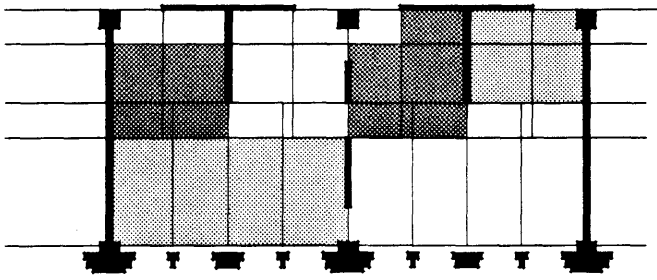

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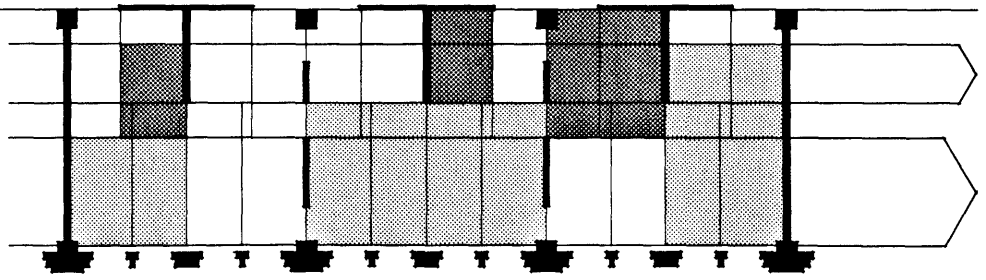


3

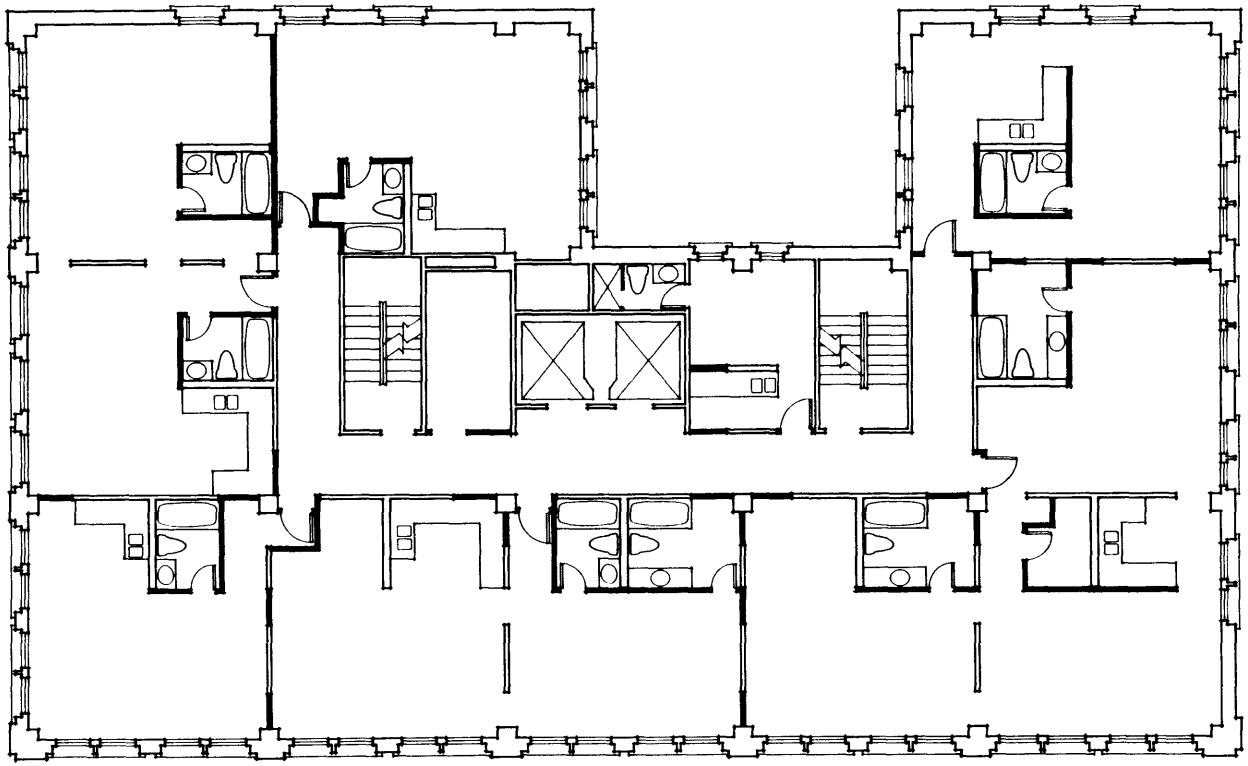
8: Basic variations

TRAVIS BUILDING

TYPICAL FLOOR PLAN

0 4 8 16 24

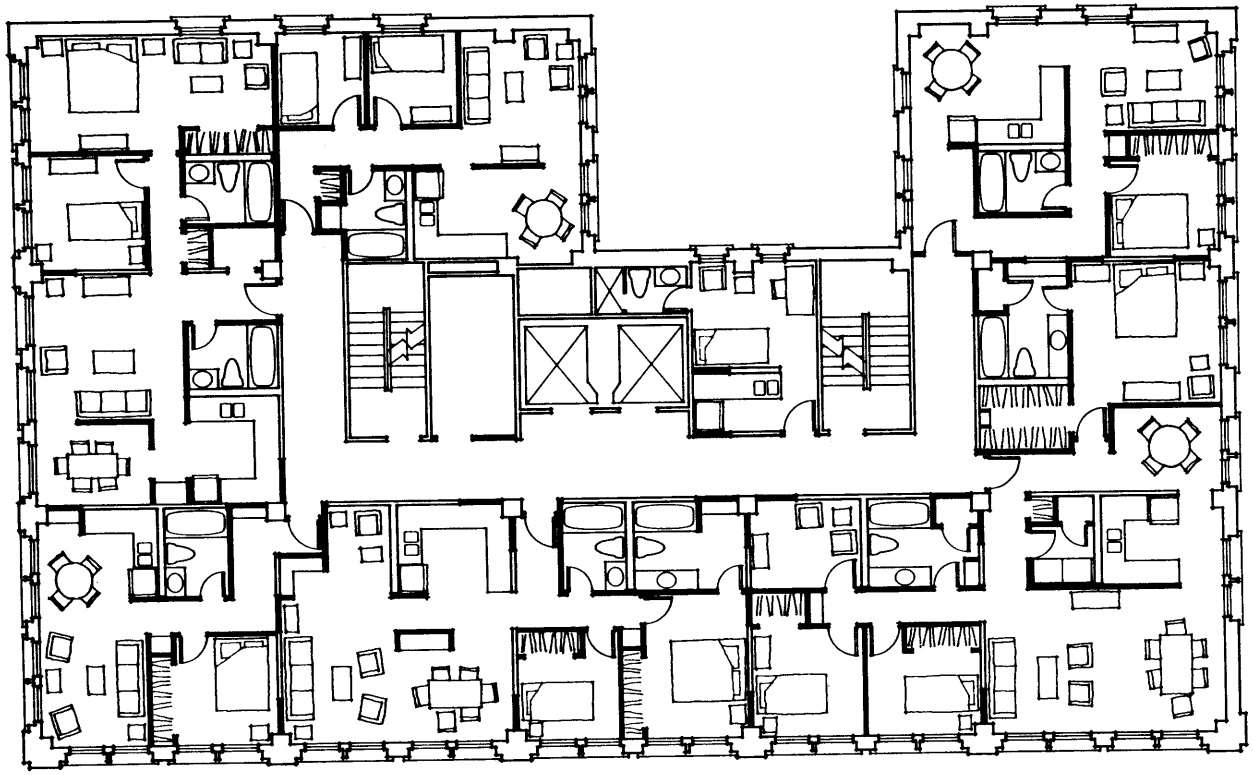
NORTH



9a: Dwelling units

TRAVIS BUILDING

TYPICAL FLOOR PLAN



9b: Dwelling units

4.3 Example: the Maverick Building

The following remarks refer to drawings 1 through 9 of the demonstration of the support design methodology for the Maverick Building.

1. Documentation

This building is larger than the first example, and more complex. Though, at first glance, its plan is a simple rectangle, it is complicated by the locations of the existing circulation elements, the odd angles, and the small and irregular bays.

2. Circulation

An additional stair is made necessary by the building code. One of the elevators has been removed to provide a large vertical mechanical chase. The inefficient circulation layout has completely surrounded a small area of the plan having only two exterior windows.

3. Zoning analysis

While the two-zone organization works quite well on the front side of the building, with the structural columns falling conveniently in the service zone, the circulation system practically obliterates the zone organization on the rear side.

