

ADAPTIVE REUSE AND GROWTH IN AN INDUSTRIAL CITY:
POTENTIALS AND RESTRAINTS

by

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ABSTRACT

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Richard Arthur Radville

Submitted to the Department of Architecture, May 1978,
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The industrial city in New England has undergone major transformations over the past century. After thriving during the prosperous 1800's and early 1900's, these cities lost their industrial tax base for a number of reasons and began to deteriorate rapidly. The industrial city became a symbol of declination and weak economy. Recently, however, interest has grown in preserving these older cities as living reminders of the Industrial Revolution in America.

As the downtown areas are revitalized, it is probable that land value will suddenly rise. New development can be expected which will threaten the unique character of these cities, as the overall density of these areas may not be enough to support current economic determinants.

This thesis will be a demonstration of the ways in which the overall density of the downtown area of a particular city can be increased significantly, while working within

the parameters of a definable image. The relationship between density and image will be studied in such a way as to determine the extent to which density can be increased before the character of the city begins to break down. The final product of the thesis will be a design study which demonstrates the physical potential of Lowell, Massachusetts.

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Thesis Supervisor

Kyu' Sung/Woo, Associate Professor of
Architecture

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INTRODUCTION

As the many industrial cities of New England attempt to revitalize, their downtown areas may begin to feel development pressures which could threaten the delicate character of the cities. These pressures could be felt on many aspects of the environment, from outdated utility systems to the parking supply. One pressure which is usually not dealt with, except in historic districts, is the influence on the character or "image" of the city in terms of the physical quality. Zoning laws may regulate such factors as height, use and overall density of an area, but generally do not include requirements regarding architectural and spatial quality. Industrial cities generally developed over a relatively short period of time in the 1800's and their architecture, therefore, has a strong, consistent, identifiable character. Recently interest has grown in preserving this character as a physical reminder of the Industrial Revolution in America.

Recognizing that these pressures may soon exist, this thesis proposes to examine the ways in which the existing physical fabric of a city can be added to in such a way that will significantly increase the overall built density while maintaining the image of the place. The thesis proposes to determine an actual upper limit of density increase which does not significantly alter the physical character of the city.

Lowell, Massachusetts, a city of about 220,000 population thirty miles north of Boston on the Merrimack River, was chosen as the city for the study for several reasons. First, it has long been known as the first industrialized city in the country, having made use of great technological and social advancements during its heyday. Second, its original architecture is still very much intact, providing a firm physical base for the study. Third, a proposal has recently been submitted to the U. S. Congress requesting funds to develop a National Urban Park which would demonstrate all aspects of life in 19th century Lowell. The park is to include restoration of the majority of the existing downtown building stock into commercial and office space. A visitor center and a hotel are included in the proposal. It is expected that by

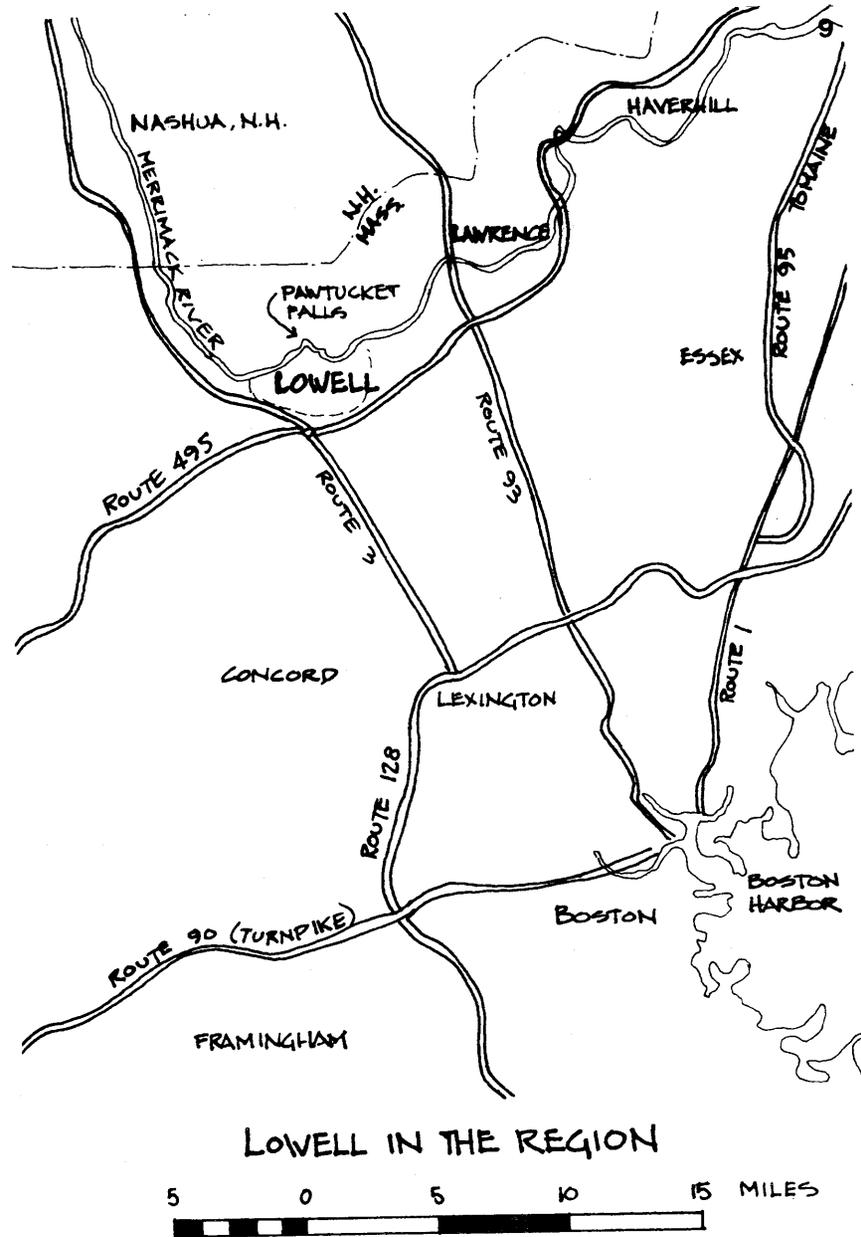
1985, the park will draw upwards of a million people a year to Lowell. All these factors make Lowell the ideal city for this type of study.

Chapter One will discuss Lowell's history in general and will detail the Urban Park proposal in order to acquaint the reader with the general setting. Chapter Two will be mainly a visual study of those elements which make up the physical image of downtown Lowell. It will attempt to document, in an analytical way, this usually abstract concept. The third chapter will be a series of design studies which relate increasing density to the "image" criteria established in Chapter Two. Chapter Four will discuss related issues such as adaptive reuse in general, ways in which the existing building stock can be made more useful by today's space standards, and related building code requirements. The method will be described in more detail at that time. Chapter Five is a detailed design study which demonstrates the physical potential of a small, two block area of downtown Lowell. The final chapter discusses potential future and related studies which could not be accomplished in the timeframe of this thesis.

LOWELL

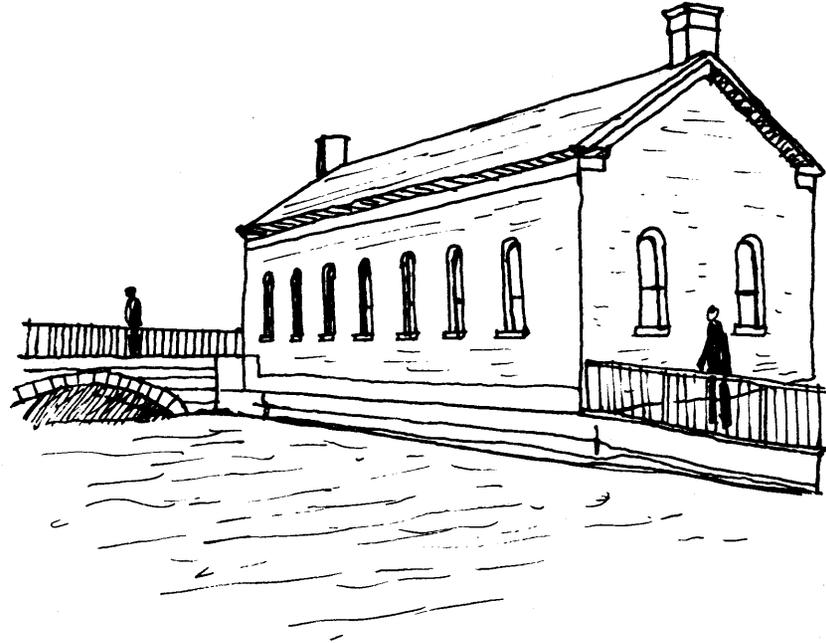
Lowell, Massachusetts is an industrial city with an abundance of historical and cultural value. Located on the Pawtucket Falls of the Merrimack River about 30 miles north of Boston, Lowell was founded in 1822. The site had originally been characterized by Indian settlements, small farms, and very small scale manufacturing establishments along the rivers and streams. In 1796, the first canal, the Pawtucket, was constructed as a bypass around the Falls from New Hampshire. The Middlesex Canal was constructed in 1803 and connected the city to the port of Boston.

The site for Lowell was chosen basically for technological reasons. The



Merrimack River dropped in level approximately 33 feet over a distance of less than two miles. The developers of Lowell took excellent advantage of this by controlling the drop and using it to power the manufacturing equipment, at first mechanically and later as electricity. An extensive canal system, finally 5.6 miles long, was developed within the downtown area. Far up the Merrimack River, streams and tributaries were dammed and controlled to ensure a steady, reliable water flow.

The water was tapped from the river at the western edge of the city, the top of the Falls, and fed into the canal system, where it was dropped at three main intervals of approximately 10 feet each.¹ This was made possible by the fact that the land around Lowell was relatively flat, so that the canal system could be situated



MERRIMACK GATEHOUSE
ON MERRIMACK CANAL
AT MERRIMACK ST.

more for reasons of efficiency than topography.

The machinery involved in this generation of power was very sophisticated and was at the time the most advanced of any system in the country. Lowell also differed from other industrial centers in later years in that each mill company did not develop its own source of power but rather purchased it from a central source similar to our own utility system. Many of these locks and canals are still in use today as power generators.

In a very short time, Lowell also became a well-known example of a sophisticated industrial city. Mills in Lowell were recognized for their practice of creating finished products from raw materials at a single location. This became known as the "Lowell System".² Outside interests also looked to Lowell for policies concerning social dealings with the work force.

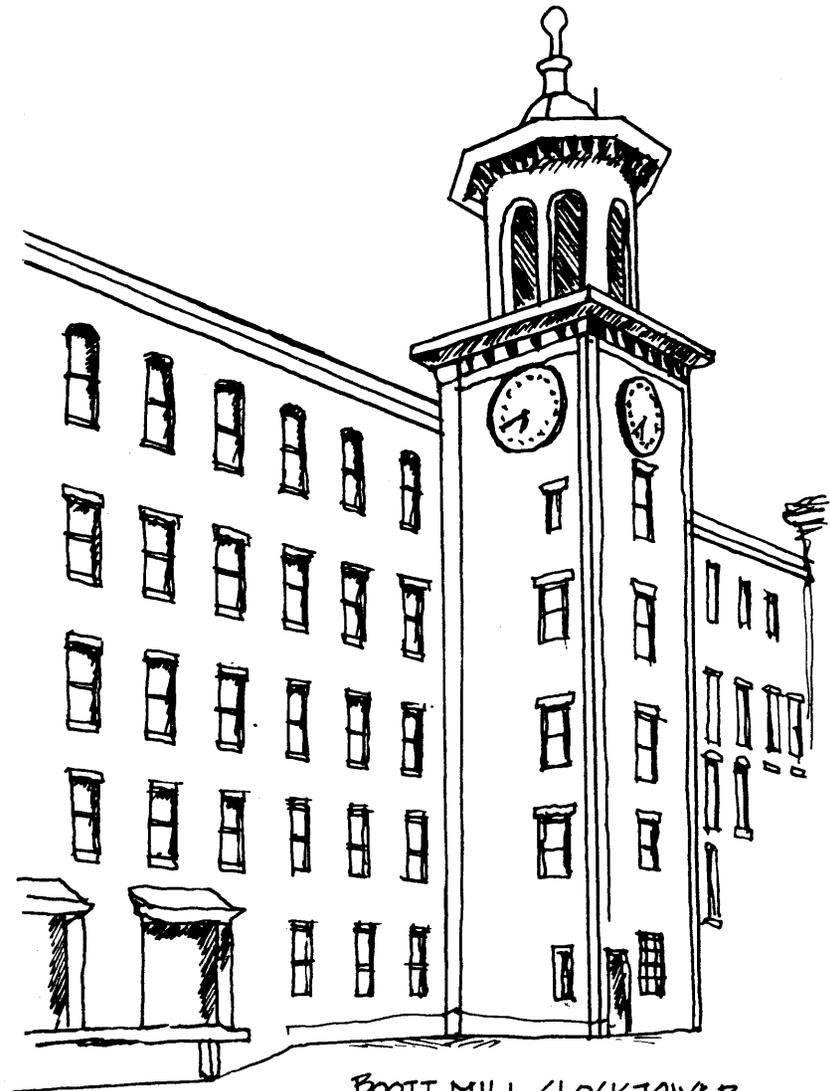
As technology advanced in Lowell, building



LOWELL MANUFACTURING CO.
CA. 1830

forms changed to adapt to them. For instance, in the early mills, power was generated by water falling through a water wheel and was transmitted to the machines by shafts and leather belts. To minimize the distribution distance and cut down on power loss, the mills were organized vertically. With the coming of electricity the shafting and belting became unnecessary, and the forms of later buildings reflect this. Today's industries find it difficult to take advantage of multi-story buildings. Thus, many of the former industrial buildings are now occupied by several smaller businesses which occupy only one floor.

Lowell's building stock today reflects the changing times of the 19th century. Mill buildings and worker housing became sources of pride in Lowell. Beautiful clock



BOOT MILL CLOCKTOWER
CA. 1835

towers adorned each of the many mill yards. Elaborate cut stone details were abundant, as was the typical mill name and date of construction carved in stone at the mill entrance. Even chimneys were extensively detailed, uniting the whole into an example of pride in the place where one works and lives. Lowell in the 19th century was an efficient and successful city and set an example for the rest of the country. The downtown area developed into a very dense commercial center, selling the products created in the city itself. Elaborate Victorian style buildings were common throughout the downtown and many are intact today. (The map at the end of this chapter shows the downtown area as it is today.)

Lowell flourished as a leading industrial city well into the 20th century. It continued to grow, not only in overall



"PROFESSIONAL BUILDING"
CORNER PALMER & MERRIMACK STS.

developed area, but also in production. New mills continued to be built as more and more manufacturers took advantage of the many benefits which Lowell had to offer.

However, beginning in the 1920's, many manufacturers in Lowell and the other surrounding industrial cities began to move to the South where power and labor were cheaper. Lowell deteriorated over the next few decades as quickly as it had grown during the 19th century. A vast majority of the mill complexes became vacant and those that remained occupied held many small tenants as opposed to one large one. The canal system quickly became unnecessary as power was supplied on a regional basis. The economy of Lowell declined to such an extent that there was little economic justification in even tearing down these old mills and reclaiming the land which the canals occupied. Many buildings, although not nearly all of the original, still stand vacant but in good physical condition. The canal system is almost completely intact. These facts are the key to future plans in Lowell.

* * *

Several years ago the State of Massachusetts began the revitalization process in Lowell with the commitment of over \$9 million to establish the Lowell Heritage Park. This park is intended to develop the waterways and surrounding areas in Lowell as recreational areas.

In January 1975, the United States Congress established the Lowell Historic Canal Commission in order to prepare a plan for the "preservation, interpretation, development and use of the Lowell Historic Canal District, in the City of Lowell, Massachusetts."³ The commission studied the entire city of Lowell over a period of two years and concluded that "the creation of a Lowell National Cultural Park by Congress is the appropriate action for the Federal government to take in order to preserve Lowell's historical and cultural resources and to interpret the city's special role in the American Industrial Revolution."⁴

While the National Park is a separate entity from the Heritage State Park, the two are intended to work together. The State Park, in fact, is partly intended as momentum for the National Park which is presently under consideration by

Congress. The Lowell National Cultural Park is a proposal for the redevelopment of substantial areas of the city. It would, basically, preserve Lowell's major historical and cultural assets and attempt to interpret to visitors the importance of Lowell and the Industrial Revolution to our modern way of life. The development would certainly stimulate Lowell's currently depressed economy in the form of job creation (both during and after construction), greater tax revenues (particularly as vacant buildings become occupied), and increased public regional spending. The park would also encourage local residents, especially business people, to appreciate the great value of Lowell.

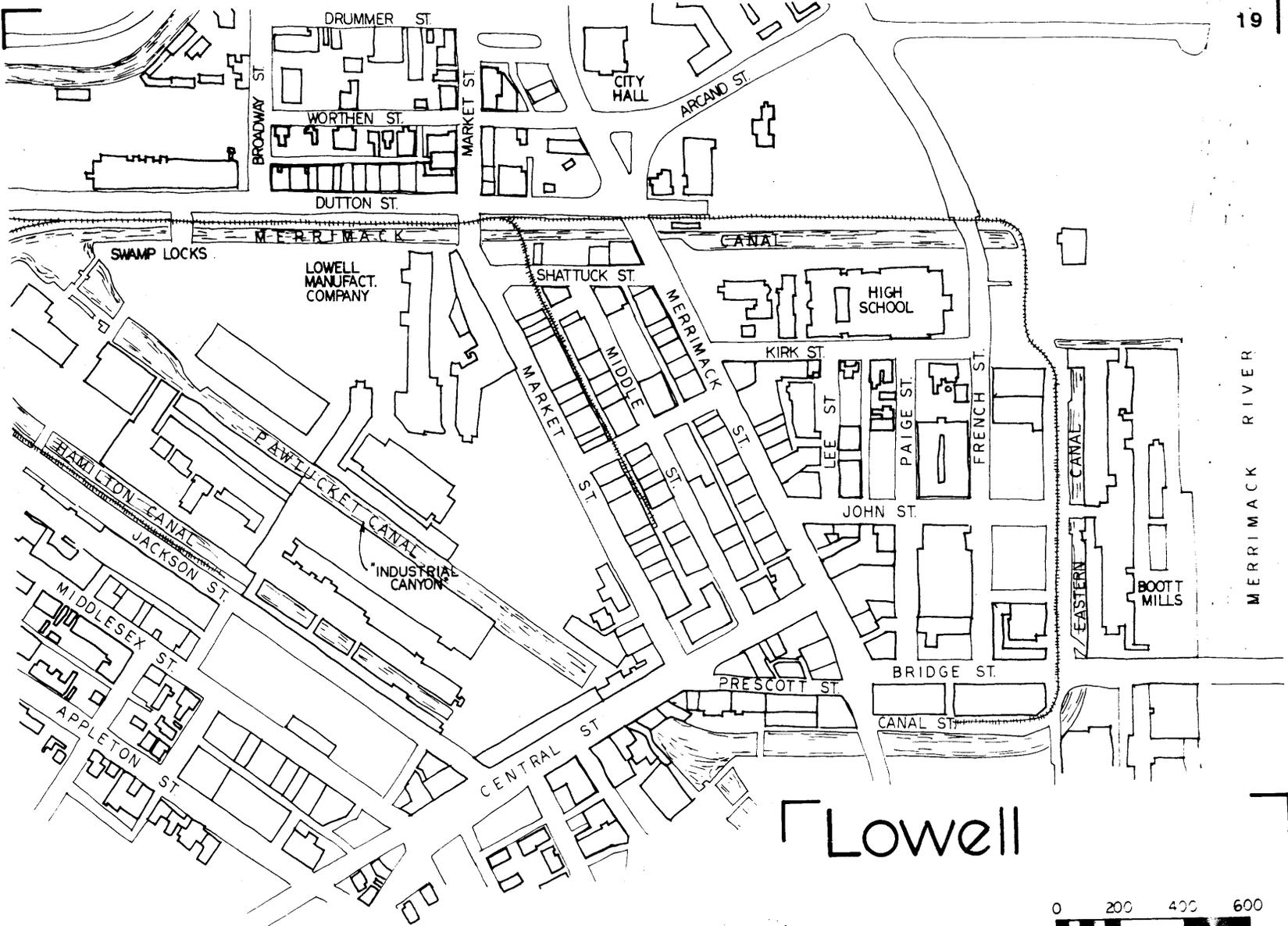
The plan has two major parts: a small, intensively developed portion in the downtown area, and less developed portions along the entire canal system in outlying areas. The downtown area will feature a section of Lowell restored to its 19th century appearance and functions, an idea easily attainable since many of the early buildings and patterns remain. The major visitor center will be located in the old Lowell Manufacturing Company and will be incorporated with major commercial development

including a hotel and many stores and restaurants, all to be developed in the recycled manufacturing company. The Heritage State Park Visitor Center will be built in a four story structure on Shattuck Street on the Merrimack Canal. Through exhibits, the visitor center will demonstrate the cultural, physical and technological aspects of life in 19th century Lowell. Barge tours along the old canals will provide tourists with a rare and powerful view of the technological innovations of the time. Power generator stations and gatehouses will be restored to their original condition so that visitors can witness all aspects of the industrial city. Green space will be developed along many of the outlying canals where various restoration and adaptive reuse projects have already taken place. The map at the end of this chapter shows the proposed downtown area park development.