4. Party walls

The possible locations of the party walls (considered only at the structural grid for this study) reveal that quite a range of sector sizes and shapes is created by the odd plan configuration and irregular bays.

5. Sector analysis

The sector analysis reveals that the narrow structural bays are not wide enough for more than one space, with the exception of two single bedrooms. Any partitioning at the exterior wall creates narrow, almost unusable spaces.

6. Service cores

The service cores have been designed around the existing columns, with the provision of three utility fixture connections on both sides of the core wall. A range of possible service space layouts has been presented; many others are possible.

7. The support

Additional wall elements have been placed at those locations where partitioning for dwelling units occurs in most every layout possibility. Note that the added elements do not restrict circulation and allow for inset entries along the public corridor.

8. Basic variations

The possible space locations within the zones and margins are indicated, together with possible sector groups of 1, 2, or 3 bays. Illustrated on the sector groups is the partitioning grid resulting from the previous sector analysis.

9. Dwelling units

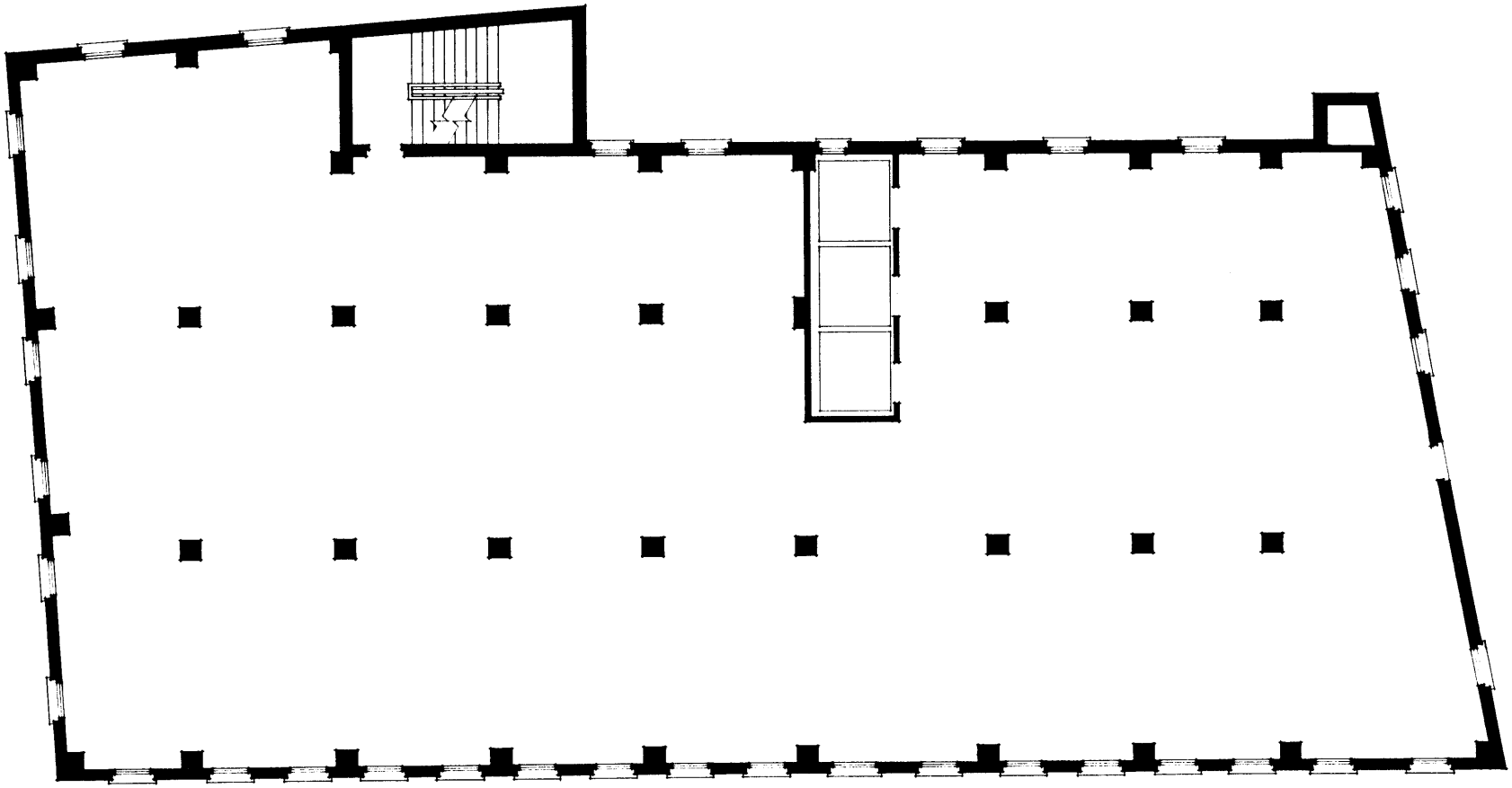
The first drawing (9a) of this final step of the design process represents a variety of possible dwelling units, completed through Level 2, Service. The second drawing (9b) shows the dwelling units completed through Level 1, Temporary.