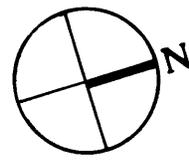
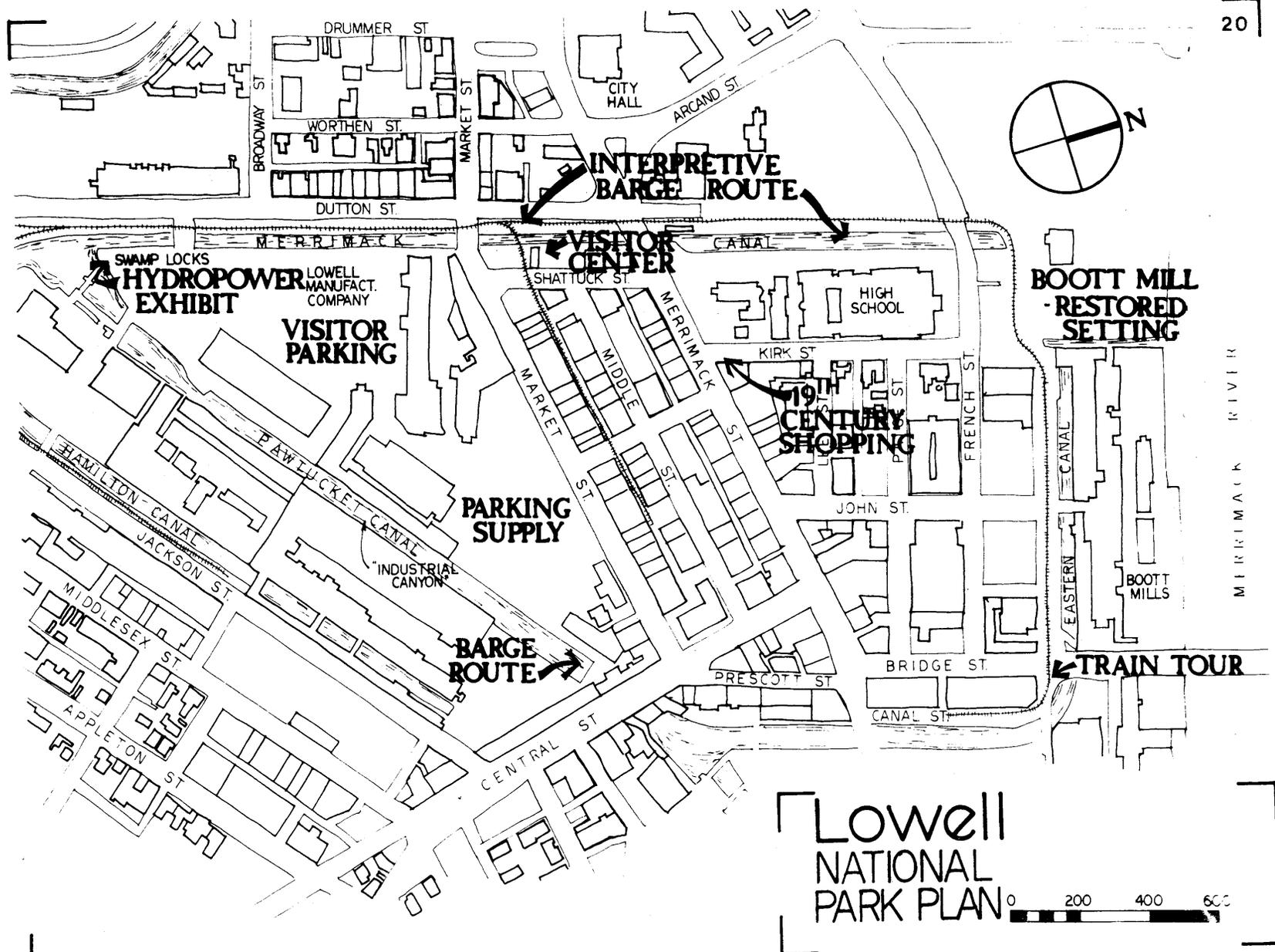
IMPACT OF THE PROJECT

The development of the park is expected to draw up to one million visitors a year to Lowell by 1985, most of whom would concentrate on the extensively developed downtown area.⁵ As

the downtown area is revitalized by this park, it is very likely that the enormous number of visitors and related economic growth could encourage expansion which may threaten the delicate 19th century character that is the basis of the park. Building lots which contain older, low rise buildings of two, three and four stories may become unprofitable to maintain. The purpose of this thesis is first to document what the character of Lowell is and then to find ways to increase the overall density in the downtown area while reusing the existing buildings, and working within the parameters of a definable image.



Lowell



**Lowell
NATIONAL
PARK PLAN**

0 200 400 600

IMAGES

The image of a city is a difficult concept to document in concrete terms. It is made up of not only the physical quality but also the economic, social and cultural aspects. The Lowell National Cultural Park will attempt to document economic, social, cultural and physical aspects through its exhibits. For the purposes of the solely architectural study of this thesis, only the physical quality can be studied.

In order to document the ways in which the existing fabric can be added to, it was necessary to document, graphically and analytically, exactly what the image of that fabric is. There are certain patterns, proportions and street qualities, for example, that can be quantified as describing the image. The buildings in the downtown area were studied in a very detailed manner in order to determine those elements and patterns. The site chosen was studied in plan, section, elevation and in model form so that all aspects could be seen. The drawings and diagrams that result from these studies document various elements

that, taken together, form the image of downtown Lowell.

The purpose of this chapter of the thesis, therefore, is to document the design principles that can be applied to new construction, as opposed to controlling new construction via rather arbitrary restrictions such as height limits. Using these principles, new construction can blend in with the old without simply "mimicking" it. The following are the elements felt to be part of the image.

CONSTRUCTION/MATERIALS

This is perhaps the most obvious of all the elements discussed. All of the original buildings in the downtown area are of unit masonry construction in the exterior walls. Bearing walls generally run perpendicular to the main streets, with either heavy timber and thick wood planks or girder and light joist construction on the interior.

The exterior wall which faces the street is generally non-bearing, but is still very much a unit masonry surface. While many of the buildings have as much as 70 percent openings in this surface, and approach a framework appearance, they still

are in the category of continuous surface construction.

TEXTURES/DETAILING

While the buildings are generally of continuous surface construction, this does not imply a smooth surface. The majority are heavily textured and beautifully detailed. This is due to the fact that this area was built during the Victorian period in the 1800's and highly developed details were part of that image. Generally, however, there are two levels of detailing in the downtown area. On Merrimack and Central Streets, the original main shopping streets, is the greatest abundance of cut stone and other beautiful details. On the less major streets, which were devoted mainly to warehousing, the details are more in the form of various simple corbelling and masonry lintels. While not as elaborate, this detailing is certainly equally beautiful in its simplicity.

ROOF LINES

This element of the image actually has to do with

building heights. While no particular building height limit can be set, there is a great variety in height from building to building. In other words, no two adjacent buildings are of the same height. This is another element which adds great variety to the area.

CORNICES

Every building is topped off by a highly developed cornice line which can consist of several things. It is either an extensive corbelling of the building surface or a thick stone lintel resting on the top of the building surface. Many times, this is where the name of the building and date of construction are carved into the stone. In either case, the purpose of the cornice is to "end" the vertical growth of the building and to give it a definite size and proportion.

ENTRANCES

In general, entrances to the retail ground floor consist of an indentation of six to eight feet wide in the surface of

the ground floor and either a single or double door which is five or six feet in off the street. This indentation is used for displaying goods and often as a shelter from the weather. Entrances to the upper levels are generally not coincident with the retail entrance and in fact are usually very inconspicuous small single doors placed at the ends of a building.

GROUND FLOOR

The ground floor of a building is always very different from the upper floors. It is always taller than the upper floors and acts as a pedestal upon which the building sits. Since the ground floor is exclusively devoted to retail establishments, it generally contains much more glass than the upper floors. Interestingly, it is also the element which holds all the buildings together, as most buildings have the same rhythm of elements in the ground floor. A particular element size of six to eight feet in width is a unifying factor between all the buildings. This may consist of the size of the glass display windows or may be an alternating solid to void situation. A consistent rhythm is set up along

the ground floor.

BUILDING PROPORTION/SIZE

It was found that although no particular building size or proportion is consistent in Lowell (as in Boston's Back Bay), there are certain proportion and size limits which can be generalized. The first has to do with horizontally proportioned buildings. In general, no individual building will be more than twice as wide as it is high. In other words, a building that is fairly long, approximately 100 feet for instance, will also be relatively tall, perhaps five or six stories. Secondly, no building will be more than 2.75 times its width in height. This proportion probably comes from the fact that the building lots in Lowell were sold in multiples of 20 to 25 feet in width, thus setting a minimum lot size. If the construction of the time allowed a height limit of 50 to 60 feet, this establishes this proportional limit. A further limitation which has to do with individual buildings is one which limits the overall size, or mass, in elevation. No building has an area (width times height) greater than

approximately 6,000 square feet. Further, one does not find two or more of the largest size buildings in a row. If there are two large buildings in the same sequence, they are always separated by a series of one or more smaller buildings.

BUILDING PROPORTION AND MAJOR DETAILING

This element of the image is concerned with the ways in which differently proportioned buildings are detailed. The individual structures can be grouped into two categories for this purpose: those which are more vertically proportioned than square, and those which are more horizontally proportioned than square. Vertical buildings tend to be detailed in a horizontal manner, so that each level appears different than the rest. This gives the building a "sandwiched" appearance. Horizontal buildings tend to be detailed in a vertical manner, generally by the use of pilasters or piers which run from the ground to the roof. This is an attempt to give these buildings elements which have the same proportions as those found on vertically proportioned buildings.

OVERALL TEXTURE

This image came from study of the area in model form. There is overall "texture" to the downtown which does not allow any particular building to dominate visually. This consists of a gradual transition from short to tall buildings with the change in height from one building to another never exceeding two stories or approximately 25 feet.

CLOSENESS OF STREET

The streets of Lowell, while very dense, do have a limit to the feeling of closure which they give to the pedestrian. In general, the total height of buildings on both sides of the street do not exceed 100 feet. That is, both sides can each measure 50 feet and add to 100 feet, or one side could be taller and dominate as long as the total does not exceed 100 feet.

SUN

This image relates building height to width of street. The main streets in the area studied run east-west, so that tall

buildings on the north side of a block will have a negative effect on the quality of a street. The average building height in the area varies from street to street but in general can be set at four or five stories. This limits the amount of new construction on the north side of a block, but allows very tall buildings on the south side.

MONUMENTAL BUILDINGS

There are, as in any city, a large number of monumental buildings. Monumental is not intended to imply large in size, but simply to say that a building was originally built to be viewed from several sides, not just as a facade in a particular streetscape. Most of the public buildings in use today were actually built early in this century, but the earlier public buildings which remain intact on the site area studied are generally of either the Victorian or Colonial style.

* * *

These physical elements are felt to represent the "image" of downtown Lowell, and many are demonstrated on the following pages.



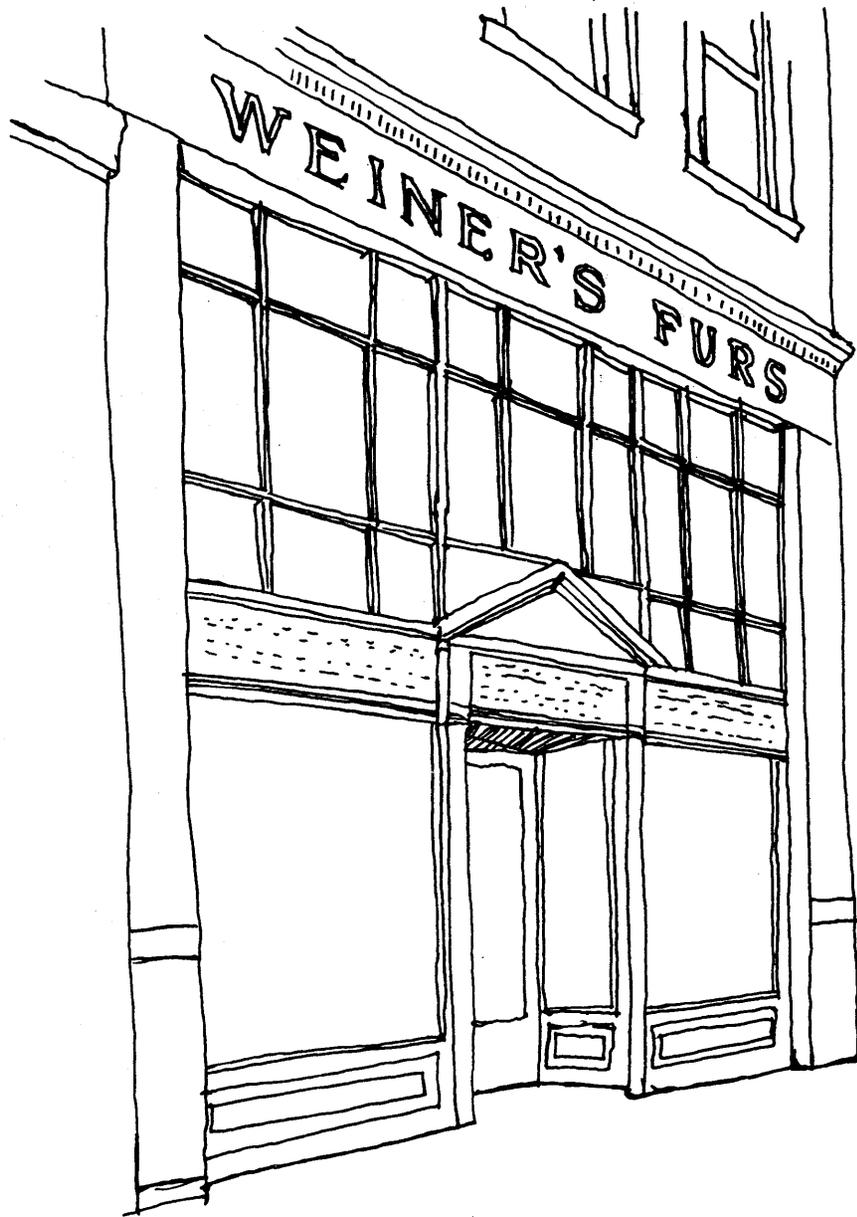
POLLARD RESTAURANT
BUILDING
MIDDLE ST.
CA. 1890

Image
TEXTURES



LOVELL FIRE DEPARTMENT
CORNER PALMER & MIDDLE STS.
CA. 1900

Image
CORNICES



WEINER FUR BUILDING
CORNER PALMER &
MERRIMACK STS.
CA. 1880

Image
ENTRANCES



POLLARD BUILDINGS
MERRIMACK STREET
CA. 1875

Image
GROUND FLOOR



WEINER FUR BUILDING
CORNER PALMER & MERRIMACK STS.
CA. 1880

Image
BUILDING PROPORTION



SAAB-DIPLOMAT BUILDING
MERRIMACK ST.

Image
HORIZONTAL BUILDINGS



SCOTT JEWELLERS BUILDING
CORNER CENTRAL & MERRIMACK STS.

Image
VERTICAL BUILDINGS



VIEW OF MIDDLE ST
FROM PALMER ST.

Image
STREET CLOSENESS



OLD CITY HALL
CA. 1830

Image
MONUMENTAL
BUILDINGS

DETERMINING THE POTENTIAL

SITE ANALYSIS

The actual site chosen for the study encompasses approximately five acres in the immediate downtown area of Lowell. It is bounded on the north by Merrimack Street, the main shopping street of the city, on the south by Market Street, on the east by Palmer Street, a small connection between Merrimack and Market Streets, and on the west end by the Merrimack Canal and Dutton Street.

Merrimack Street, a one-way, extremely busy street, is totally lined with a wide range of commercial sizes and types, from several large department stores to small variety stores. Traffic coming from the south, from routes 495 and 30, is eventually funneled into Merrimack Street via Central Street, a north-south connection one block to the east of the site. Market Street, the southern boundary of the study site, is also one way but in the opposite direction, running west to east. It was originally lined with many warehouses and factory stores

on the ground floor of the north edge and by the massive mill buildings of the Lowell Manufacturing Company to the south. Presently, the north edge contains a wholesale electric supply company, a restaurant, two small new professional buildings (one and two story), various "factory outlet" stores, and several grade parking lots. The southern edge now contains only two original buildings of the Lowell Manufacturing Company (a massive five-story structure) and a large empty space being developed as a five level parking structure. The mill structure will be developed into a medium-sized hotel and will have its entrance off a courtyard which will separate it from the entrance to the parking garage. This courtyard is directly opposite the middle of the study site. At the west end of the site is Shattuck Street, a one-way, north-south street, which connects Market Street to Merrimack Street. It runs parallel to the Merrimack Canal and to Dutton Street, which is on the opposite side of the canal. At the intersection of Shattuck and Market Streets is the building to be developed as the visitor center.

Middle Street, which runs east to west, is one way to the west and bisects the site. Originally dominated by warehousing and factory store type enterprises, it now retains much of that character. It is a very dense, narrow street (only 45 feet between the building faces) with an average height of 45 to 50 feet. Generally very quiet, even at rush hour, it is basically used for two purposes other than the few remaining factory stores: first as a shortcut around Merrimack Street, and secondly as a streetside parking lot. Traffic patterns are such that Middle Street and Shattuck Street are not really necessary, as their directions and destinations are matched by Merrimack Street and Dutton Street.

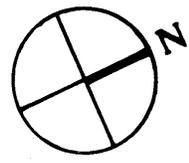
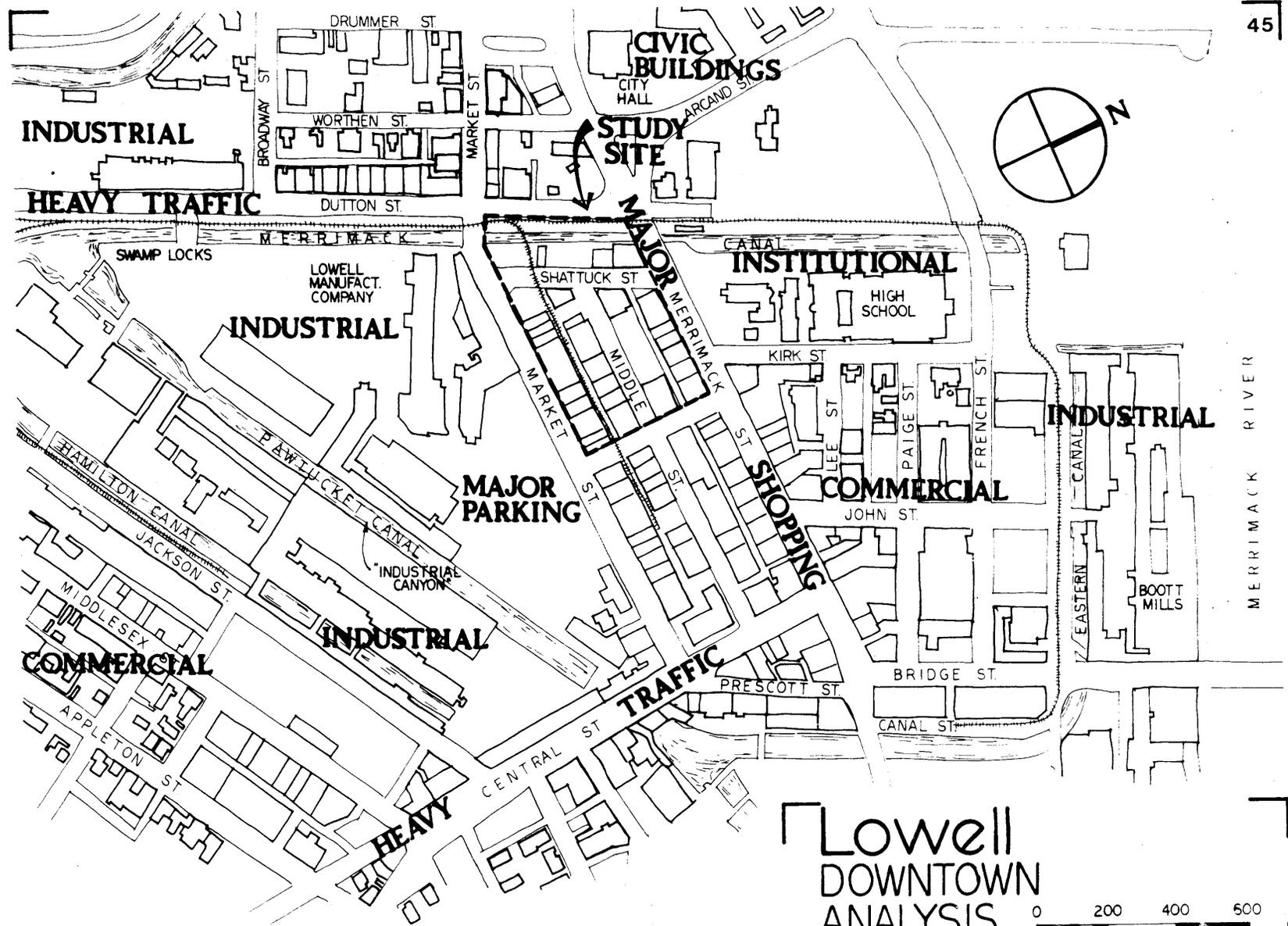
On the north side of Merrimack Street is an old stone church and rectory occupying a large grassy site and, beyond that, the public high school. Also on this side of Merrimack Street, across the Merrimack Canal, is one of the original gatehouses which will be restored as part of the Urban Park Plan. Further down Merrimack Street to the west is the present City Hall, built in the late 1800's, and three blocks to the north is the Merrimack River.

BUILDINGS

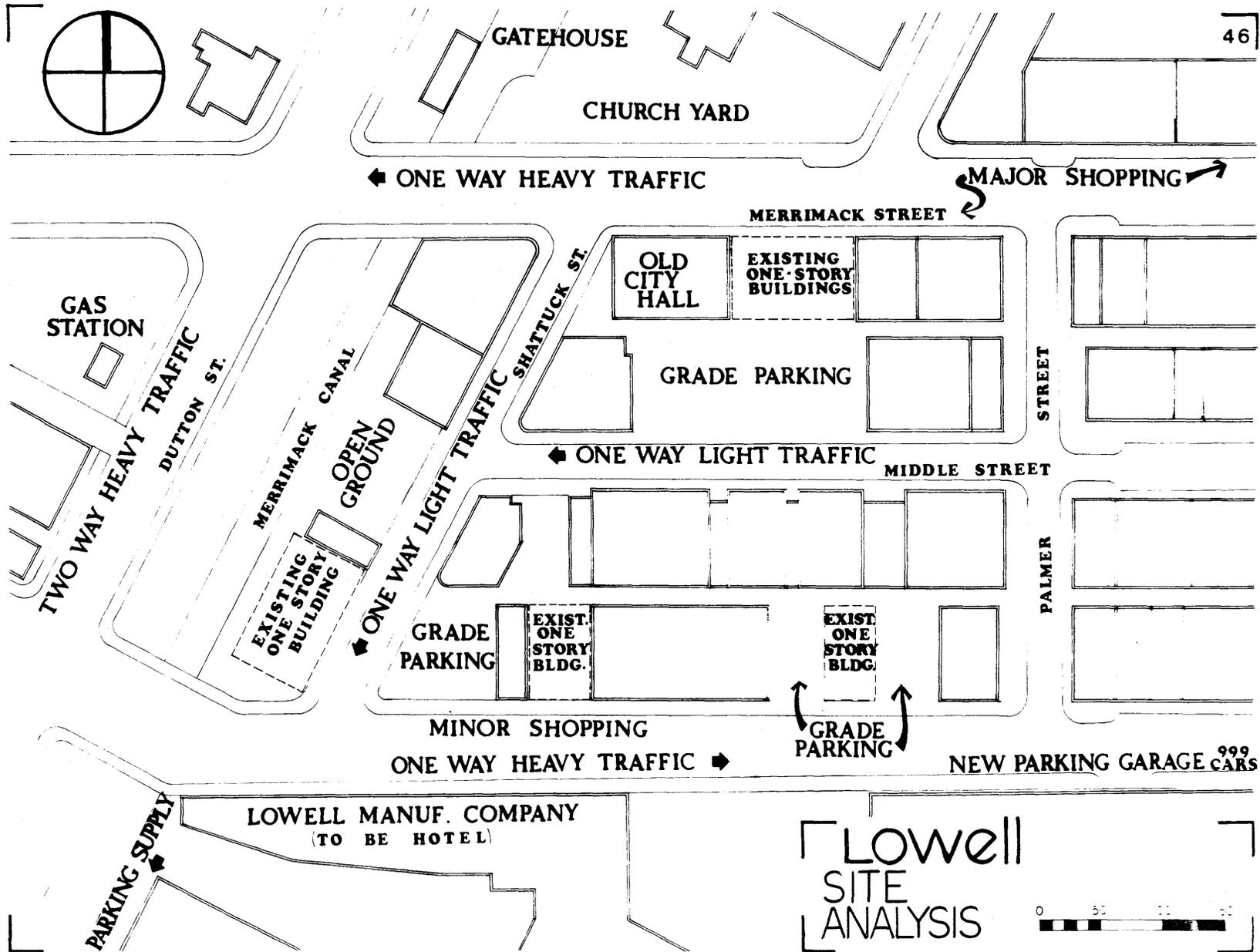
There are several particular buildings which are worthy of discussion. Old City Hall, at the intersection of Merrimack and Shattuck Streets, is a three story late Colonial Style building built in the 1830's. It was originally built with no surrounding buildings and was intended to be viewed alone. One of the few hip roof buildings in the area, it is presently used as commercial office space. Immediately next to the Old City Hall on Shattuck Street is the Lowell Institution for Savings, a two-story Federal Style building. Its highly detailed cornice line is one of the most beautiful in the area. Further down Middle Street is the original Lowell Gas and Light Company building, a two-story, hip roof building presently occupied by several law offices. The old Lowell Fire House is located at the corner of Middle and Palmer Streets.

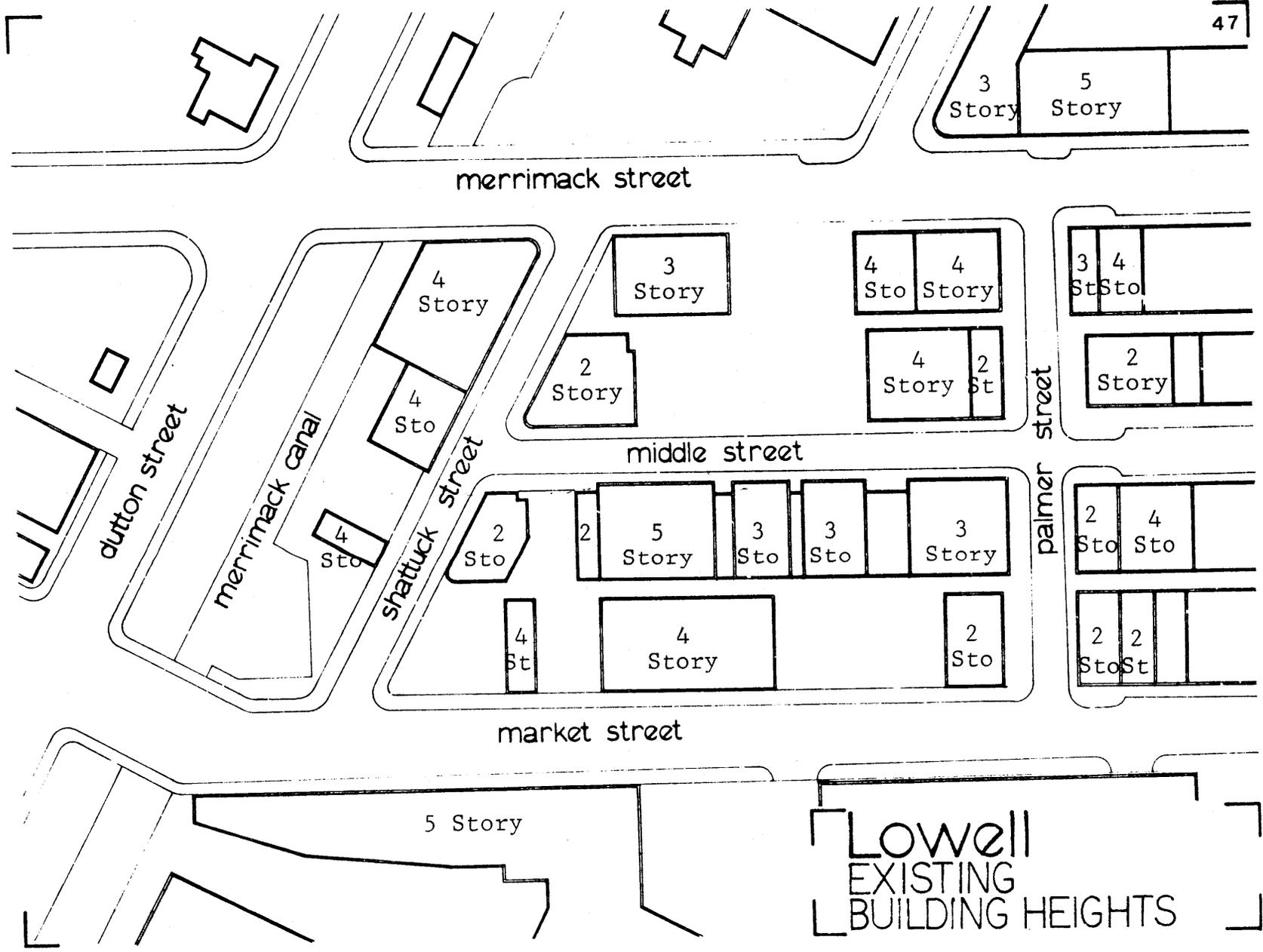
Presently there is much empty floor space on the site. The ground floors for the most part are occupied by commercial establishments. While the upper floors are generally empty,

some are used for office space, particularly in the Professional Building (see discussion in Chapter Four). There are a few manufacturers left in this section, the major one being a clothing manufacturer in a building on Middle Street. All empty lots, a total of five, are presently occupied by grade parking lots which are leased by various tenants. The following maps show in detail various aspects of the area studied.



**Lowell
DOWNTOWN
ANALYSIS**





CONSTRUCTION

As mentioned earlier in this thesis, the most common construction technique is exterior masonry bearing walls perpendicular to the main streets with either mill construction or girder and joist construction on the interior. Mill construction is classified as wood construction having no member, except for flooring, with any dimension less than six inches (nominal) in any direction. Typical bay sizes in the interior of these structures range from 12 by 15 feet to 15 by 20 feet. Columns are either large square wood (8" by 8" and up) or cast iron, typically 4" to 5" in diameter.

EXISTING CONDITIONS

Downtown Lowell is a very densely developed area. In areas which still retain all of the original buildings, the average floor area ratio is about four. In fact, this is the maximum allowable floor area ratio in the present zoning laws.⁶ The following table describes existing relationships on the site chosen:

EXISTING BUILT RELATIONSHIPS

Total ground area (excluding public ways)	165,000
Existing ground area covered by buildings	98,000
% ground area built upon	59%
Total existing rentable space	334,000
Ground area "unbuilt"	67,000
Existing F.A.R. (overall)	2.0

Parking will always be a major problem if required on-site. Lowell's zoning requirements are fairly typical of other cities. They are as follows for the downtown area:

<u>USE</u>	<u>NO. OF SPACES</u>	<u>PER UNIT</u>
Public assembly	1	8 seats
Institution	1	1,000 sq. ft.
Retail/office ground floor	1	150 sq. ft.
Retail/office upper floors	1	500 sq. ft.

cont.

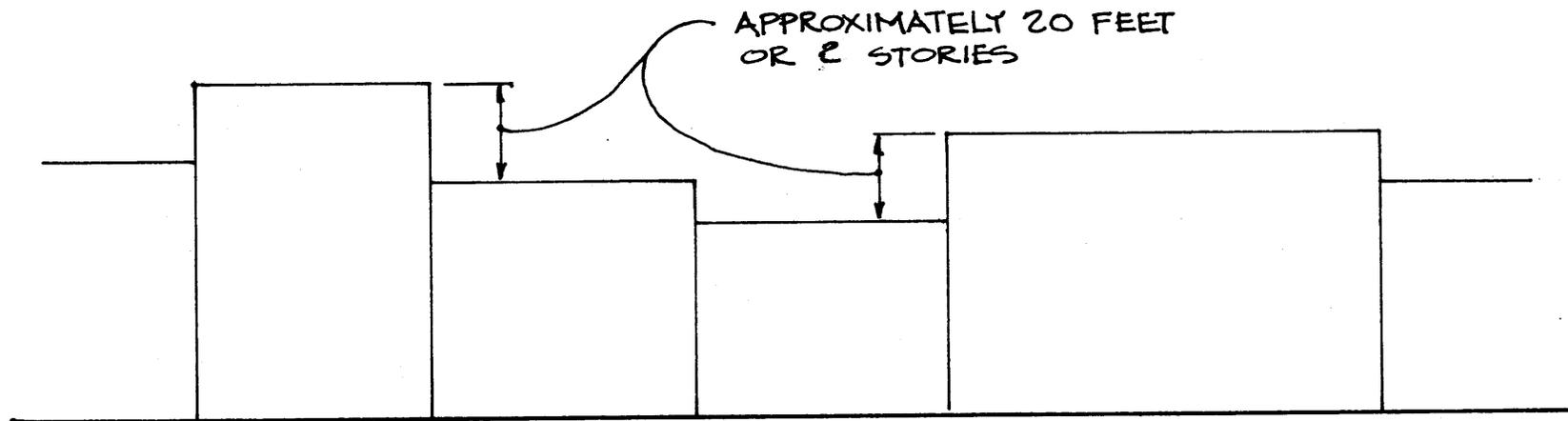
USE	NO. OF SPACES	PER UNIT
Factory	1	1,500 sq. ft.
Residential (general)	2	Each unit
Residential (elderly)	1	1 1/2 units

Relating this to the actual density of the area studied, one can see that parking requirements immediately outweigh any of the other criteria studied. The existing ground floor area alone of 98,000 square feet requires 653 parking spaces. The upper floor area of 236,000 requires an additional 472 parking spaces, for a total of 1,125 spaces just for the existing built area. Building all of this parking on site would require the use of every additional developable lot on the site. This is certainly not the point of this thesis. In fact, in most cases when a site is developed in Lowell, the builder is not required to build the required amount of parking, but instead agrees to lease an equivalent amount in one of the many peripheral parking lots and garages.⁸ For the purposes of this study, this assumption will be made.

DETERMINING THE POTENTIAL

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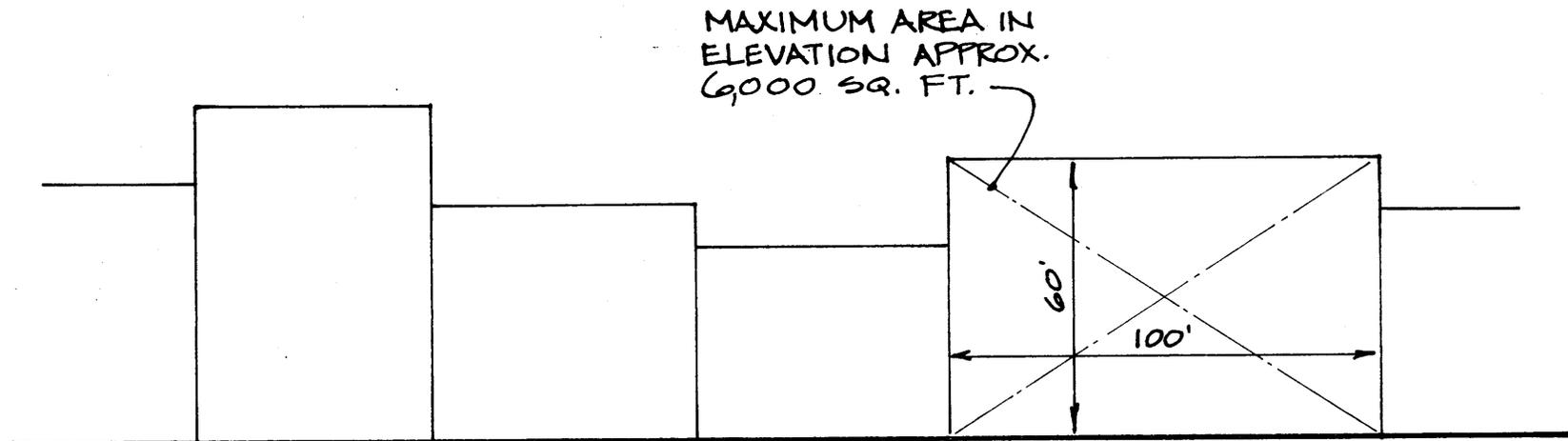
The final product of this thesis is a design solution which demonstrates the physical potential for growth of the area studied. In order to determine exactly what that potential is, it was necessary to determine which of the design elements studied in Chapter 2 could control or limit the density of the area. Many of those elements are certainly part of the image, yet do not control density. For instance, cornices will be used as a design tool but will not control how tall or short a building is. The following criteria are those which control building height and mass, and thus the density of the area.



DIAGRAMATIC ELEVATION
NO SCALE

THERE IS NO CHANGE IN BUILDING HEIGHT
OF MORE THAN 20 FEET OR 2 STORIES. THIS
ESTABLISHES A SMOOTH, GRADUAL "TEXTURE"
IN THE DOWNTOWN AREA.

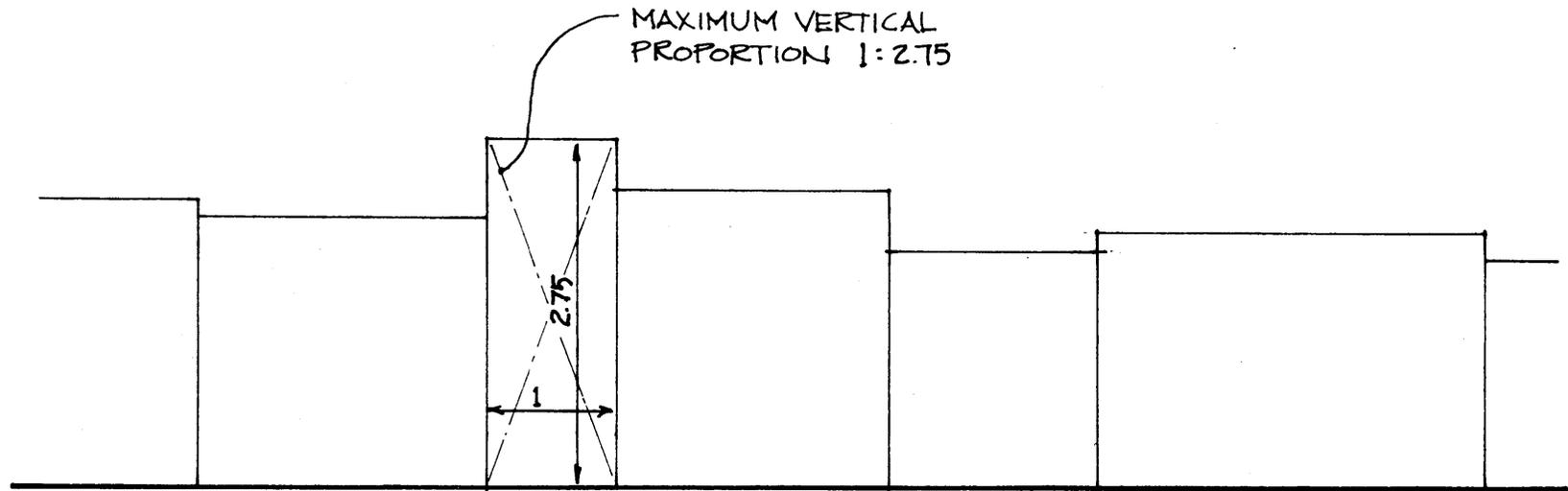
Criteria
OVERALL TEXTURE



DIAGRAMATIC ELEVATION
NO SCALE

THE LARGEST BUILDING SIZE (IN ELEVATION)
IS APPROXIMATELY 6000 SQUARE FEET (H x W).
ALSO, TWO OF THIS LARGE SIZE WILL BE
FOUND NEXT TO EACH OTHER, BUT WILL BE
SEPARATED BY ONE OR MORE SMALLER SIZES.

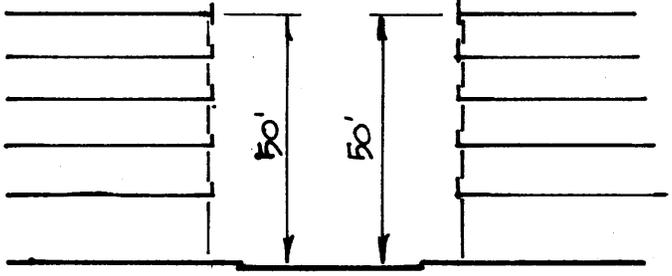
Criteria
BUILDING SIZE
& PROPORTION



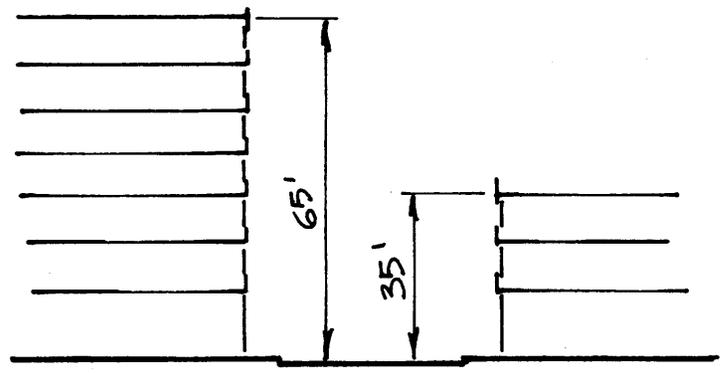
DIAGRAMATIC ELEVATION
NO SCALE

NO INDIVIDUAL BUILDING HAS A VERTICAL PROPORTION GREATER THAN 1:2.75. ALSO, PARTS OF LARGER BUILDINGS TEND TO FOLLOW THIS RULE.