MAVERICK BUILDING

TYPICAL FLOOR PLAN

0 4 8 16 24

NORTH

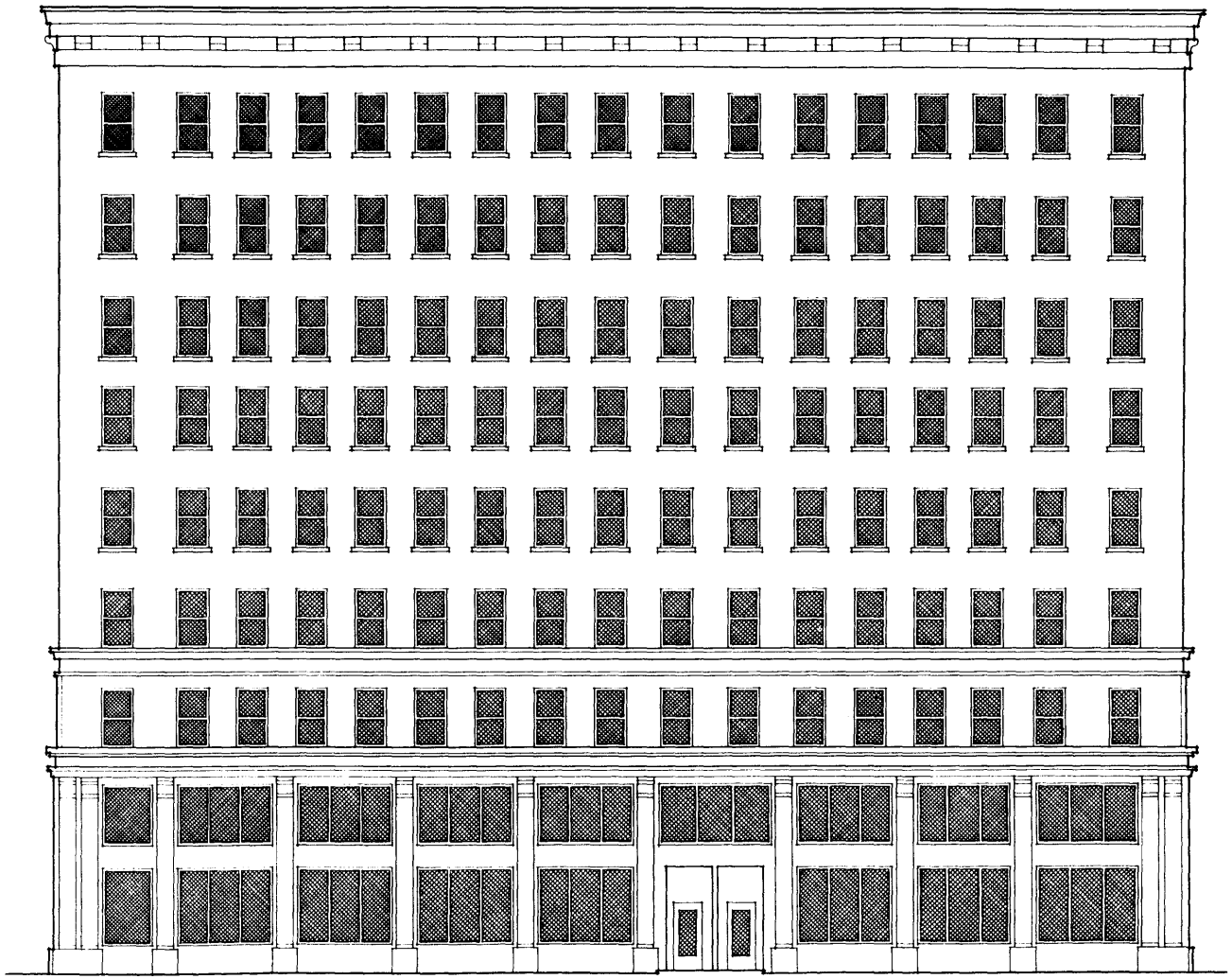


1: Documentation

MAVERICK BUILDING

FRONT ELEVATION

0 4 8 16 24



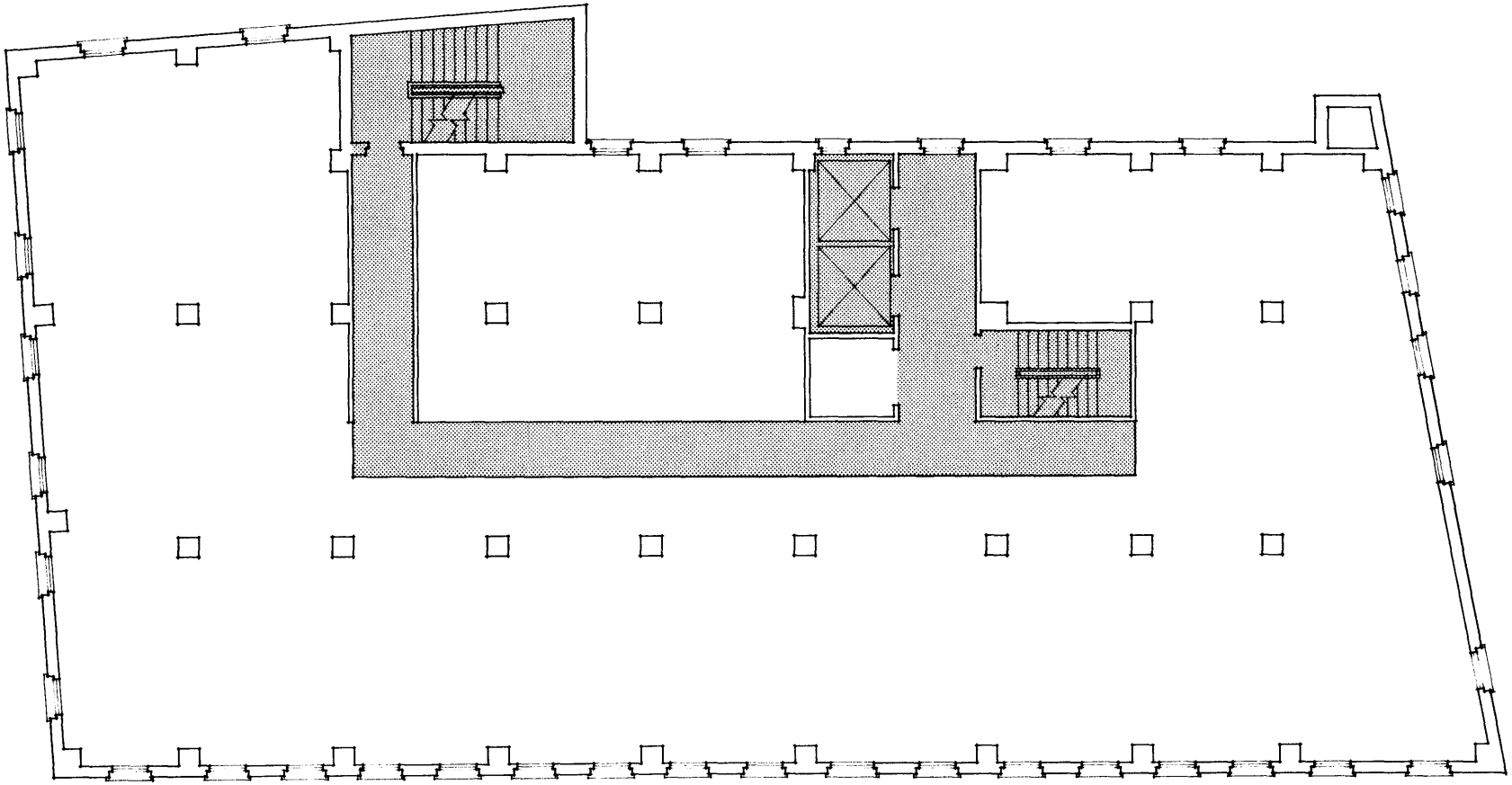
1: Documentation

MAVERICK BUILDING

TYPICAL FLOOR PLAN

0 4 8 16 24

NORTH



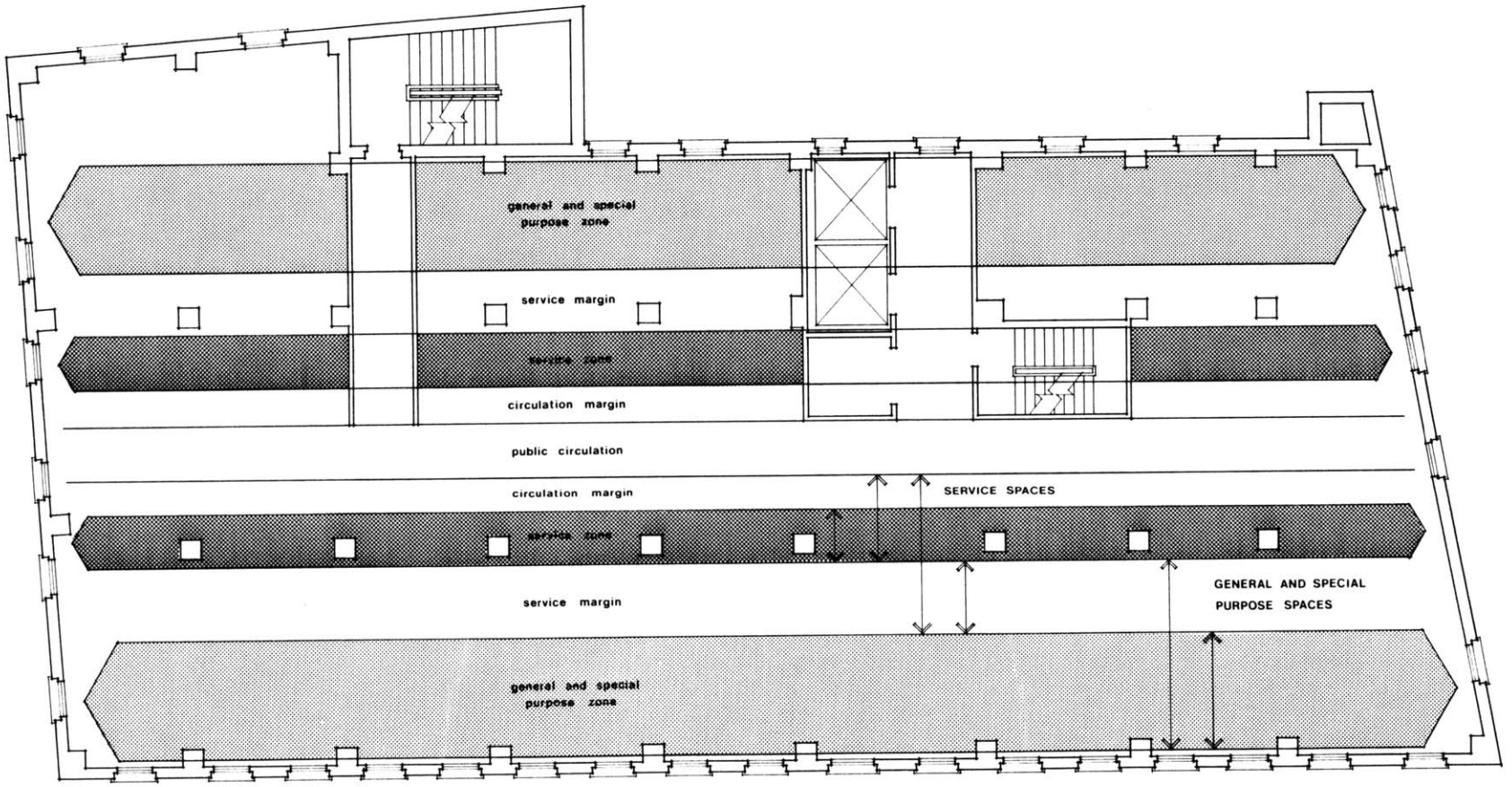