Criteria
BUILDING PROPORTION



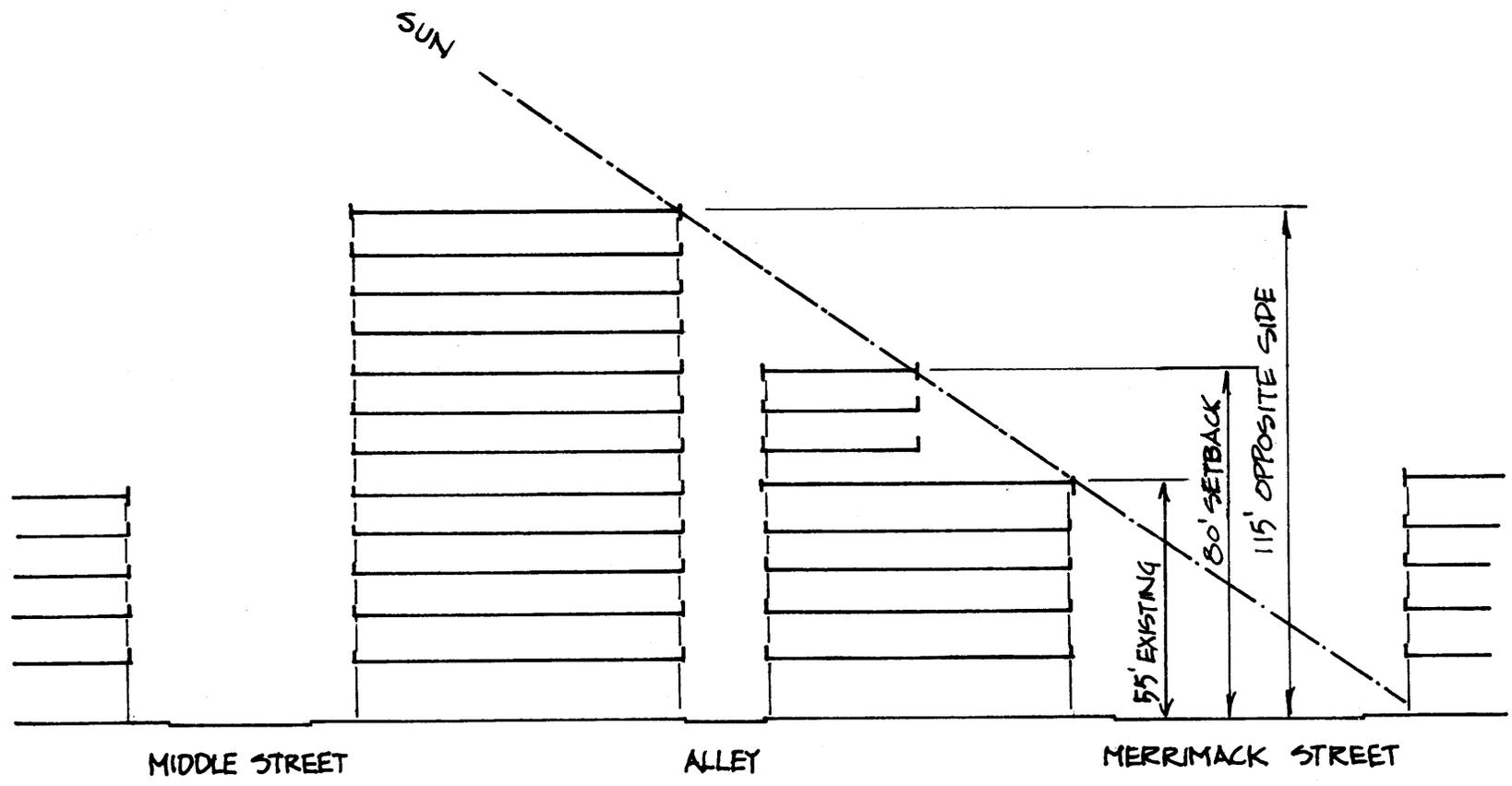
EQUAL BOTH SIDES



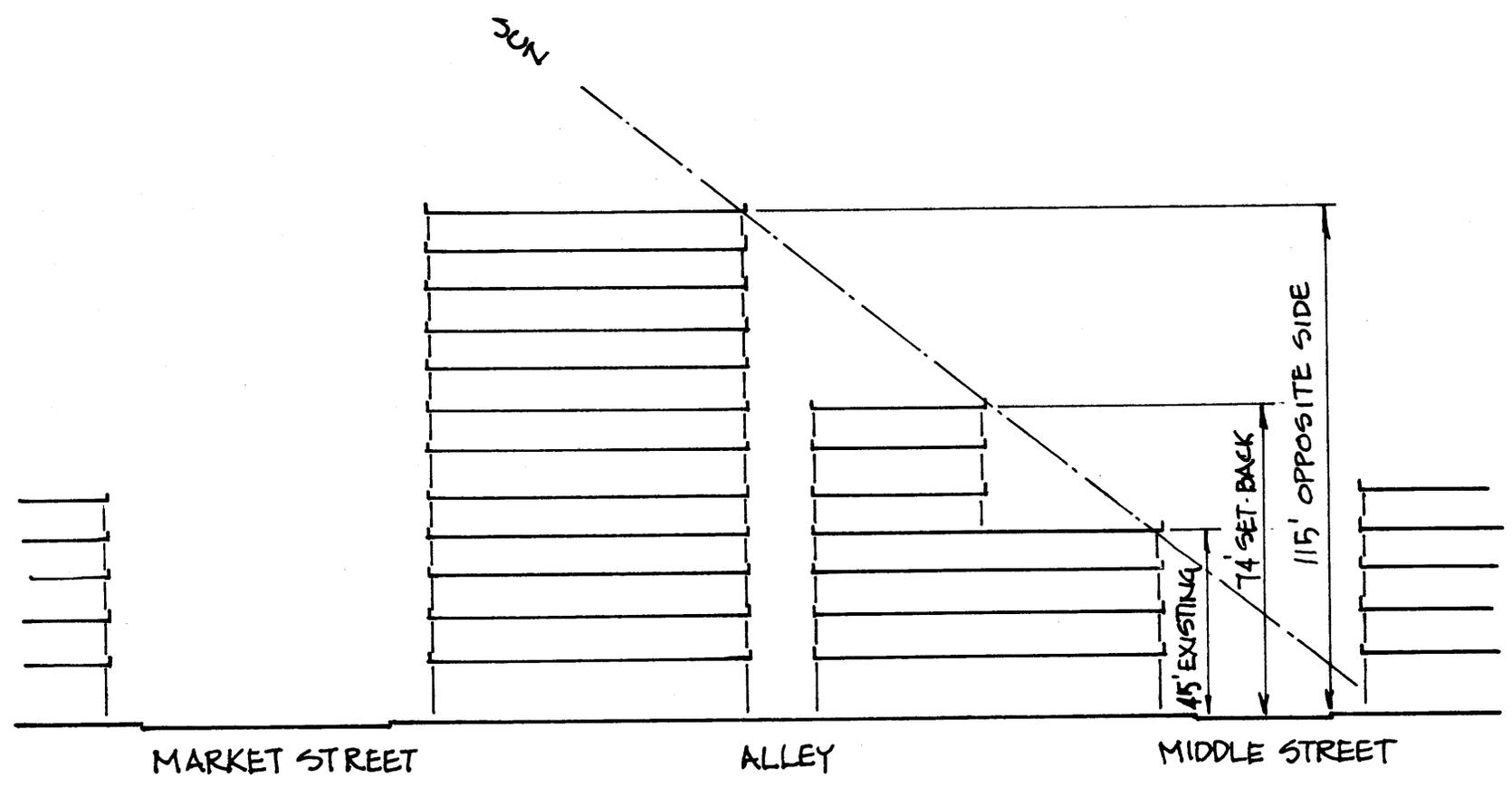
ONE SIDE DOMINATES

THE TOTAL BUILDING HEIGHT OF BOTH SIDES OF A STREET IS MORE OR LESS CONSTANT, AND EQUAL TO APPROXIMATELY 100'

Criteria
STREET CLOSENESS



Criteria
SUN ON STREET
MERRIMACK STREET

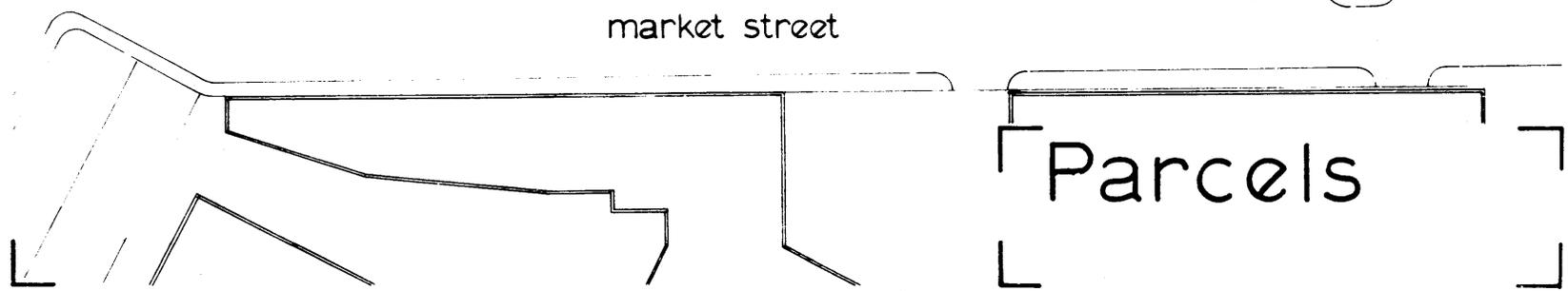
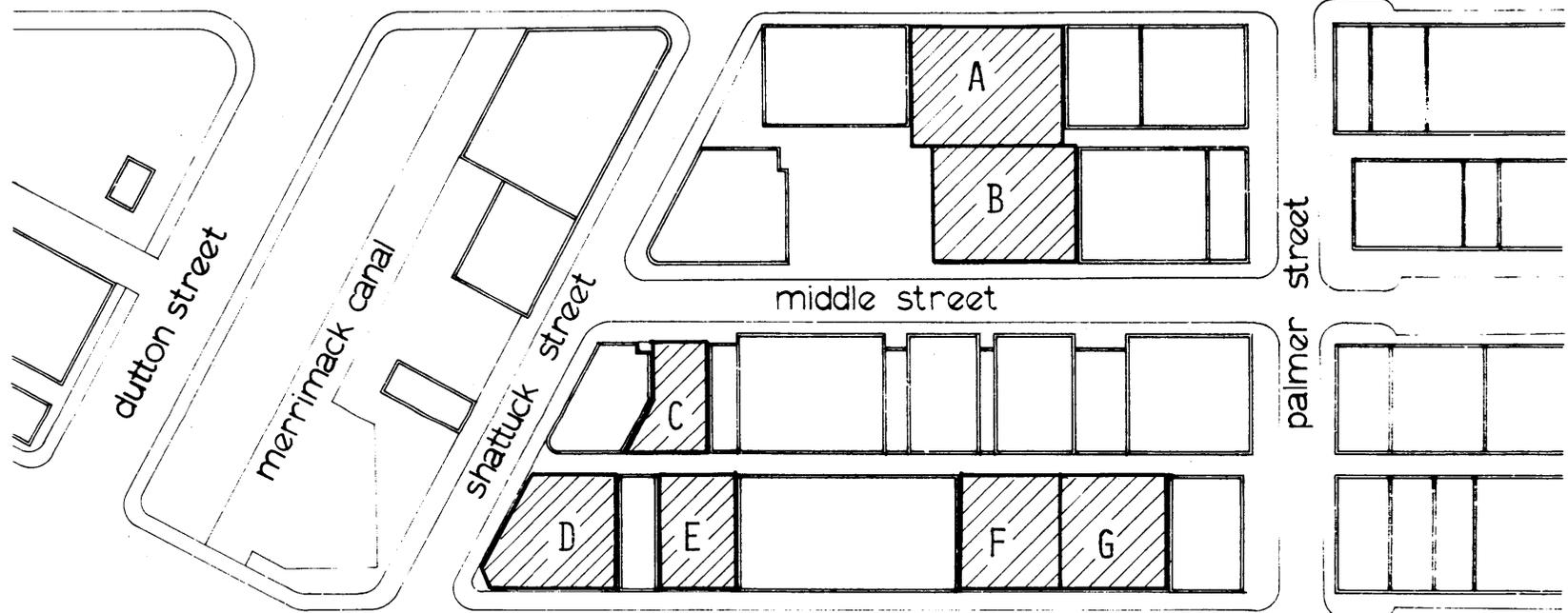
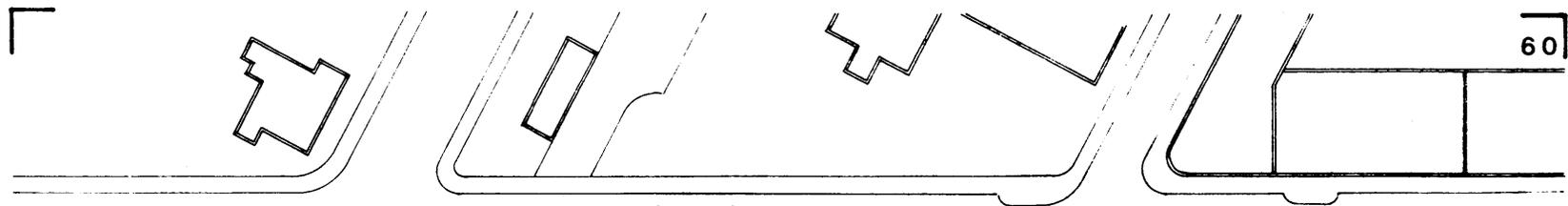


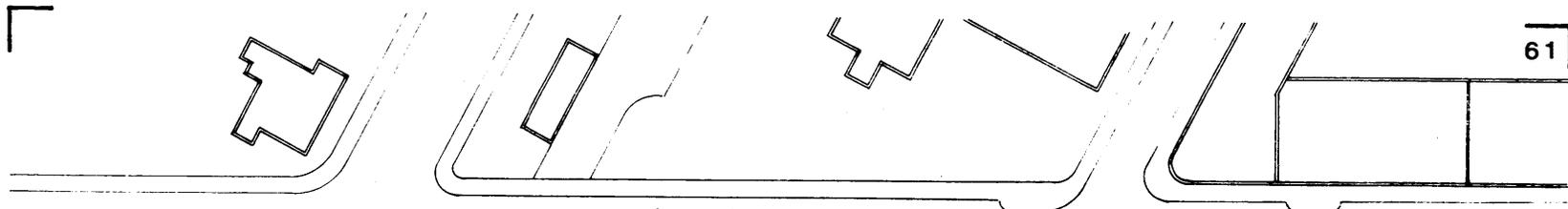
Criteria
SUN ON STREET
MIDDLE STREET

The method used to determine the upper limit of density in the area was as follows. First, the open lots in the site were divided into 7 separate parcels, as shown at the end of this chapter. The next step was to complete a separate schematic design study for each of the criteria which could control. Each was studied in plan and in elevation, using as design tools each of the other remaining elements. These studies were very schematic and intended to work totally independently of each other. For this reason, they often appear harshly designed and very unrespectful of the context. However, it was felt that this was the only way to understand how each of the criteria was working and what the limit set by each was. These studies are shown in plan only on the following pages.

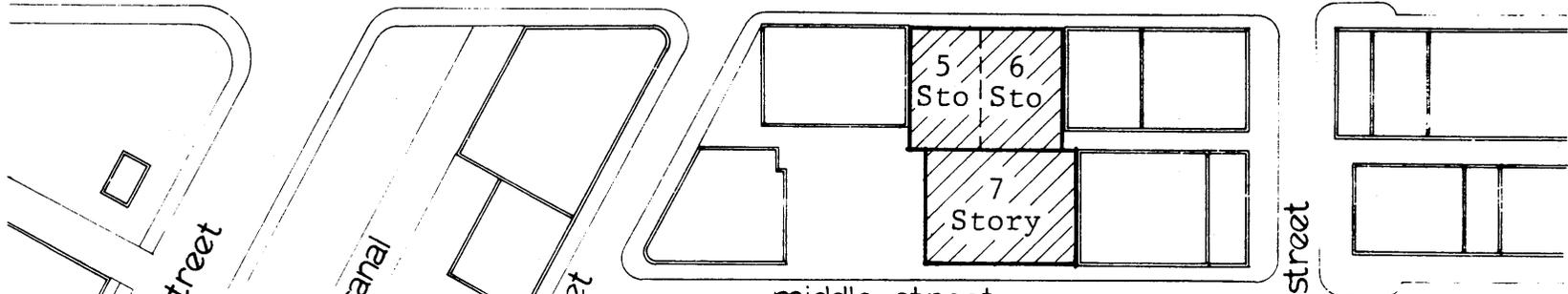
The next step in the process was to arrive at a series of compromises for each parcel which would relate each of the various criteria to a final level of density increase. A cutoff point was reached when the density level violated too many of the criteria established as controls. These judgments

are subjective to a large degree, but are grounded in the objectivity of the individual criteria. The compromises themselves are documented here in the form of "Parcel Studies". One can see that in addition to the specific criteria, other issues became important also. Local conditions such as small buildings had some influence. Open space allowed slightly larger buildings to either side. The result of these studies, the actual potential of the place, is shown diagrammatically in the following photographs.

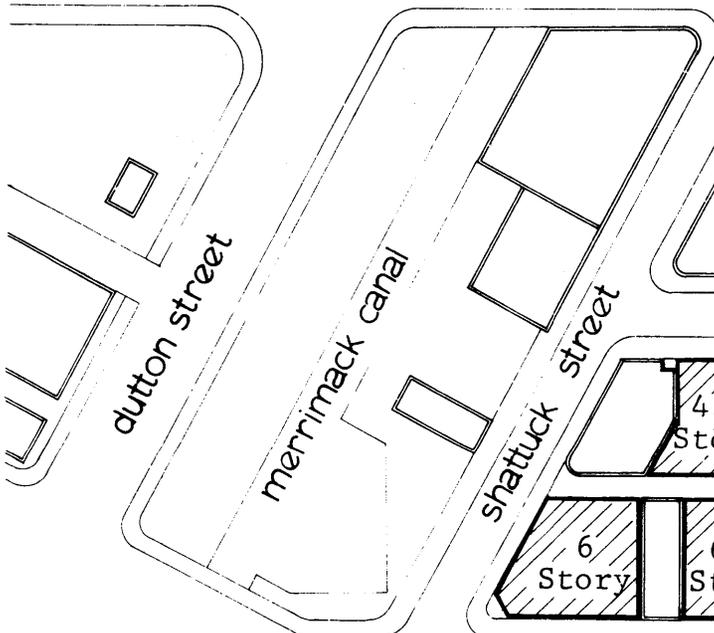




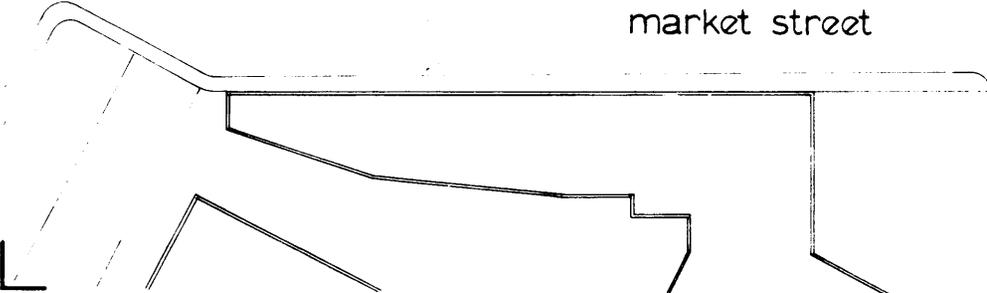
merrimack street



middle street



market street



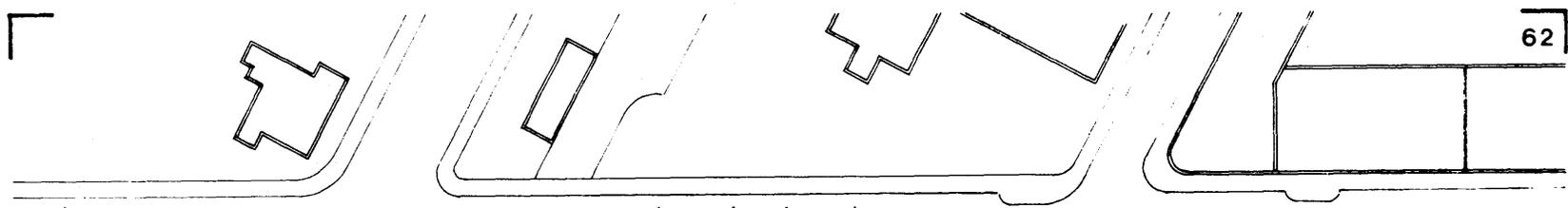
dutton street

merrimack canal

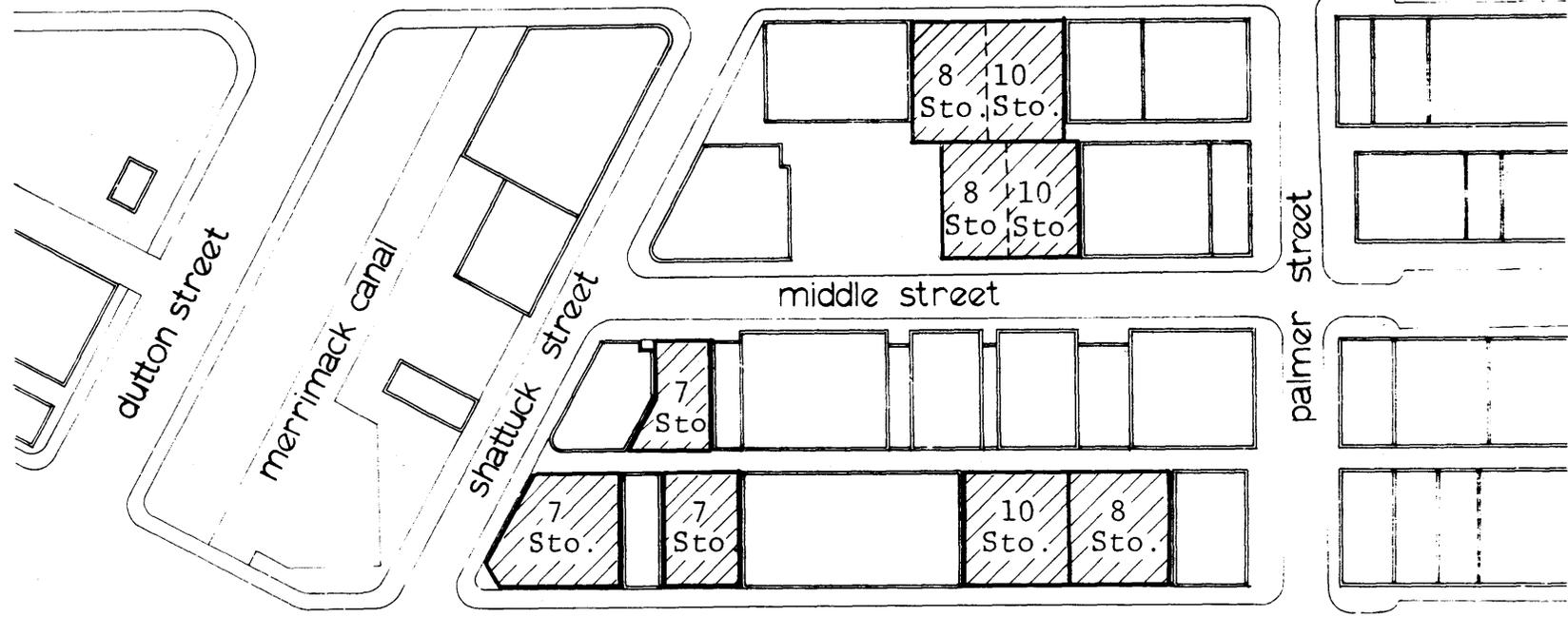
shattuck street

palmer street

Criteria
OVERALL TEXTURE



merrimack street



dutton street

merrimack canal

shattuck street

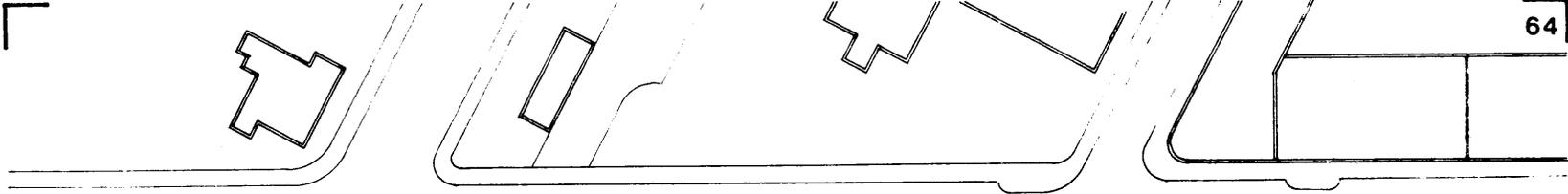
middle street

market street

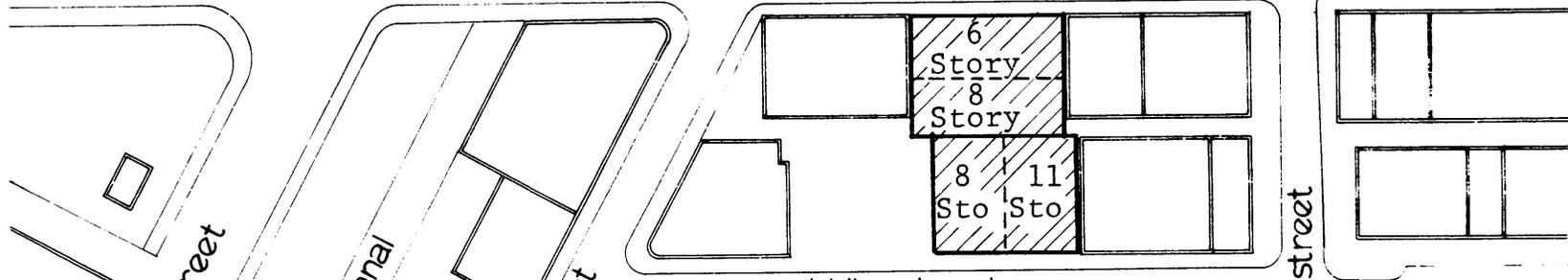
palmer street

Criteria
 BUILDING PROPORTION
 & MASS





merrimack street



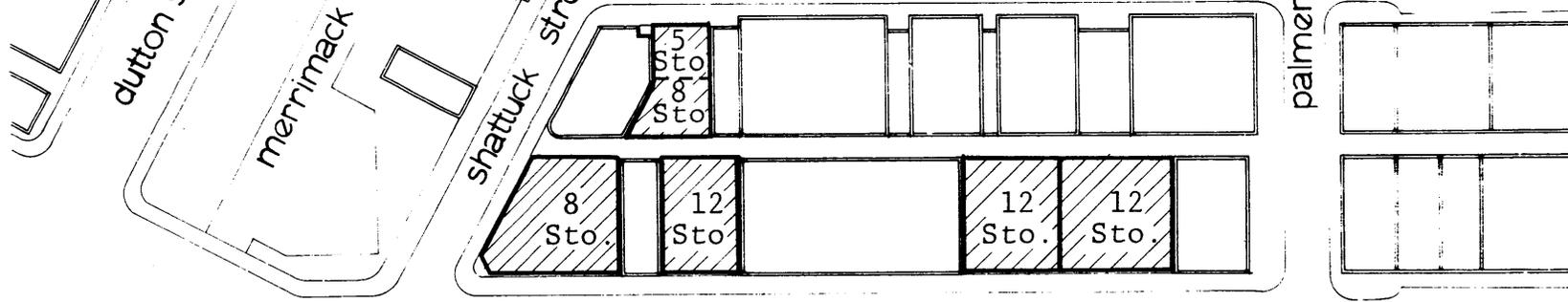
middle street

dutton street

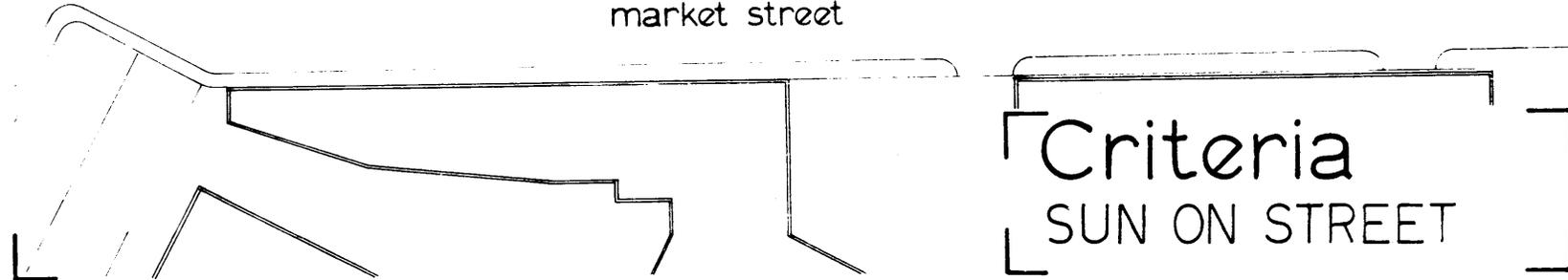
merrimack canal

shattuck street

palmer street



market street



Criteria
SUN ON STREET

PARCEL STUDY

PARCEL: A LOCATION: MERRIMACK ST.

<u>CRITERIA</u>	<u>HEIGHT LIMIT</u>
1. STREET OPENNESS	7 STORY
2. BUILDING PROPORTION & MASS	10 STORY / 8 STORY
3. SUN ON STREET	6 STORY / 8 STORY SET BACK
4. OVERALL TEXTURE	6 STORY / 5 STORY

LOWEST CRITERIA: OVERALL TEXTURE : 6 / 5

HIGHEST CRITERIA: BLDG. PROPORTION : 10 / 8

COMMENTS: - BECAUSE OF THE DESIRE TO SET BACK OFF THE STREET SO THAT OLD CITY HALL CAN BE VIEWED, IT SEEMS THAT THERE SHOULD ALSO BE A CHANGE IN HEIGHT, DUE TO THE IMAGE OF "ROOFLINES."

- NO "LARGE" SIZE BUILDINGS ON THIS STRETCH, SO THIS WILL NOT BE A DETERMINANT.

- FIRST, TRY 7 STORY, 6 STORY. 7 IN THE EAST HALF OF THE PARCEL IS PUSHING BOTH "SUN ON STREET" AND "OVERALL TEXTURE". 6 NEXT TO OLD CITY HALL IS THREE STORIES HIGHER THAN THIS "MONUMENTAL" BUILDING - THIS WILL REMAIN AT 5 STORIES. CAN, HOWEVER, MAKE USE OF SET BACK IN TALL PORTION, SET BACK 30' TO 8 STORIES.

FINAL CHOICE: 7 STORY 80' AT THE STREET
5 STORY 58' AT CITY HALL
SET BACK TO 8 STORY 90'.

PARCEL STUDY

PARCEL: B LOCATION: MIDDLE STREET

<u>CRITERIA</u>	<u>HEIGHT LIMIT</u>
1. STREET OPENNESS	7 STORY
2. BUILDING PROPORTION & MASS	10 STORY / 8 STORY
3. SUN ON STREET	11 STORY / 8 STORY
4. OVERALL TEXTURE	7 STORY

LOWEST CRITERIA: STREET OPEN./TEXTURE : 7 STORY

HIGHEST CRITERIA: SUN ON STREET : 11/8 STORY

COMMENTS: IT SEEMS WORTHWHILE TO BREAK THIS PARCEL INTO TWO SECTIONS, SINCE THE EXISTENCE OF THE PARK IN THE ADJACENT LOT MAY CALL FOR SLIGHTLY LOWER BUILDINGS.

- AT 8 STORY / 11 STORY, STREET OPENNESS AND TEXTURE ARE BOTH TERRIBLY VIOLATED BY THE TALL PIECE.

- AT 7 STORY / 10 STORY, THE SITUATION IS THE SAME, THE 10 STORY PIECE IS STILL TOO TALL.

- AT 7 STORY / 9 STORY, THE 9 STORY PIECE IS NOT TOO BAD, SINCE THE ADJOINING 4 STORY BUILDING IS ACTUALLY OVER 60' TALL. - THIS RESULT ALSO GOES WELL WITH PARCEL A, WHICH HAS AN 8 STORY PART. THE SMALL 9 STORY PIECE COULD ACTUALLY BE SERVED FROM THE EIGHTH FLOOR, IF DESIRED

FINAL CHOICE: 7 STORY / 9 STORY

PARCEL STUDY

PARCEL: C LOCATION: MIDDLE STREET

<u>CRITERIA</u>	<u>HEIGHT LIMIT</u>
1. STREET OPENNESS	8 STORY
2. BUILDING PROPORTION & MASS	7 STORY
3. SUN ON STREET	5 STORY SET BACK TO 8 STORY
4. OVERALL TEXTURE	4 STORY

LOWEST CRITERIA: TEXTURE: 4 STORY

HIGHEST CRITERIA: STREET OPENNESS 8 STORY

COMMENTS: THIS PARCEL HAS SOME OVERRIDING FACTORS IN THAT IT IS INFLUENCED NOT ONLY BY THE "FACADE" WHICH FACES MIDDLE ST, BUT ALSO BY THE CHARACTER OF SHATTUCK ST. THIS SMALL STREET AT THIS POINT IS VERY DELICATE, CONTAINING BOTH THE LOWELL GAS COMPANY BUILDING AND THE LOWELL INSTITUTION FOR SAVINGS, BOTH OF WHICH ARE TWO STORIES. ALSO, THE PRESENTLY EMPTY LOT ACROSS SHATTUCK STREET WILL BE DEVELOPED AS OPEN SPACE FOR THE NATIONAL PARK. A SMALL ONE STORY BUILDING AT THE CORNER OF MARKET AND SHATTUCK ST WILL ALSO BE REMOVED TO MAKE WAY FOR THE BARGE TOUR TERMINUS.

SO, EVEN AT 5 STORIES, THE NEW CONSTRUCTION HAS BEGUN TO OVERPOWER THE SMALL SCALE OF SHATTUCK ST, AND CAN BE DIRECTLY SEEN OVER THE LOWELL GAS COMPANY BUILDING. SO THIS LIMIT WILL BE 4 STORY, 45'

FINAL CHOICE: 4 STORY, 45 FEET.

PARCEL STUDY

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PARCEL: D LOCATION: MARKET ST./SHATTUCK ST.

<u>CRITERIA</u>	<u>HEIGHT LIMIT</u>
1. STREET OPENNESS	6 STORY
2. BUILDING PROPORTION & MASS	7 STORY
3. SUN ON STREET	7 STORY (DUE TO OPEN SPACE)
4. OVERALL TEXTURE	4 STORY (SHATTUCK ST)

LOWEST CRITERIA: TEXTURE : 4 STORY

HIGHEST CRITERIA: BUILDING PROPORTION & SUN : 7 STORY

COMMENTS: DUE TO THE SAME GENERAL CRITERIA AS
DISCUSSED IN PARCEL C, THIS PARCEL WILL BE
LIMITED TO 4 STORY AND 50 FEET (TO MATCH
ADJACENT BUILDING ON MARKET ST.

FINAL CHOICE: 4 STORY 50 FEET

PARCEL STUDY

69

PARCEL: E LOCATION: MARKET ST.

<u>CRITERIA</u>	<u>HEIGHT LIMIT</u>
1. STREET OPENNESS	5 STORY (60 FT.)
2. BUILDING PROPORTION & MASS	7 STORY (80 FT.)
3. SUN ON STREET	11 STORY (120 FT.)
4. OVERALL TEXTURE	6 STORY (70 FT.)

LOWEST CRITERIA: STREET OPENNESS : 5 STORY

HIGHEST CRITERIA: SUN ON STREET : 11 STORY

COMMENTS: THIS IS A DIFFICULT PARCEL SINCE THE TWO
ADJOINING BUILDINGS HAVE TALL FLOORS (BOTH
4 STORY & OVER 50 FT.)

- AT 6 STORIES, TEXTURE OK, STREET OPENNESS
OVER. BUT THIS IS PROBABLY ALLRIGHT IF IT'S THE ONLY
ONE IN THE SEQUENCE.

- AT 7 STORIES, TEXTURE OVER BY ONE FLOOR
BUT THIS MAY BE OK. STREET OPENNESS STILL ALLRIGHT
FOR SAME REASON.

- AT 8 STORIES, BUILDING PROPORTION IS OVER
& TEXTURE IS OVER BY TWO FLOORS - WILL STAY AT
7 STORIES.

FINAL CHOICE: 7 STORY 80 FT.

PARCEL STUDY

PARCEL: F LOCATION: MARKET STREET.

<u>CRITERIA</u>	<u>HEIGHT LIMIT</u>
1. STREET OPENNESS	8 STORY (OPEN SPACE ACROSS)
2. BUILDING PROPORTION & MASS	9 STORY
3. SUN ON STREET	12 STORY
4. OVERALL TEXTURE	6 STORY

LOWEST CRITERIA: TEXTURE : 6 STORY

HIGHEST CRITERIA: SUN : 12 STORY

COMMENTS: STARTING AT 6 STORY, ALL IS OK.
- AT 7 STORY, TEXTURE OVER BY ONE FLOOR, REST STILL OK
- AT 8 STORY, TEXTURE OVER BY 2 STORY, STREET OPENNESS UP TO POTENTIAL. - AFTER THIS THE TEXTURE CRITERIA WILL HAVE TOTALLY FAILED.
SO THIS WILL BE LIMITED TO 8 STORIES, & IN FACT WOULD BE BETTER IF IT WAS SET AT SEVEN ON THE WEST SIDE & STEPPED UP TO 8 STORIES ON THE EAST. - WILL DECIDE THIS IN FINAL DESIGN.

FINAL CHOICE: 7 STORY 80 FT
8 STORY 90 FT.

PARCEL STUDY

PARCEL: 4 LOCATION: MARKET STREET

<u>CRITERIA</u>	<u>HEIGHT LIMIT</u>
1. STREET OPENNESS	5 STORY (GARAGE OPPOSITE)
2. BUILDING PROPORTION & MASS	9 STORY
3. SUN ON STREET	12 STORY
4. OVERALL TEXTURE	4 STORY