2: Circulation

MAVERICK BUILDING

TYPICAL FLOOR PLAN

0 4 8 16 24

NORTH



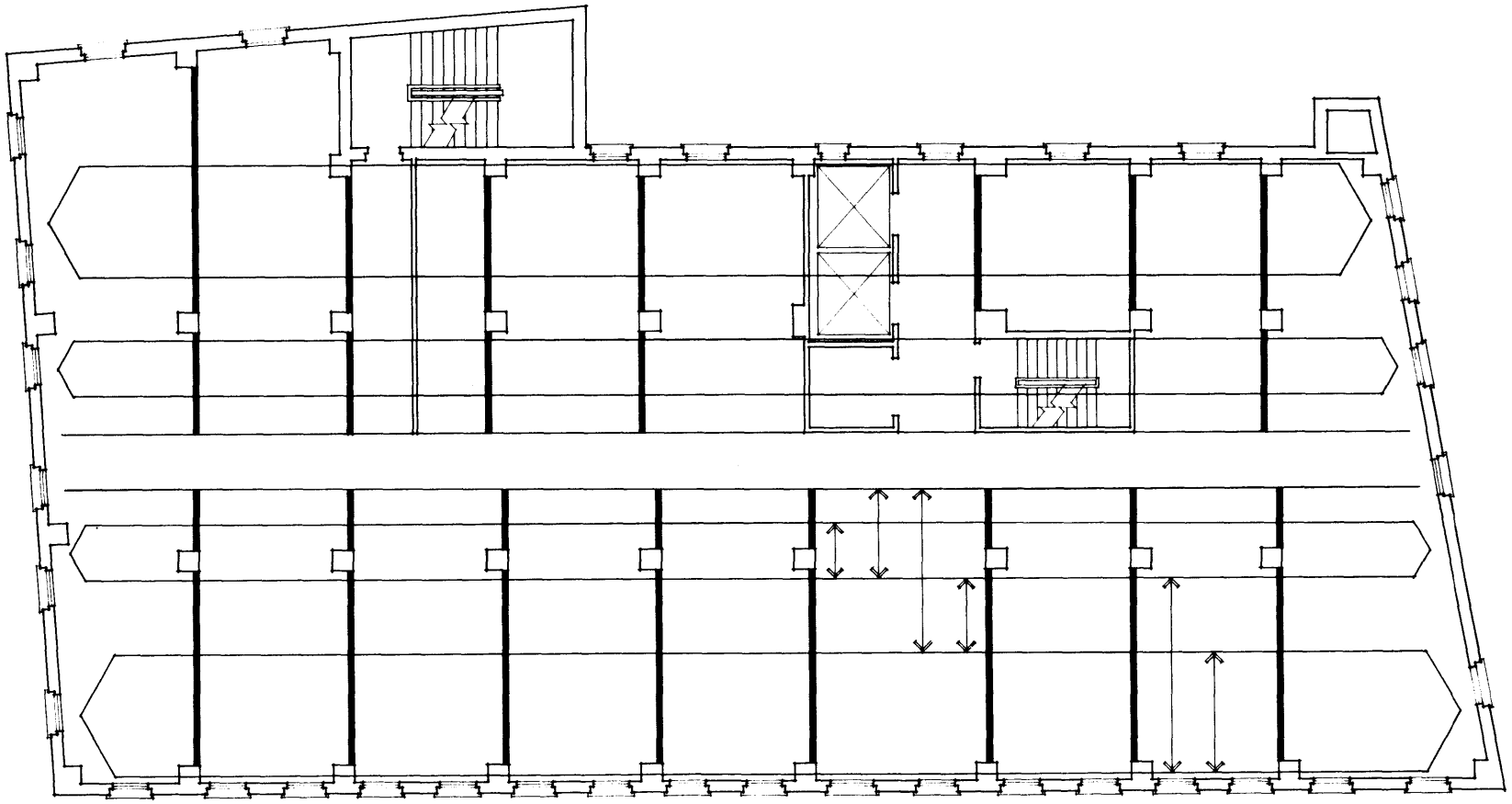
3: Zoning analysis

MAVERICK BUILDING

TYPICAL FLOOR PLAN

0 4 8 16 24

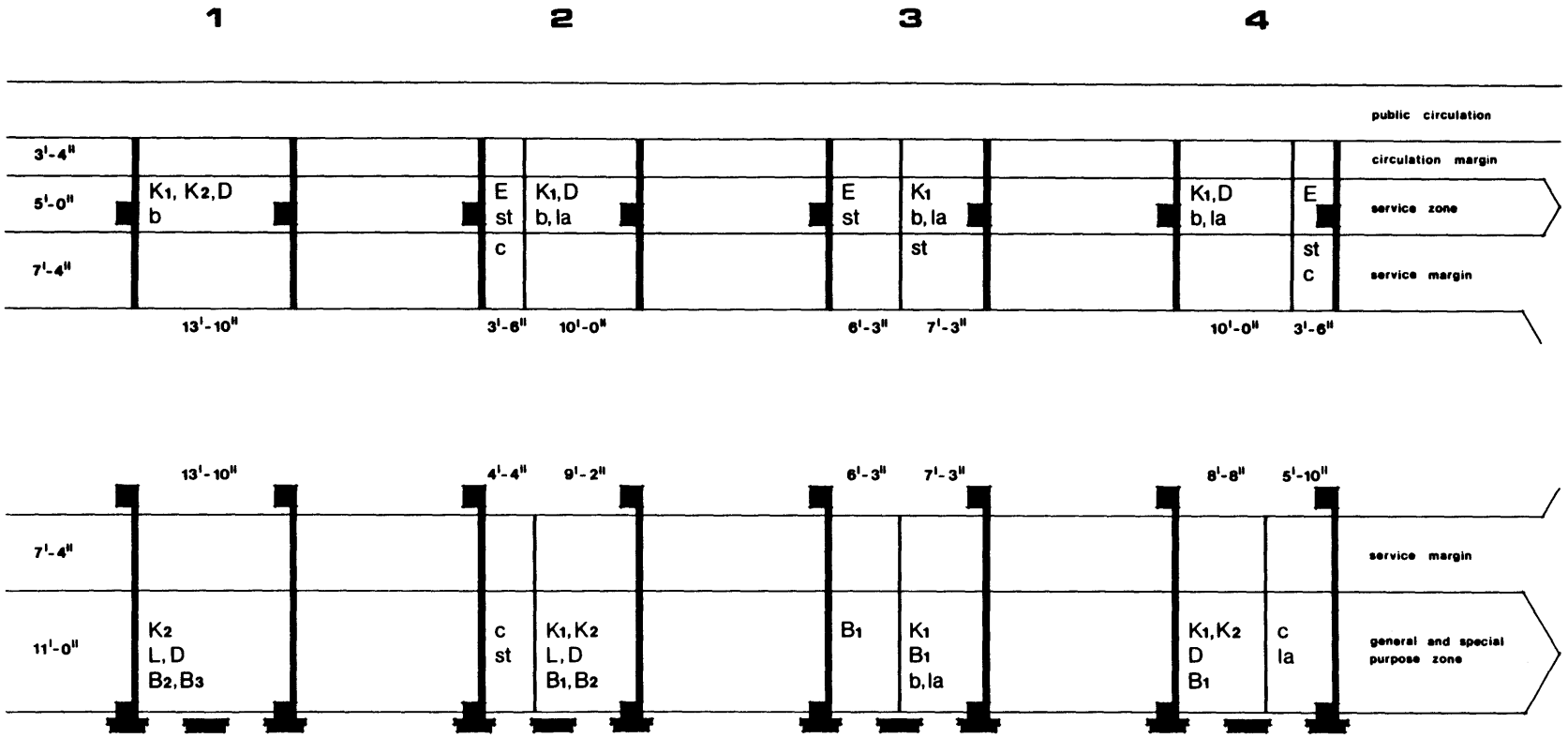
NORTH



4: Party walls

MAVERICK BUILDING

TYPICAL BAYS



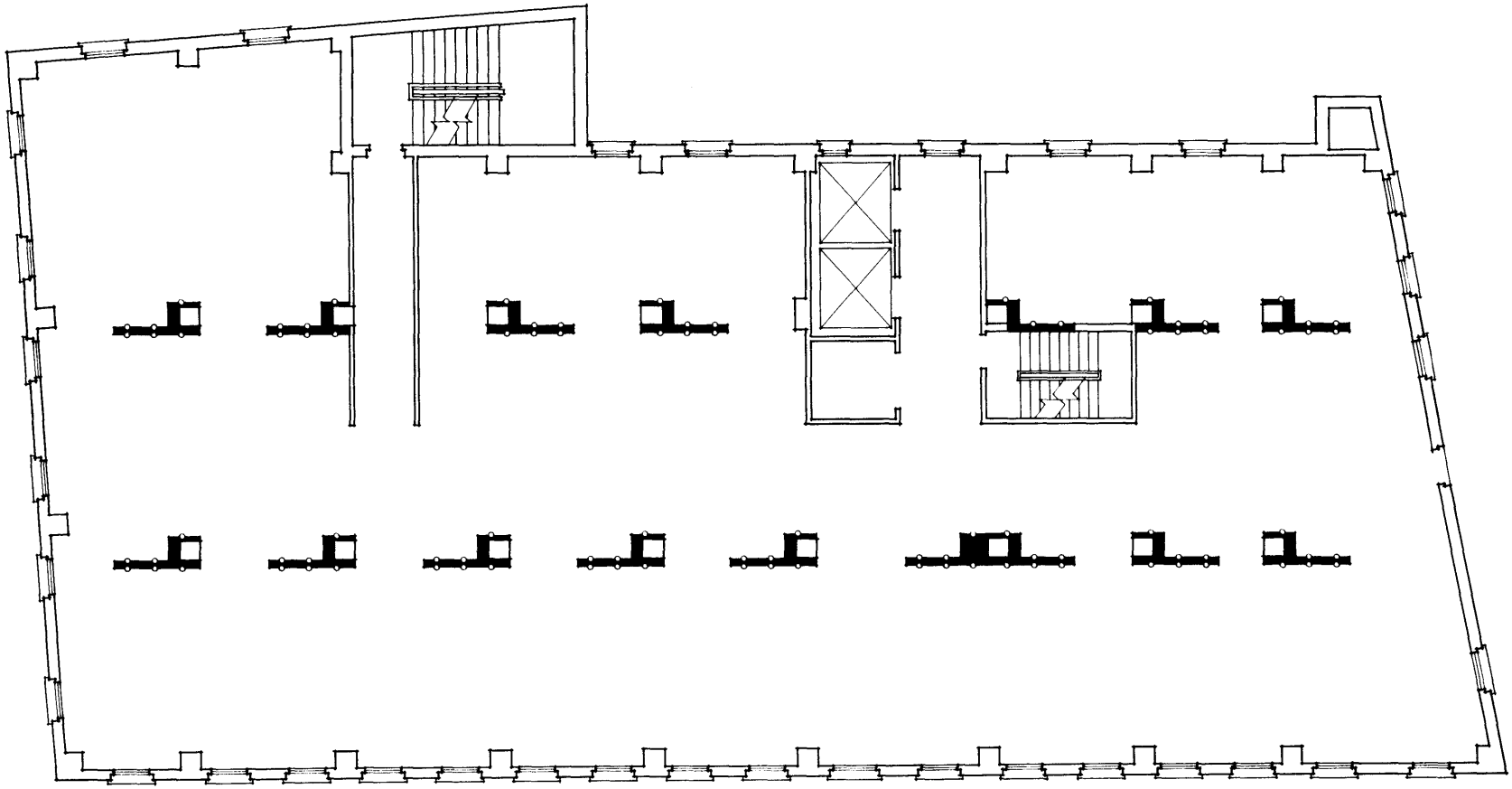
5: Sector analysis