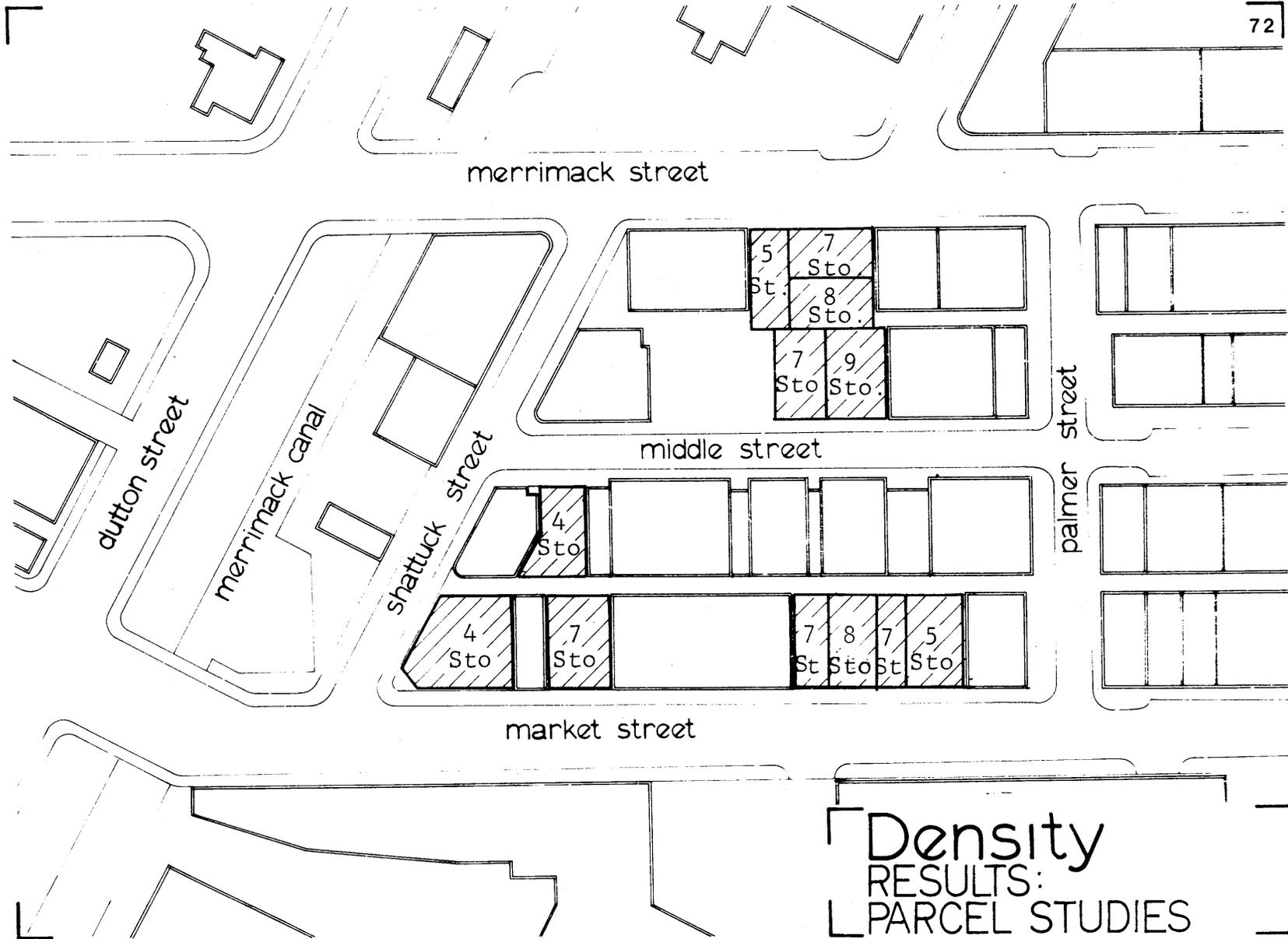
LOWEST CRITERIA: TEXTURE: 4 STORY

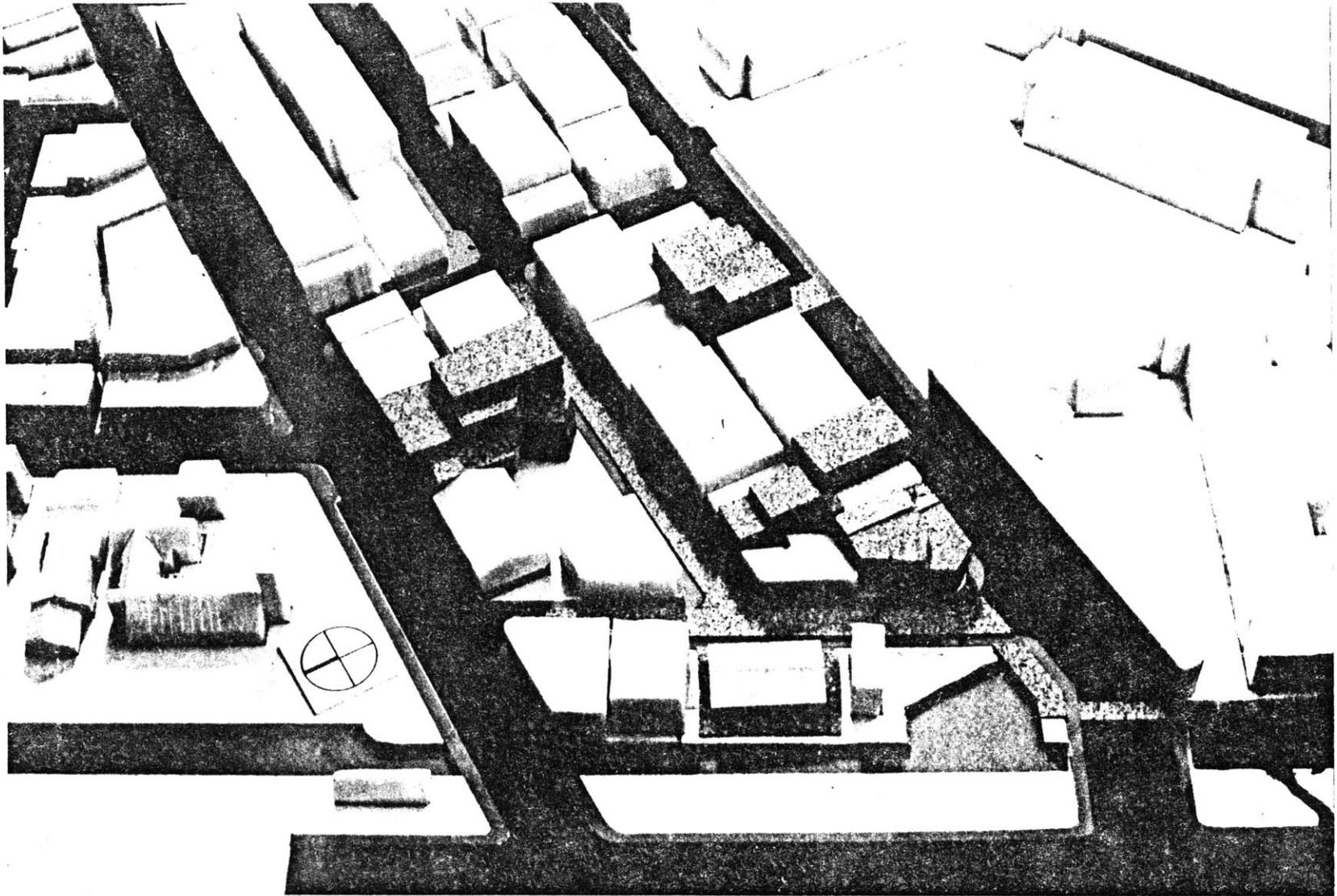
HIGHEST CRITERIA: SUN: 12 STORY

COMMENTS: AT 5 STORY, ONLY THE TEXTURE IS VIOLATED BY ONE FLOOR, BUT THIS IS PROBABLY OK. AT SIX STORY, THE TEXTURE IS OVER BY TWO FLOORS AND THE STREET OPENNESS IS OVER BY ONE FLOOR.

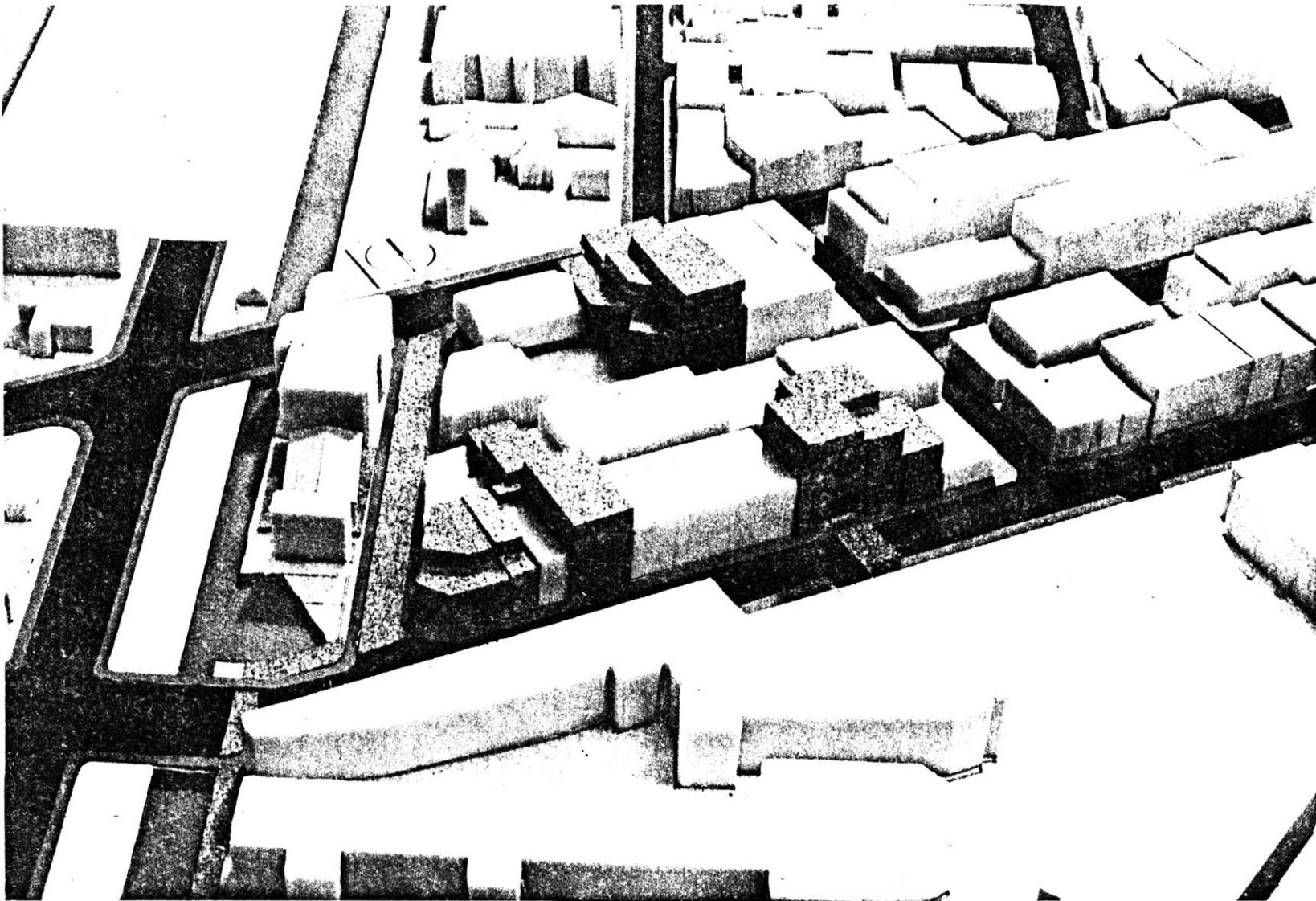
- IN ORDER TO GET THIS TO WORK WELL WITH PARCEL F AND STILL SATISFY THE CRITERIA, A GOOD CHOICE SEEMS TO BE 5 STORIES AT THE EAST END, NEXT TO THE TWO STORY BUILDING, AND 7 STORIES ABUTTING PARCEL F, WHICH IS PROBABLY 8 STORIES AT THIS POINT.

FINAL CHOICE: 5 STORY 50 FT.
7 STORY 75 FT.

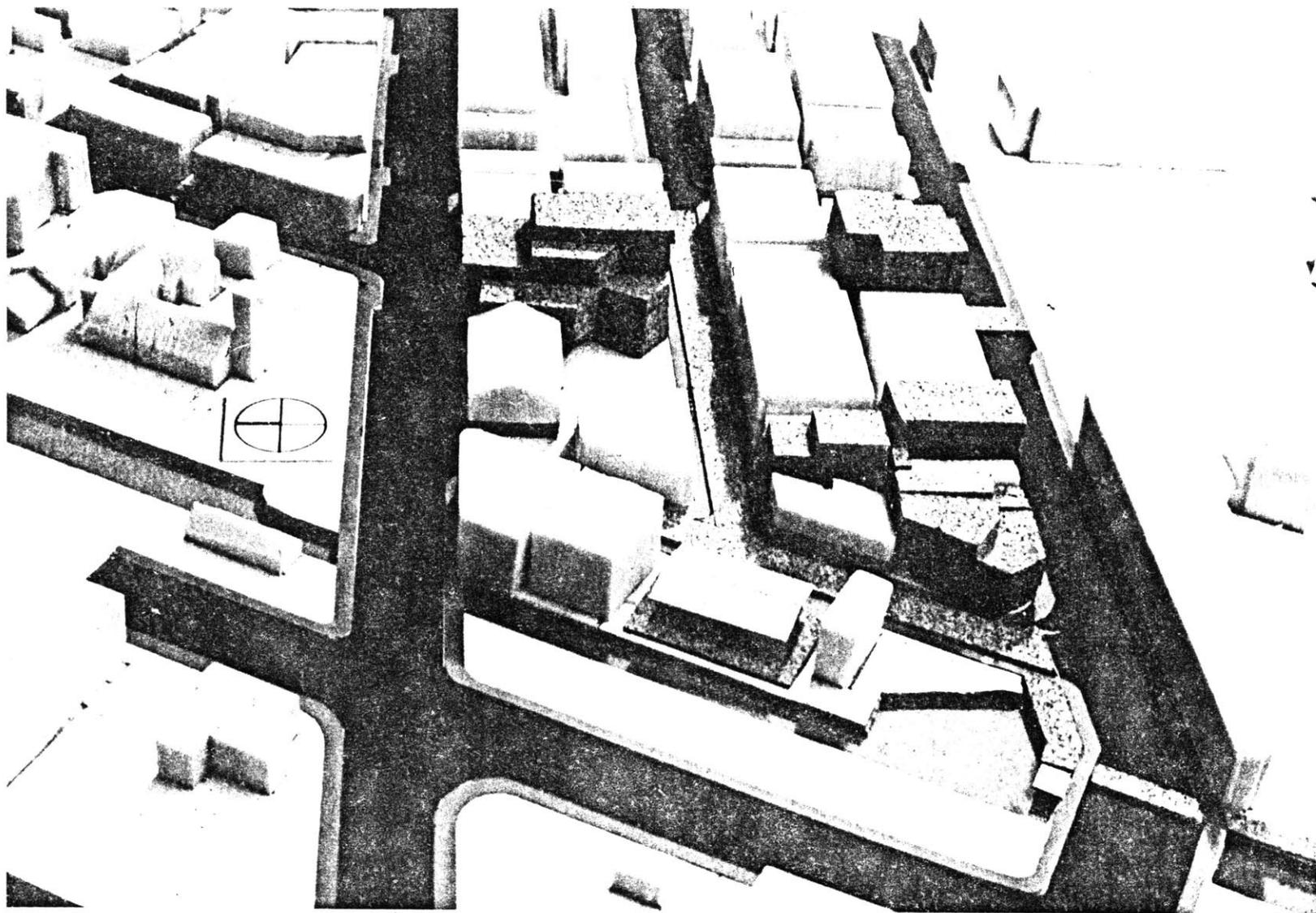




VIEW FROM NORTHWEST



VIEW FROM SOUTHWEST



VIEW FROM WEST

RESTRAINTS

As the downtown area of Lowell begins to revitalize, many problems with the physical environment will be found. Developers will encounter situations peculiar to each building, such as structural condition of the foundation or framework. Many of these problems are general ones which can in fact be dealt with in an imaginative way to make the city even more interesting and alive. This chapter will discuss several of these issues.

BUILDING SIZE AND REUSE

When the majority of industrial cities were developed, modern services such as elevators either did not exist or were not as yet common. Since some buildings are also very small in area per floor, in many cases as small as 1,500 to 2,000 square feet, it may be difficult to justify the installation of a modern service core when the building is adapted to modern uses. While the potential cost savings of the concept of adaptive reuse has been proven time and time again in recent years, that

savings still may not justify the cost of the service core. One solution to this problem is to group several smaller buildings together around a central service core which might contain in a compact unit elevators, toilet facilities, and an exterior service/loading dock. This new core can be located within the confines of one of the buildings or, if the original buildings are discontinuous, can be constructed in a gap between the buildings.

This method has already been used successfully in Lowell, approximately 25 years ago, forming what is known as the "Professional Building". Three separate buildings which actually front on three different streets were united around an elevator core which was located at the rear of one of the buildings on the service alley. Access to the elevator is from the smaller

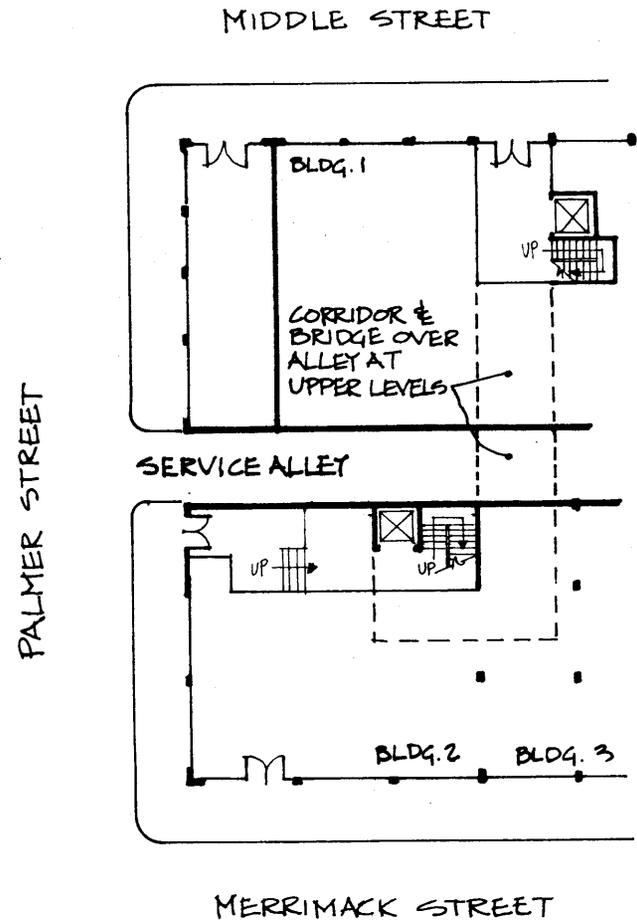


DIAGRAM OF
PROFESSIONAL BLOCK

of the three streets. (See diagram)

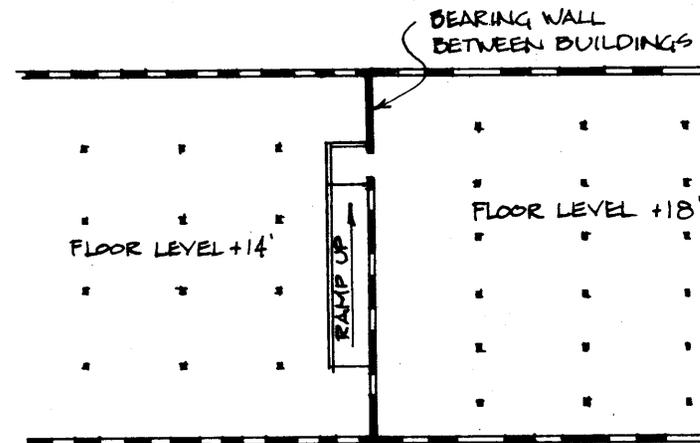
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This design tool is not without its problems, however. When buildings are grouped in this way, the association one has with the buildings from the street is altered. It may happen that to reach an office in a particular building, you may have to enter a door in a neighboring building or, in the case of the Professional Building, a door on another street. The most common solution to this problem has been simply to place signs at the entries of each of the original buildings which direct the user to the proper entry. Perhaps the most logical solution should be to eliminate entirely all entrances except one, and thus eliminate the street address so that confusion will not arise in the first place. Architecturally, it would make sense to unite the buildings in some visual way. This could be accomplished simply by using similar sign graphics or by using similar glazing techniques if the styles allow it.

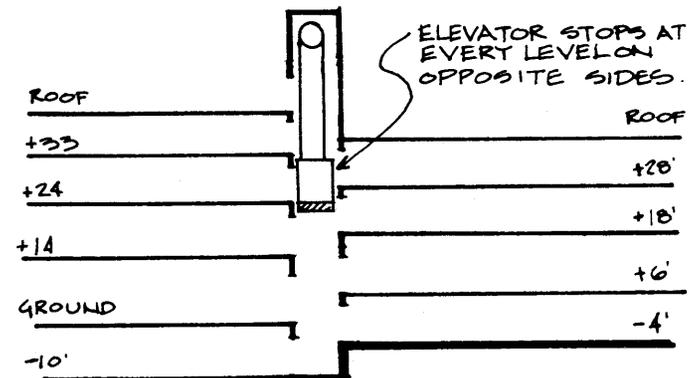
If the buildings to be united are across a service alley from each other and face on opposite streets, they may be united by a new ground floor shopping arcade which spans

between the two blocks. The new service core could be located in the middle. Servicing the buildings by the alley becomes difficult in these cases, but this could either be accomplished by allowing trucks to drive in and back out or by lowering the service alley to a level below the street.

Another problem encountered when uniting several buildings is that of floor heights. Only by luck will all floor heights be the same and most likely will be different by as much as five or six feet. This can be dealt with in several ways. The simplest and least expensive method would be to place ramps which do not waste useful floor space parallel to the level change. (See diagram.) A more sophisticated and more expensive solution is to use reverse stop elevators, which



DIAGRAMATIC FLOOR PLAN NO SCALE
SHOWING TWO BUILDINGS OF DIFFERENT FLOOR HEIGHT CONNECTED BY RAMP



DIAGRAMATIC SECTION
SHOWING TWO BUILDINGS OF DIFFERENT FLOOR HEIGHT CONNECTED BY REVERSING ELEV.

can open doors on opposite sides at half levels. (See diagram.) The area around the level change could be made very special and exciting if the existing walls are opened up to create a new multilevel space. If located at a new service core, this could become an exciting focus for the complex.

Further problems arise at the planning level. Uniting several buildings requires that they all become available for sale at the same time. A developer should be able to control all the parts at once and would undoubtedly not be interested in the risk of one building remaining unavailable while he renovated the others. This is a problem of coordination and requires much cooperation from the planning office.

PARKING SUPPLY

Parking, as always, is one of the major restraints and controls when dealing with an urban design project. These cities were built before the advent of the automobile and also are very dense. To restore an area to some semblance of its original character and at the same time provide parking

at least equal to the existing supply can be a difficult and frustrating problem. Parking garages are an obvious solution, but these structures have no physical precedent in these historic districts. It is certainly possible that a garage could be detailed in such a way as to use the design elements discussed in Chapter Two. A parking structure could certainly respect the scale of the area as well as an office structure, so that the overall streetscape is not interrupted. The availability of parking is appealing to renters and shoppers and it cannot be ignored.

The parking problem in the area studied is further aggravated by the fact that the lots are typically only 75 feet deep. This makes it difficult to justify the construction of a multi-level garage, as 75 feet is too narrow for a double lane garage, which is usually required for circulation in multi-level structures.

Building parking under new structures will generally not prove to be a valuable solution for the same reason. Most empty lots, like the buildings, are small and it is difficult

to justify the cost of digging down several levels unless the number of cars on each level is substantial. Problems also occur with neighboring buildings. Underpinning is an expensive and timeconsuming process, especially when dealing with buildings that are in excess of 100 years old. This process can damage the foundation of the structure being underpinned. Further restraints may occur in digging several levels into the ground. The water table may have to be lowered around the structure and this could easily effect the foundations of neighboring buildings. As water is taken away, soil may settle thus upsetting the foundation. Old wooden piles will rot if taken out of water.