MAVERICK BUILDING

TYPICAL FLOOR PLAN

0 4 8 16 24

NORTH



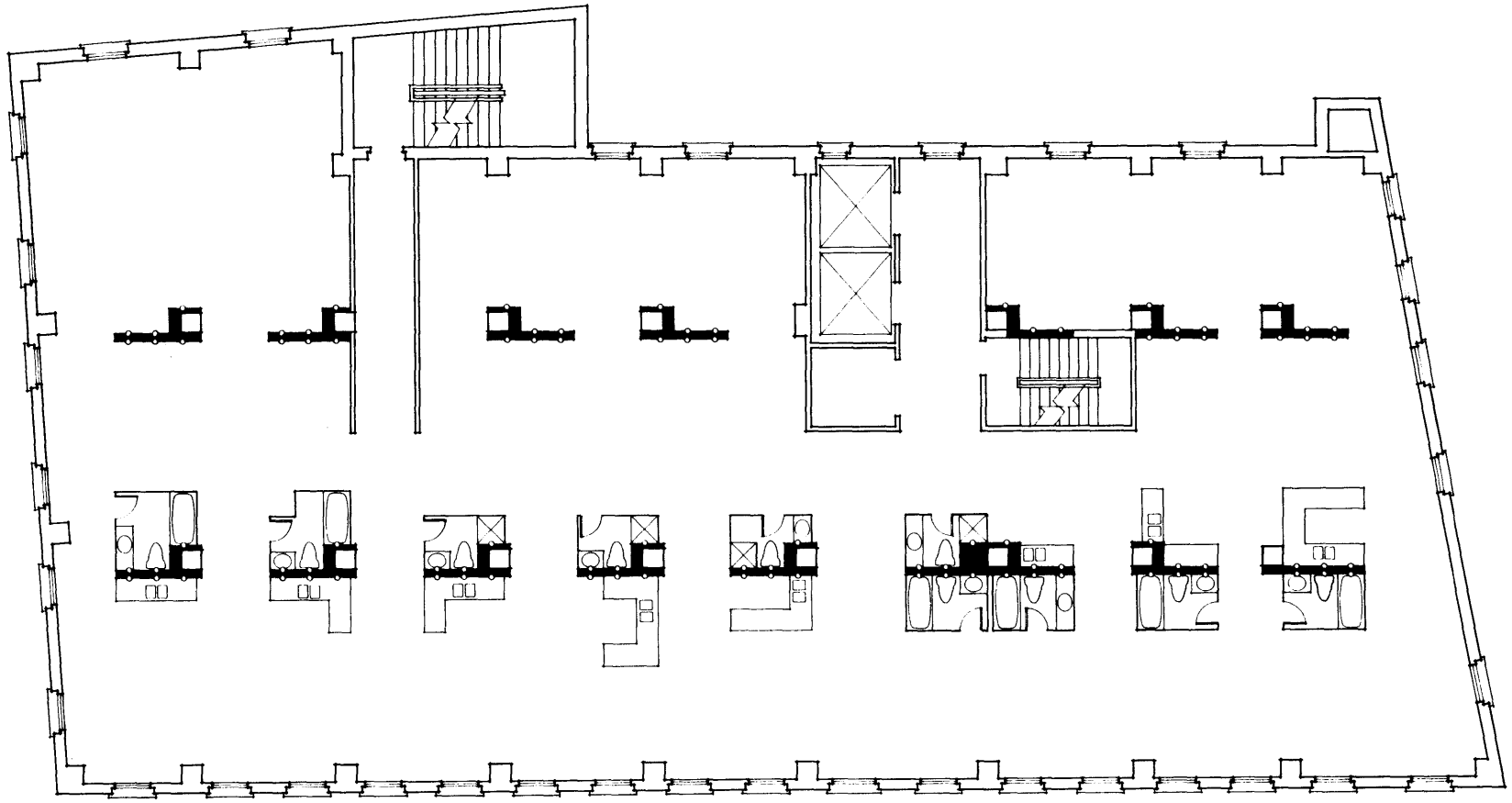
6: Service cores

MAVERICK BUILDING

TYPICAL FLOOR PLAN

0 4 8 16 24

NORTH



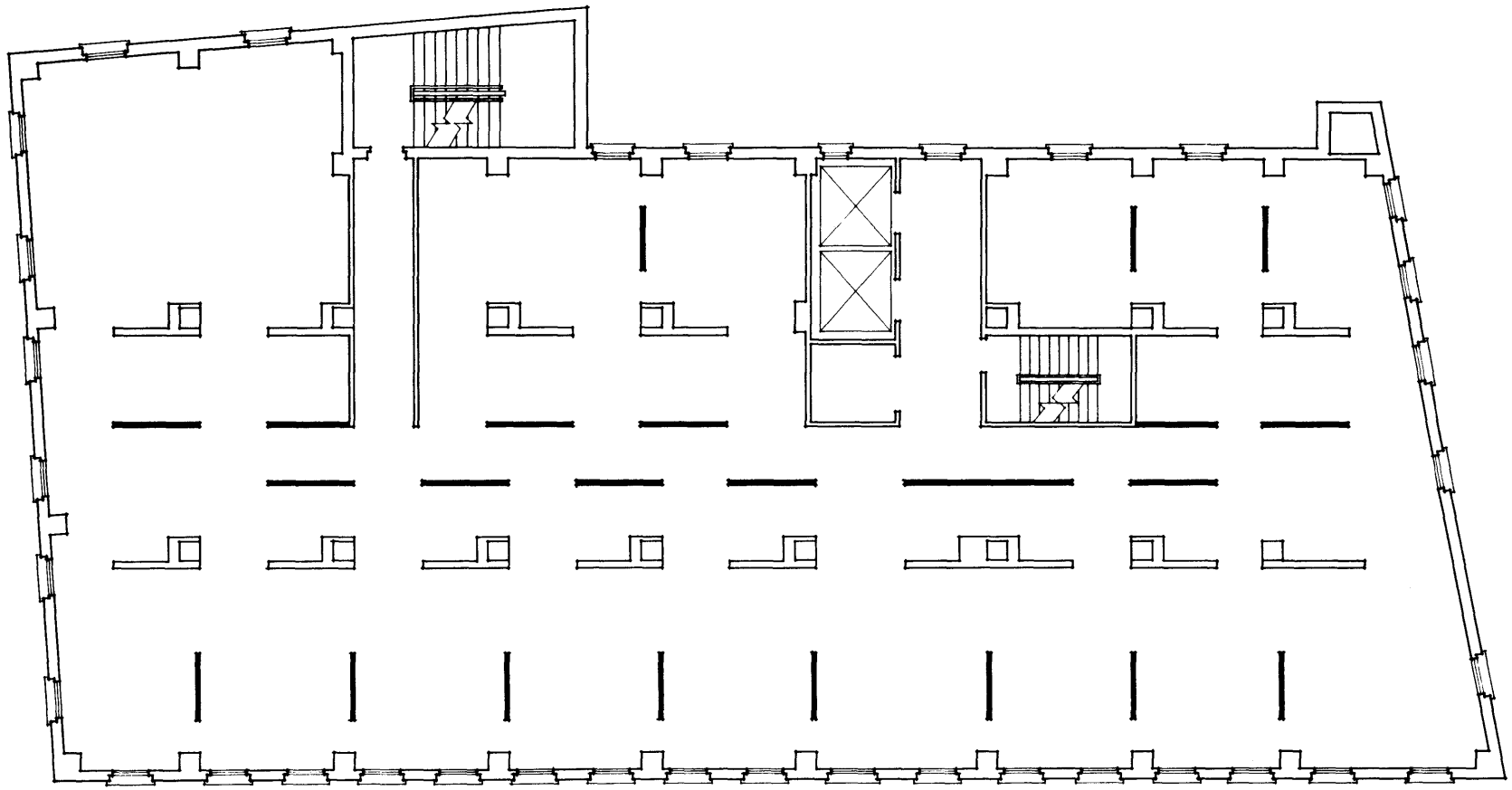
6: Service cores

MAVERICK BUILDING

TYPICAL FLOOR PLAN

0 4 8 16 24

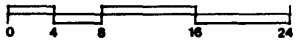