SOIL/FOUNDATION CONDITIONS

While this restraint is certainly not peculiar to this study, it is a real one and has many ramifications. It may limit the height of new construction to the height of existing structures or it may limit the range of building height. If, above a certain building height, a new and more expensive

foundation system is called for, a whole range of building heights may be hard to justify due to the expense of the foundations. For example, a particular soil condition may call for belled caissons for buildings up to eight stories. After that, perhaps conditions require steel pilings driven to bedrock far below. Building a twelve story building may not justify the cost of the steel pilings, but 20 stories may be reasonable. In downtown Lowell, the height range of existing buildings is from one story up to about twelve stories. This study will probably limit construction to under twelve stories so foundation conditions will not be a control.

BUILDING AND FIRE CODES

The state building code limits the floor area, height above grade and number of stories of various building types. The codes apply not only to new construction but also to adaptive reuse and will have a heavy bearing on this study. The first and most obvious ramification of these codes is related to the concept discussed earlier in this chapter of

uniting several buildings. Most of the buildings in downtown Lowell are of exterior masonry bearing walls and either interior mill construction (no wood member less than six inches nominal in any direction) or interior wood girder and joist construction. While the code allows a rather high floor area and height for mill construction, joist construction is somewhat limited. Uniting several buildings of this construction type may easily surpass the limit and thus require that each remain "fire separate". The following table shows the related requirements taken from the state code.

Egress from an older building can also become a problem. A common solution is to make egress horizontal first, instead of directly vertical within each structure. In this way, during a fire persons could travel from one "fire separate" zone into another, then travel to the ground floor. Ideally, a new service core which unites the buildings could be built either on the exterior, or as a part of a new building, which should be of class I, unlimited construction.

AREA AND HEIGHT LIMITATIONS - TABLE 2.6 - MASS. STATE BUILDING CODE

USE GROUP	TYPE 1 Fire-proof		TYPE 2 Non-combustible			TYPE 3 Exterior Masonry Wall		
			protected		un-prot.	mill	Ordinary Joisted	
							prot.	un-prot.
	1a	1b	2a	2b	2c	3a	3b	3c
MERCANTILE (shopping)	no limit	no limit	6 story 75' 22,800 †	4 story 50' 15,000 †	2 story 30' 9,600 †	4 story 50' 14,400 †	3 story 40' 13,200 †	2 story 30' 9,600 †
BUSINESS (offices)	no limit	no limit	7 story 85' 34,200 †	5 story 65' 22,500 †	3 story 40' 14,400 †	5 story 65' 21,600 †	4 story 50' 19,800 †	3 story 40' 14,400 †
ASSEMBLY (movie theatres)	no limit	no limit	5 story 65' 19,950 †	3 story 40' 13,125 †	2 story 30' 8,400 †	3 story 40' 12,600 †	3 story 40' 11,550 †	2 story 30' 8,400 †
ASSEMBLY (lecture, rest.)	no limit	no limit	5 story 65' 19,950 †	3 story 40' 13,125 †	2 story 30' 8,400 †	3 story 40' 12,600 †	3 story 30' 11,500 †	2 story 30' 8,400 †
ASSEMBLY (night clubs)	no limit	4 story 50' 7,200 †	3 story 40' 5,700 †	2 story 30' 3,750 †	1 story 20' 2,400 †	2 story 30' 3,600 †	2 story 30' 3,300 †	1 story 20' 2,400 †
RESIDENTIAL (hotels)	no limit	no limit	9 story 100' 22,800 †	4 story 50' 15,000 †	3 story 40' 9,600 †	4 story 50' 14,400 †	4 story 50' 13,200 †	3 story 40' 9,600 †
RESIDENTIAL (multi- family)	no limit	no limit	9 story 100' 22,800 †	4 story 50' 15,000 †	3 story 40' 9,600 †	4 story 50' 14,400 †	4 story 50' 13,200 †	3 story 40' 9,600 †

DEMONSTRATING THE POTENTIAL

It was felt that the information gathered in the preceding chapters could best be demonstrated through a relatively detailed design study of the site chosen. The study will make use of concepts developed in the Lowell National Park Proposal and the level of density increase documented in Chapter 3. The design will propose ways of using and servicing the building stock which are in context with an analysis of downtown Lowell's present and future needs.

Since no specific program was available for the study, the design decisions regarding frequency and locations of elevator service cores and exitways were based on studies of office space standards and on the building code requirements.

At the basic level, it was found that in five to eight story buildings two elevators were necessary to serve a building area of between 12-20,000 square feet per floor. Rarely was

any point in the office structures studied more than 125 feet (direct) from the elevator core. The Massachusetts Building Code requires that no part of an office be more than 200 feet from a fire separate exitway. These standards were used, again, to hold the study within the confines of modern space requirements.

THE PROPOSAL

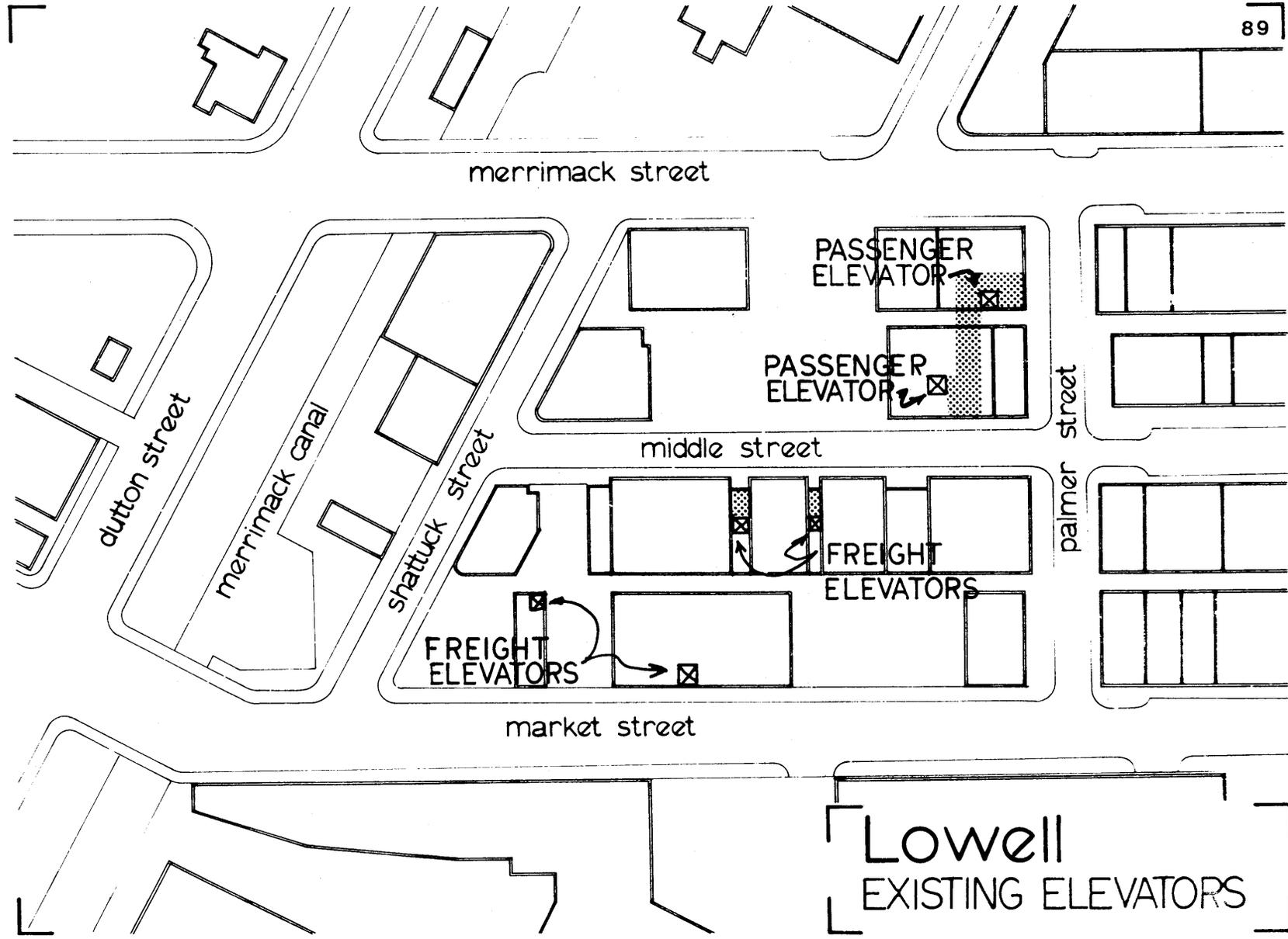
The design study will accept the basic premises of the Lowell National Park Plan. These include the location of the barge and train tour terminals, the location of the visitor center, the locations of parking supply, and the development of a hotel in the Lowell Manufacturing Company. Areas along the Pawtucket Canal will not be considered for development since they are part of the proposal. The study, then, will concentrate on the small area bounded by Shattuck, Merrimack, Palmer and Market Streets.

As no developers' packages have been proposed and no proposal for a particular use is available, it will be assumed

that all ground floor area will be developed as retail space, that second floor space will be flexible between office and retail space, and that upper levels will be devoted to office space.

The majority of buildings on the site are in need of new service cores, as the drawing on page 89 indicates, since most of the early buildings contain only one staircase and an old freight elevator. Several buildings do not require service in the form of elevators, however. These include the Professional Block at the corner of Merrimack, Palmer and Middle Streets, already serviced by adequate elevators (see diagram on page 77); the Lowell Institution for Savings and the Lowell Light and Gas Company, both at the corners of Shattuck and Middle Streets; and a small building at the corner of Palmer and Market Streets. The latter three buildings mentioned are all two stories tall and thus do not need elevators.

The major element in this design study is the closing to vehicular traffic of both Shattuck and Middle Streets. Since



merrimack street

dutton street

merrimack canal

shattuck street

middle street

market street

palmer street

PASSENGER ELEVATOR

PASSENGER ELEVATOR

FREIGHT ELEVATORS

FREIGHT ELEVATORS

Lowell
EXISTING ELEVATORS

their sole role now is to supply street-side parking, it was felt that a pedestrian mall on these narrow streets could be a key factor in the revitalization process. With no automotive traffic, the pedestrian can still experience the scale of the streets but will be uninhibited by the narrow sidewalks which are a necessary complement to vehicular traffic on narrow streets. This concept has met with great success in many similar cities, such as Salem, Massachusetts. Salem's main shopping street, also very narrow, was closed to traffic and developed with seating and small parks. The actual sidewalks and curbs were left in place, however, so that the pedestrian would be reminded of the former character of the place. Deliveries and service to the retail establishments are allowed only at certain hours in Salem and the disruption to the pedestrian mall is minimal. This is also the proposal for this design in Lowell.

Another major urban design decision concerns a small park, to be known as Center City Park, proposed for the present parking lot behind Old City Hall. A park in this location, together with the pedestrian mall on Middle Street, has great potential. If

treated as a small break in the building wall of Middle Street, it would be unlike any other open space in the city. It would not only be in direct sun most of the day, but it would be away from traffic and noise and could easily become a focus for the pedestrian mall. This park is part of the Lowell National Park Plan and is also proposed by the City Development Authority. It is accepted as an integral part of this design study.

Another factor which influences the urban design aspect of this study is the location of parking supply. Again, it will be assumed that parking will be supplied off-site as lot sizes are too small and existing structures alone require more parking than the site can hold. A large visitor lot is to be built behind the Lowell Manufacturing Company, and a five-level parking structure is being constructed on Market Street, opposite Palmer Street. These parking supplies form two major forces on the study site. The first is on axis with Shattuck Street where tourists will arrive on the site at the barge tour terminus. This axis is then very important to

commercial development, as Market and Middle Streets, in order to develop commercially, need strong ties with Merrimack Street, the major shopping street. The second axis comes from the five-level parking structure on Market Street. The pedestrian entrance to this garage coincides with the entrance to the proposed hotel. As this garage is intended primarily for lease space, there should be a direct connection to the major elevator service cores which will serve office workers. The design proposes a ground floor break through the block past an interior service core, with retail space on either side of the break. The buildings will actually be eroded to a height of two stories through this block in order to visually connect the two sides of the block, to bring some activity from the street into the block, and so that if future needs require it, the entire interior of the block could be changed to retail space with minimal renovation.

In examining the existing buildings together with the proposal for new construction developed in Chapter 3, one finds that the buildings have many common problems. First, and most obvious, none have service cores. Second, none have

any level of interior distribution systems. Third, the egress from these structures is well below standards. The approach in the design study, then, is to unite the existing buildings in such a way that they can share not only service cores, but also circulation systems and egress locations. A natural and potentially exciting aspect which is common to all the buildings is the back alley which they all share. The proposal for the block surrounded by Shattuck, Middle, Palmer and Market Streets is to build a second level pedestrian spine above the present alley which could serve the office spaces above. The space connects two new service cores which are located as far away from each other as possible in new construction. The locations of the cores were determined from the density study in Chapter 3. The tallest new structures are seven stories near the west end of the block and eight stories at the opposite end. (See diagram page 72.) The tallest locations are not at the absolute ends of the block but are close enough so that every office location is no more than 150 feet from an elevator. It was felt that exceeding the limit discussed earlier would not be a problem as the

entire design is based on pedestrian access and that the interior spine could be considered an exterior street.

The cores are connected at every level but only on one side of the spine at upper levels (through the fourth level). Basically, the distribution system is pedestrian oriented, and vertical access by foot will be encouraged by making the distribution system as clear as possible. Many stairs are proposed connecting the corridors on upper floors to the main pedestrian spine. Various floor heights are connected by ramp systems in order that all levels be accessible to the handicapped. Several bridges cross the multi-level open area above the pedestrian space, which is closed at the top by a continuous skylight.

An additional egress stair was provided at the far east end of the block to serve the spaces at that end. Fire separation in the design would be provided both continuously between the pedestrian space and all office spaces and at various points between the buildings horizontally, as determined by the Massachusetts State Building Code Table 2.6

on page 85 of this thesis. Fire separation would not have to occur between each of the separate buildings as most are well below the limits set in that table.

Again, the purpose of developing the multi-level pedestrian spine was to make extra use of as few service cores as possible. Early design studies which looked at various parts of the block locally showed that in order to develop the block without the pedestrian spine, three or perhaps four single service cores, each with two elevators, would have been required to achieve the same level of density increase. The spine is basically a way to increase efficiency of the system.

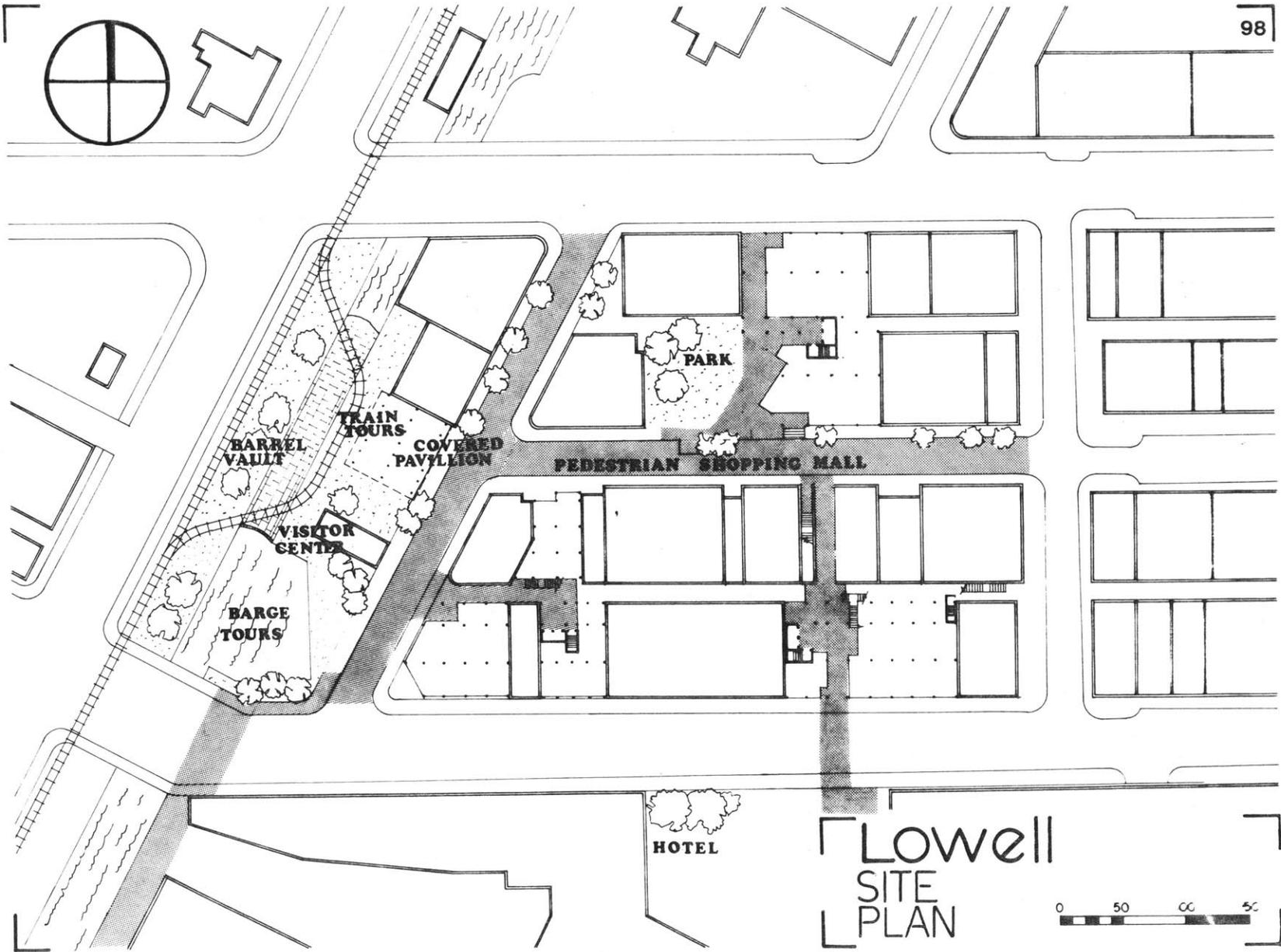
The design has also tried to deal with the issue of staging of construction. Rather than expect the whole block to be built at once, one could imagine that only a minimal amount be built at first, perhaps only the service cores. This is the reason that they are located close to existing buildings. In this way, the existing buildings could be made more servicable and, as need arose, the remainder of new construction added to the project.

The pedestrian spine system has provided an opportunity to give a strong identity to the block. If each parcel were to be developed individually, it would, as discussed in Chapter 4, be difficult to know which entrance served a particular location. In this design proposal, there is one major entrance on each street to the spine which serves the entire block. These entrances are designed so as to appear conspicuous from the street. On Market Street, the entrance is in new construction. The heavy lintel which rests over the ground floor (see Chapter 2) is raised at this point to the top of the two level void and the ground floor pattern of framework construction is extended up to meet it. The two-level void is directly visible from the street and would be seen as a focus for the street. (See view 2, page 114.) The entrance on Middle Street happens to occur in an existing building. In this case, the building skin is removed and is replaced by a heavy concrete lintel, again over the second floor. The interior of the building is eroded behind the entrance, again becoming a focus for the

street. (See view 1, page 113.) The two entrances from the end of the block are minor ones, but would still be seen as different from their surroundings. Tall glass walls would be seen from the street and the continuous skylight would also be seen.