NORTH

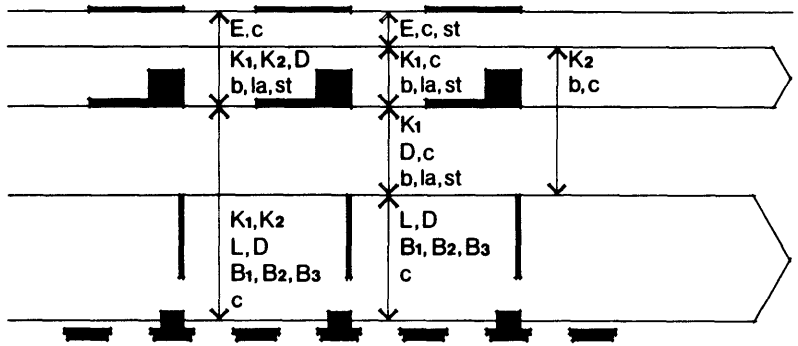


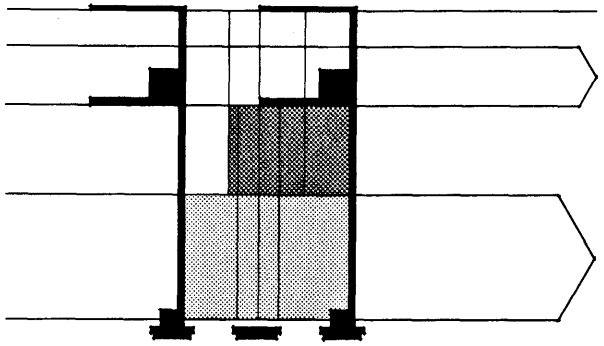
7 : The support

MAVERICK BUILDING

BAY COMBINATIONS







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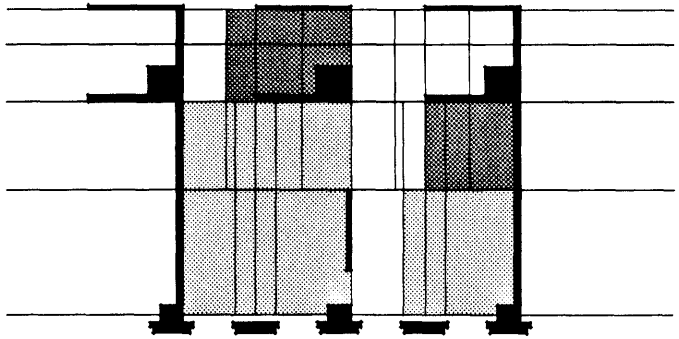

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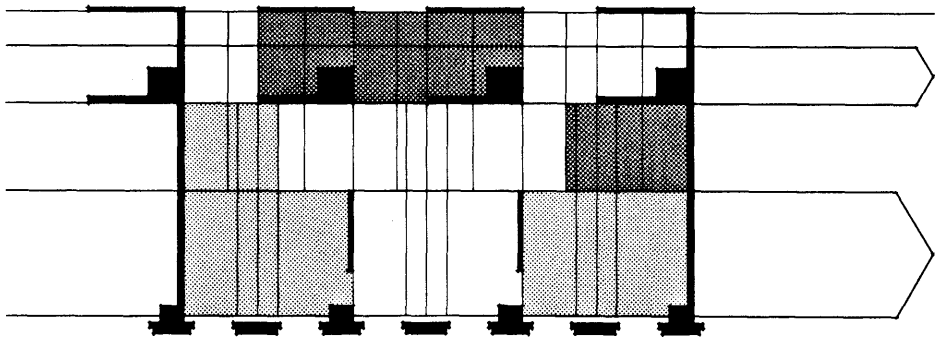


3

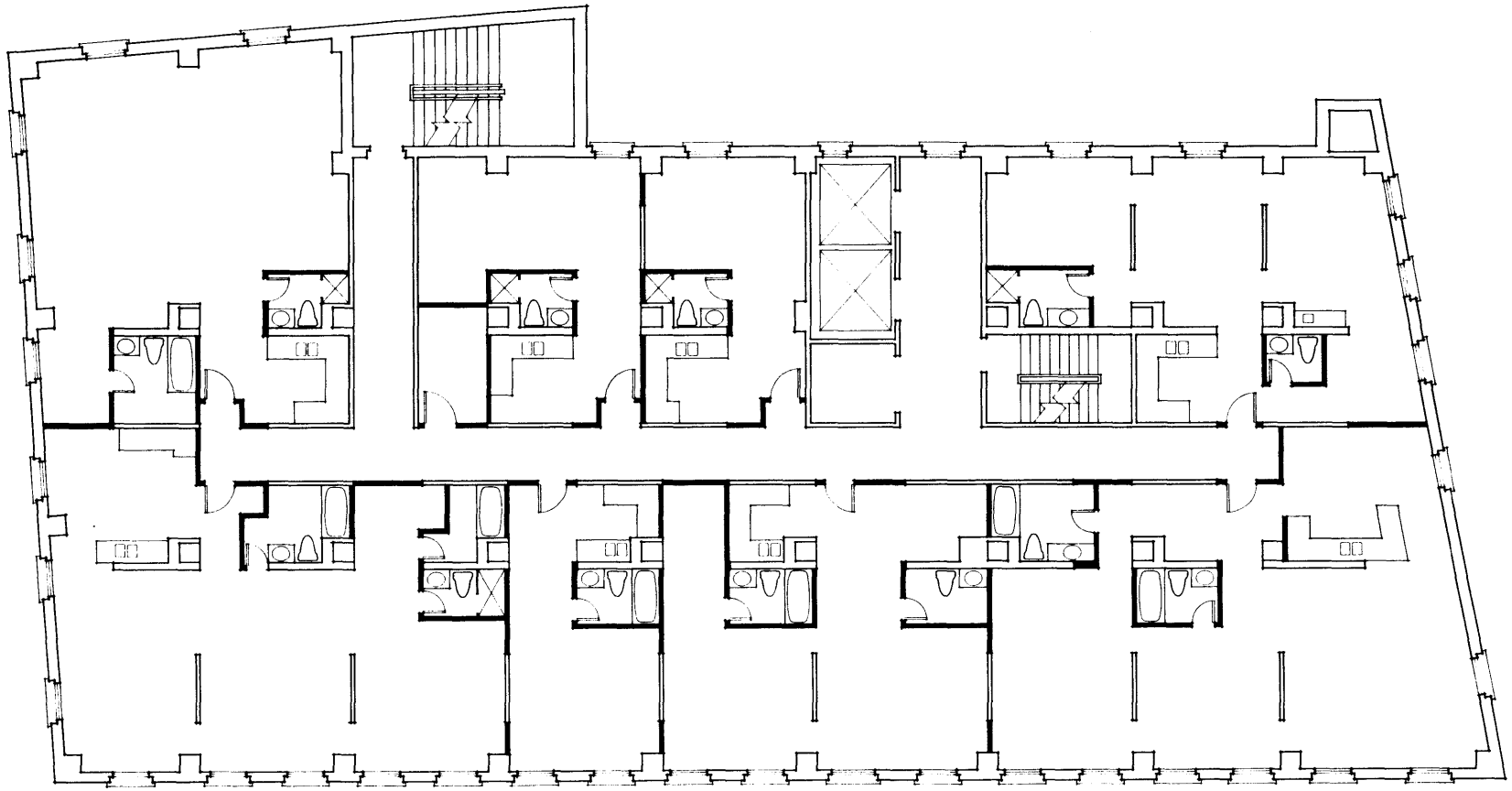
8: Basic variations

MAVERICK BUILDING

TYPICAL FLOOR PLAN

0 4 8 16 24

NORTH



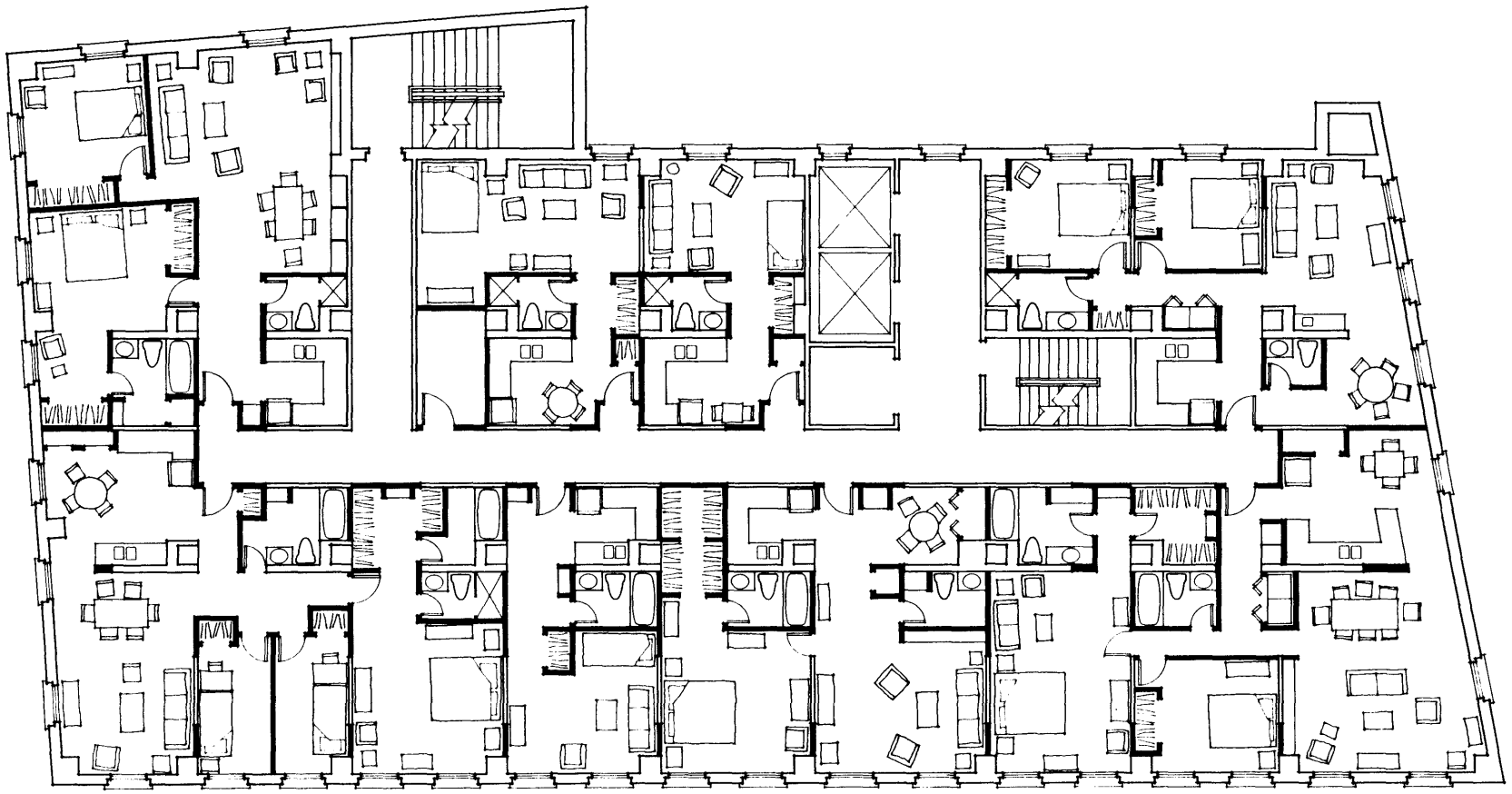
9a: Dwelling units

MAVERICK BUILDING

TYPICAL FLOOR PLAN

0 4 8 16 24

NORTH



9b: Dwelling units

CHAPTER 5 : Assessment of the Approach

5.1 the building type

5.2 the design methodology

5.3 general assessment

5.1 The building type

The adaptation of the selected building type, the old medium-rise office building, for residential use offers a number of advantages. In general, the buildings of this type are attractive and of sound construction, quite capable of presenting a residential image. Their facades have ordered, regularly-spaced fenestration, with windows of residential scale. They usually have adequate ciculation systems, though some buildings will require an additional stair. Their typical plan shapes provide for a large exterior surface area.

The building type also presents a number of disadvantages, however. These buildings do not typically have the mechanical or utility systems necessary for residential occupancy, and the introduction of new systems creates problems of routing through the existing structure and of utility metering of individual dwelling units. In addition, the problem of metering and the need for economy in construction encourage the design of minimal and inflexible service cores. In plan, these buildings are narrow, and though this increases access to natural light and ventilation, they are, in fact, too narrow, given their existing double-loaded circulation. This shallow depth creates dwelling units of only one or two spaces deep, with service spaces along the public circulation corridor, having no direct access to the exterior. Irregularities in building plan or facade create difficulties in dwelling unit design. Odd angles, existing circulation elements, irregular bay sizes, and irregular window spacing (though not common)

all present unusual problems in the design of the building interior.

In the conversion of the building type to housing, perhaps more serious alterations to the individual building should be considered. Of the three major factors in the interior redesign, the exterior facade, the structural system, and the circulation system, it is the last of these that poses the most restrictions. Given the narrow plan dimensions of these buildings, dwelling units could be oriented across the whole depth of the building, from one exterior facade to the opposite. This would necessitate a new circulation system, such as multiple entries. Though preferable in residential design, multiple entries would be prohibitively expensive, as the height of this building type requires elevators and dual fire stairs.[1]

There is insufficient grounds here to discard the building type as a whole for consideration in the conversion to housing, but there is enough evidence to suggest that a more specific office building type might be more consistently suitable. Detailed requirements for the building height, exterior facade, structural bay sizes, plan configuration, and existing circulation elements and their location, would enable the identification of buildings that would not pose insurmountable problems in the conversion to housing.

1. Southern Building Code Congress International, Inc., Standard Building Code, 1976 Edition, (Birmingham, Alabama, 1976), 11-3.

5.2 The design methodology

The application of the SAR support design methodology, as adapted here for the particular building type, has quite a number of advantages, with very few drawbacks. The methodology provides for an ordered and systematic evaluation of a housing support, and therefore, of an existing building structure for its suitability as a support. It enables the designer to identify all the possibilities in the organization of the support and individual dwelling units, and yet, the process is not a rigid sequence. Furthermore, the methodology requires the clear distinction between the public and private spheres of housing production. It also forces the designer to consciously establish the space and relationship standards to be met in the design of the dwelling units.

The limitations of the methodology are relatively minor. It does not contend readily with building quirks and inefficiencies, such as unusual plan shapes, irregular bay spacing, and irregular window spacing. These situations require a more tedious analysis in the methodology or a more traditional approach to their resolution within the final design. This methodology is not a set of instructions for the design of a support. The design of the support is still determined by the designer, within program, cost, market, and building code constraints.

In specific terms, the process within the methodology has some

noteworthy consequences in its application for the building type. While the zoning analysis is a good technique for initial analysis of the building plan, accepting the existing circulation system of the building necessitates a two-zone organization. The imposition of this two-zone organization limits the possibilities of space location, especially service spaces. Both the sector analysis and the basic variations are excellent means of analyzing the exterior wall and the structural bays, though the thorough study of any irregularities in building plan can become very tedious.

In general, this design methodology is an invaluable, even indispensable, tool in the evaluation of the suitability of an existing structure for residential use, and of the housing support introduced in the conversion. It provides for step-by-step analysis of the proposed design. But it can never be (and was never intended to be) a replacement for the quality, thoughtful design of a building's conversion.

5.3 General assessment

A true evaluation of the approach presented here cannot be made without the test of an actual implementation, utilizing an existing building for conversion, but a general assessment can be made based on the apparent advantages and disadvantages.

In the nature of supports, a distinction is recognized between the public and private "spheres of responsibility," and therefore, control of a dwelling interior by its resident is not only encouraged, it is required. The resident must take charge of the dwelling unit layout, construction, and subsequent maintenance and modification. Besides having a psychological advantage over traditional housing methods, this approach could be much more marketable, especially in condominium or cooperative arrangements. The mapping out of the Levels of Construction provides a realistic picture of the extent of participation required by the resident in the private sphere, and as a result, a more informed decision about the appropriate location of the division between the two spheres is possible.

As discussed in Chapter 1, rehabilitation itself has many advantages, among them the social and economic benefits of preserving the existing building stock and stimulating the redevelopment of a neighborhood. Of major consideration in the production of economical housing are the construction economies possible. The reuse of an inexpensive existing structure, time saving, and the availability of public

funds for rehabilitation are the more obvious economic benefits. This approach presents others. Supports have been proven less costly to construct than traditional housing.[1] They allow for more standardized construction materials and methods. Mass-production of components is possible. Finally, the avoidance of expensive interior construction within individual dwelling units by the recognition of the private sphere of production can facilitate a very economical housing development project.

There are some potential difficulties in the implementation of the approach which can only be judged fairly on the basis of an actual development project. The first of these is the marketability of support housing in the United States. Though there is little reason to doubt that it could be very desirable if done well and for the appropriate housing market, support housing is untraditional and requires the participation of the resident. Another possible problem in support housing, especially for low income housing, is the difficulty of controlling the quality of the housing within the rehabilitated building, as the quality is ultimately in the hands of the residents. There might also be some difficulty in practice in the definition of the Levels of Construction to the degree necessary to be of any assistance in the separation of support and detachable units.

Overall, the advantages of the approach seem to outweigh the potential problems. The building type selected for this study, as defined in Section 2.2, has some inherent traits that present obsta-

1. Dekker, 8.

cles to its conversion to support housing. A more specifically-defined variation of the old office building type, or possibly another building type altogether, might prove to be more suitable for this conversion. The nature of the particular building and the construction materials and methods will determine how readily a distinction can be drawn between the support and detachable units. And ultimately, the building environment and the targetted housing market will greatly affect the success of a development project.

CHAPTER 6 : Conclusions

"The profitable recycling of a building - and it must be profitable if the recycling process is to be continued - requires imagination, knowhow, and the courage to speculate. A great deal of speculative risk can be removed by intelligent forward planning and by following a step-by-step procedure...that will assure ...that everything that can be done has been done...to make the project a success."

Laurence E. Reiner

6.1 Evaluation criteria

In the development of housing by the private sector (or by joint public and private effort) there are three primary interest groups: the developer or owner, the city or municipality, and the residents. The developer is the prime moving force behind the creation of a viable project, and is usually the one who stands to gain or lose the most. The city, as a governing body, is mainly concerned with the health and safety of its citizens, and must establish rules and regulations to that end. And it is the residents who must ultimately live with and adapt to the product provided by the developer and regulated by the city. Each of these groups has a different set of criteria by which to judge the relative success or failure of a given project. The basic evaluation criteria of each group are outlined below.

The Developer

1. present and future marketability
2. property appreciation
3. tax advantages
4. speed of project completion
5. feasibility of project management
6. simplification and ease of construction
7. economy of construction
8. ease of zoning and building code compliance
9. economy of building operation and maintenance

The City

1. community health and safety
2. justification of city support for project
3. zoning and building code compliance
4. appropriateness of the project:
   neighborhood, building type, housing type
5. longevity and future viability of property
6. physical appearance of finished poduct
7. Minimum Property Standards
8. sensitive building preservation
9. provision of housing choice

The Residents

1. affordability of housing
2. personal health and safety
3. appearance and quality of finished product
4. space standards
5. flexibilty of dwelling unit:
   size, organization, character, technical modification
6. comfort
7. economy of maintenance and utilities

6.2 Incentives for the developer

Implementation of the kind of rehabilitation and conversion project being proposed here must necessarily involve the interested participation of a private developer, whether alone or in joint venture with the city. Though the city is capable of implementing such a project on its own, it will rarely be able to achieve the economies possible by the private sector, and it can probably never avoid the specter of public housing. If itemized, there are sufficient incentives to outweigh the potential risks to the private developer.

The developer will have two primary risks in this type of project: the housing market, and cost control. He might be faced with no market for his product, due to unaffordability, the lack of demand for support housing within the targetted market, inappropriate location, or irreversible neighborhood decline. The cost of the project might exceed the construction budget, due to poor cost estimation, unforeseen complications in the renovation, or the inability to standardize construction materials and methods.

The potential benefits to the developer are savings in time, energy, and money (not to mention such intangibles as civic pride and goodwill). The developer is able to save time through the rehabilitation of an existing structure, through minimizing and standardizing the interior reconstruction, and through faster marketing.[1] He can save energy in the salvaging of an existing building and in the oper-

1. McLaughlin, "Rehabilitating for Profit," 66.

ation and maintenance of the rehabilitated building. And the developer is able to save money, thereby protecting his profit, by acquiring an unrenovated building at low cost, by minimizing interior construction, by reducing interim operating and finance costs, by obtaining low-interest public funds, and by taking advantage of the many tax benefits associated with rehabilitation (such as tax abatement and accelerated depreciation).

The potential risks and incentives involved in the rehabilitation and conversion of old office buildings to support housing are summarized below.

POTENTIAL RISKS

1. housing market
    a. lack of demand for the housing product
    b. unaffordability of the housing product
    c. uncertainty about the nature and quality of finished housing
    d. inappropriate location, or neighborhood decline
2. cost control
    a. poor cost estimation
    b. unforeseeable complications or technical difficulties
    c. lack of efficiency or standardization in construction
    d. compliance with city requirements for occupancy

1. Bunnell, 10.

INCENTIVES

1. time savings
    a. rehabilitation of an existing structure (vs. new construction)
    b. minimal interior construction
    c. standardization of housing support construction
    d. phased occupancy based on construction progress

2. energy savings
    a. salvage of an existing structure
    b. efficiency of building operation and maintenance
    c. avoidance of heavy equipment in construction

3. money savings
    a. low cost of property acquisition
    b. minimal interior construction
    c. lower interim and finance costs
    d. availability of public funds for rehabilitation
    e. tax advantages

4. marketability
    a. preference for renovated structures over new housing[1]
    b. pre-leasing (based on existing building)
    c. freedom from a specific housing unit model

6.3 Further investigation

With the completion of this study, several areas can be seen to warrant further investigation. Three general areas in need of more study are: the building type, the organization and management of the actual project, and support design.

To begin with, a more in-depth analysis of the selected building type is in order, together with a more specific or exact definition of the type. It would also be enlightening to investigate the whole range of old building types that are potentially suitable for conversion to housing.

The presentation of the four Levels of Construction may seem to have been oversimplified here. They serve primarily as an illustration of the approach being presented. Further study of these levels, along with the underlying project organizational structure, could in itself be a major investigation. No attempt has been made here to illustrate the nature of the organization and management of a real project. While it would depend to a great extent on the actual individuals and parties involved, and their respective interests in the project, this organizational structure could also be the subject of a major study.

The analysis of the application of the design methodology to the building type could be pursued to a greater depth. The relative ease

or difficulty of the various steps of the design process was not recorded here; it might shed more light on the suitability of the building type and the methodology itself. Of primary interest to this author, but beyond the scope of this thesis, would be the design and specifications for the actual construction of a housing support within a rehabilitated building, including the service cores, the mechanical systems, and possibly an interior partitioning system. This would require an extensive knowledge of building construction and state-of-the-art building materials and components.

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