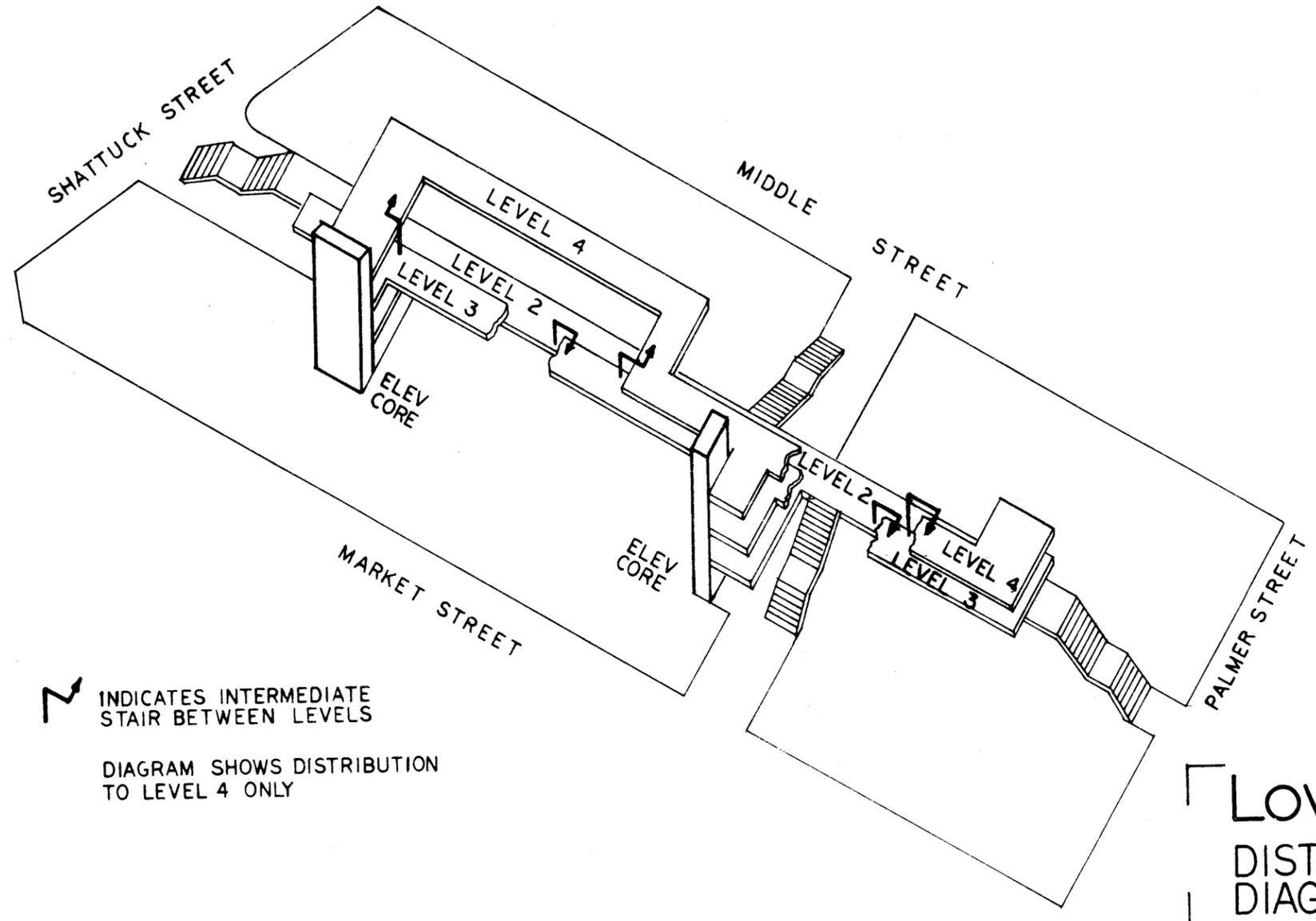
The facades of the new buildings attempt to make use of the image elements described in Chapter 2. Proportions, overall sizes and materials all follow the established rules. For instance, the large, new building block on Market Street is broken down into two main elements, one of which is the eight-story vertically proportioned element. This portion of the building has major detailing horizontally. Windows are organized horizontally and the building is layered from ground to roof, much like the Scott Jewelers building at the center of Central and Merrimack Street. (See page 37.)

Other elements such as windows, materials and lintels are attempts to use sizes and rhythms found in neighboring buildings, making the new large building blend in with the old.



Lowell
SITE
PLAN

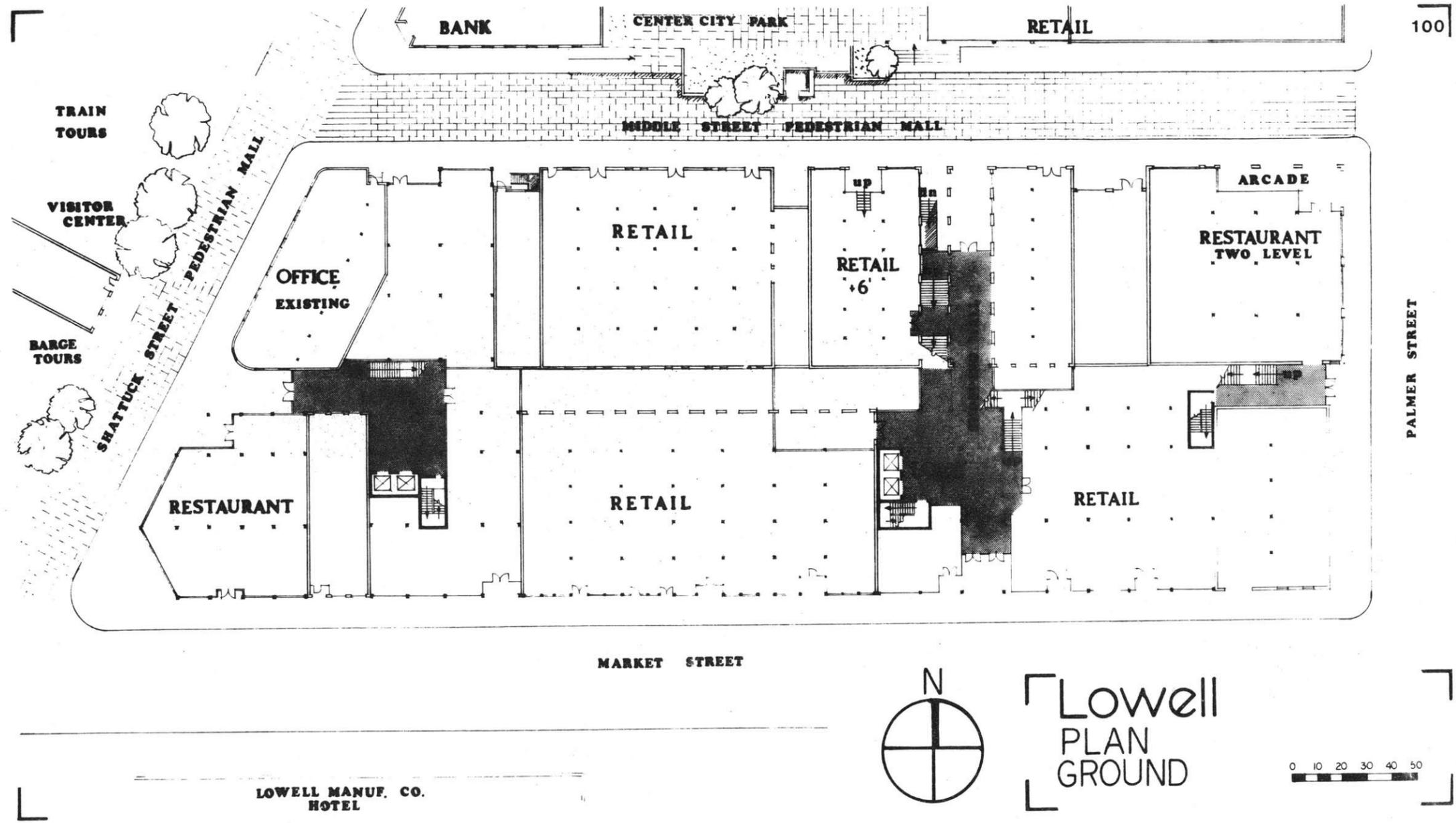


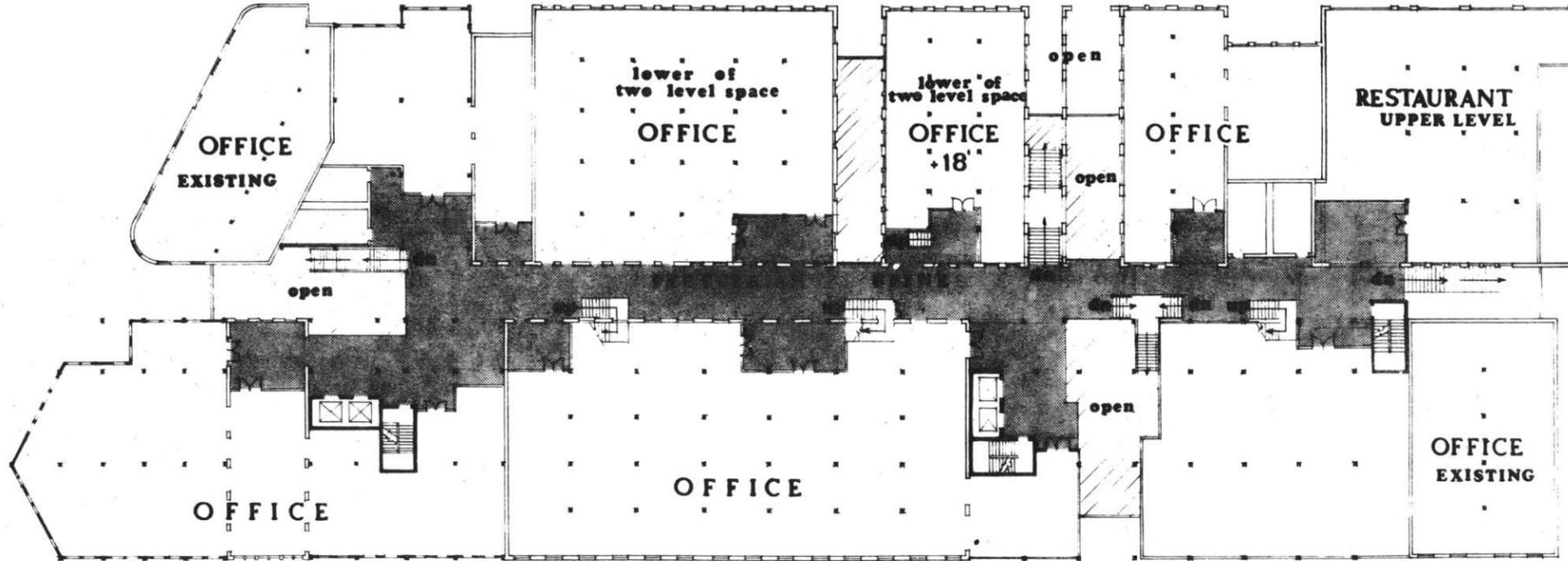


INDICATES INTERMEDIATE
STAIR BETWEEN LEVELS

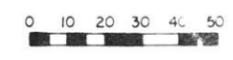
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TO LEVEL 4 ONLY

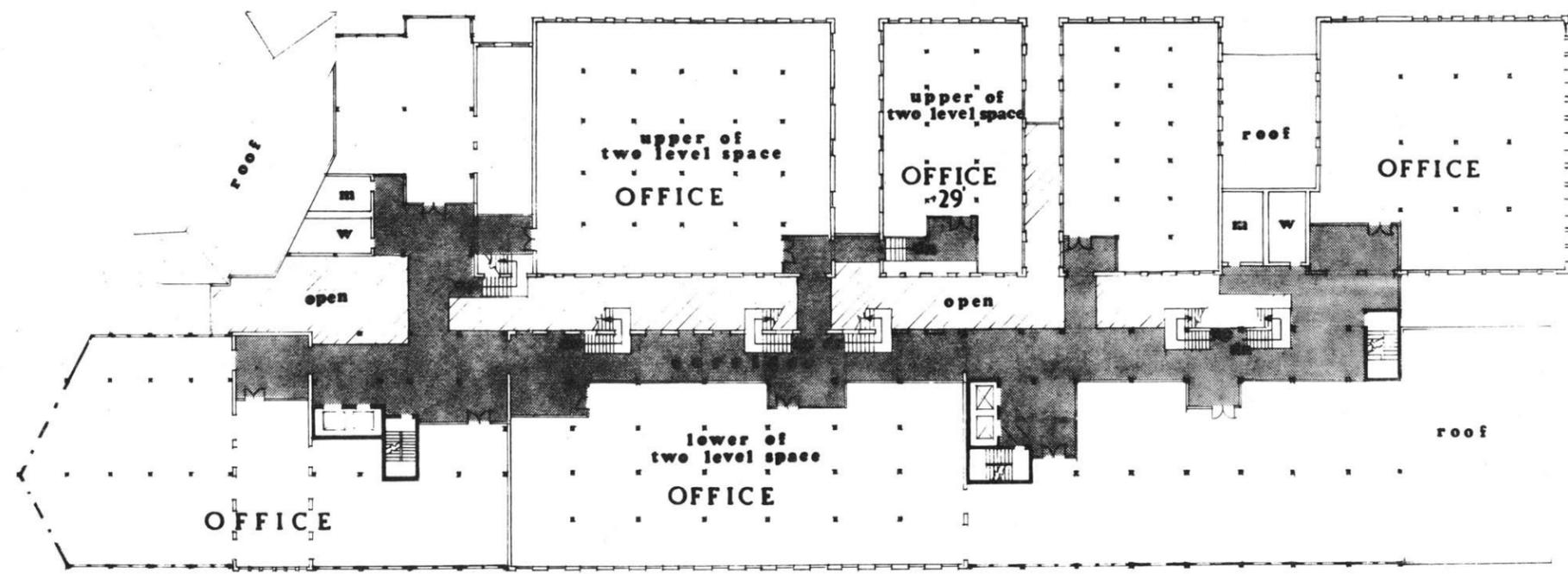
Lowell
DISTRIBUTION
DIAGRAM



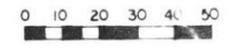


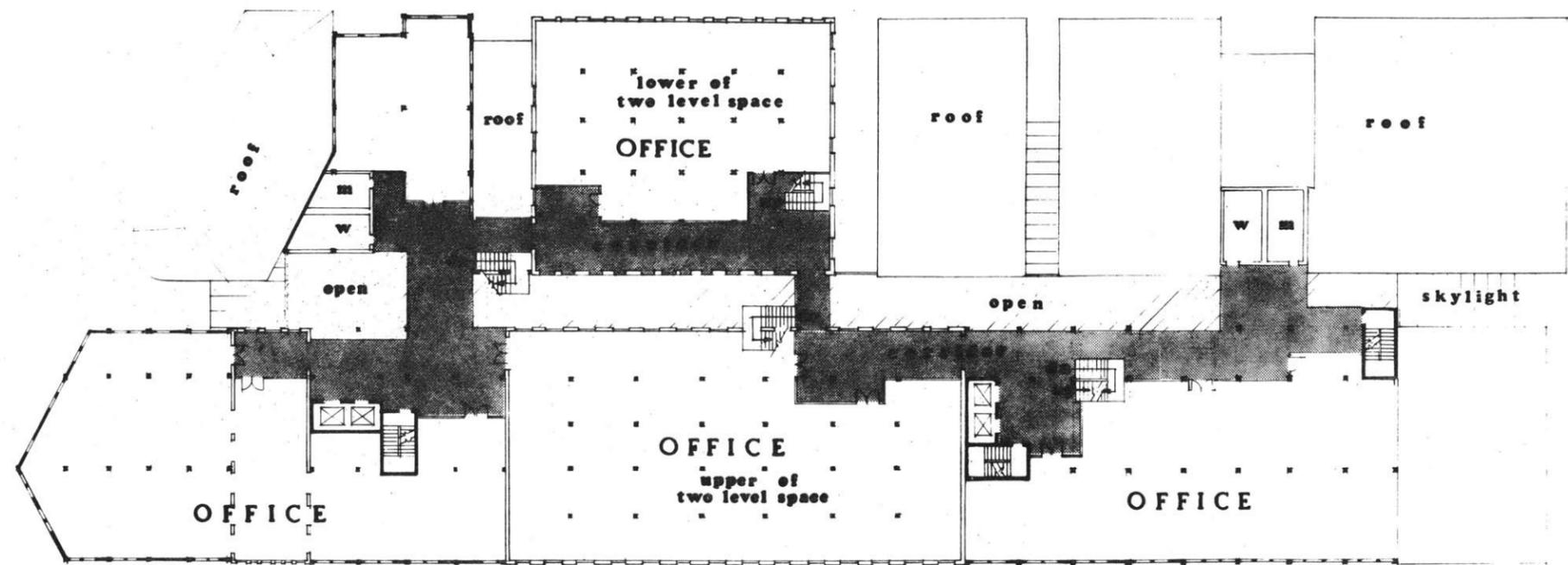
Lowell
PLAN
LEVEL 2



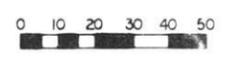


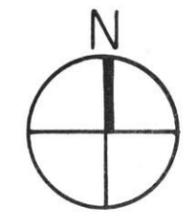
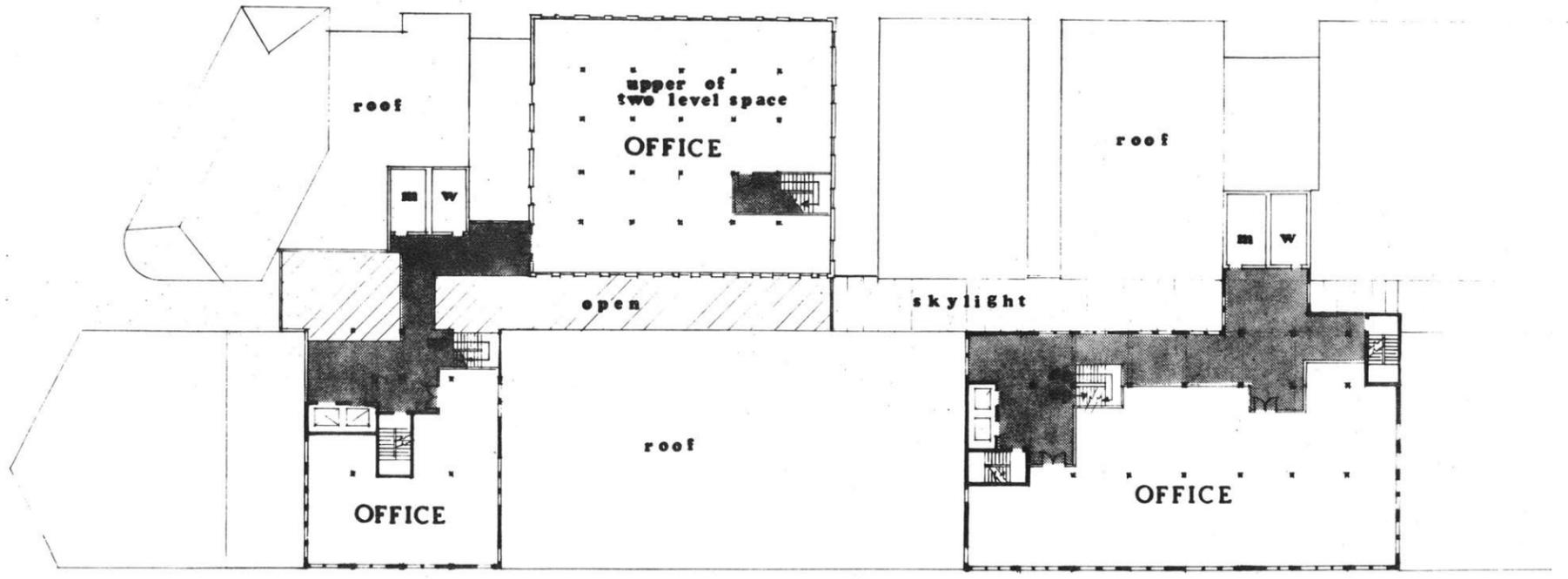
Lowell
PLAN
LEVEL 3





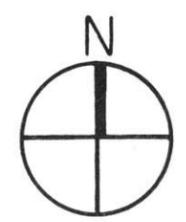
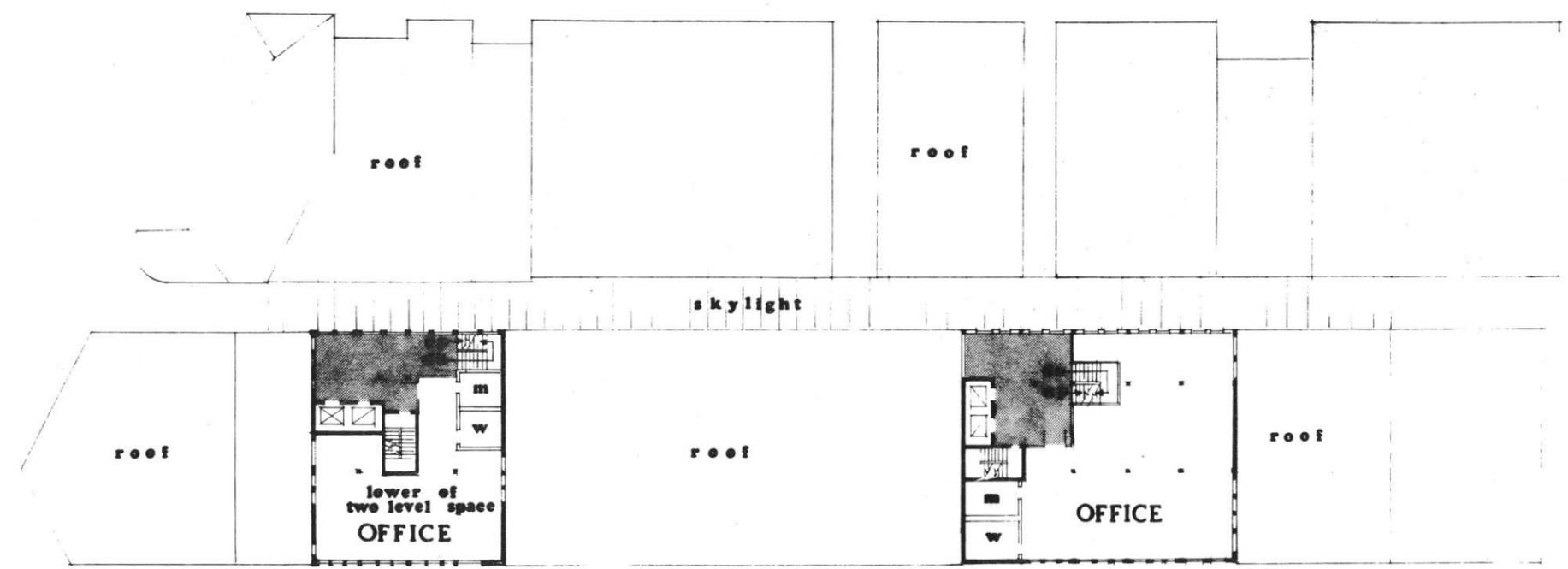
Lowell
PLAN
LEVEL 4





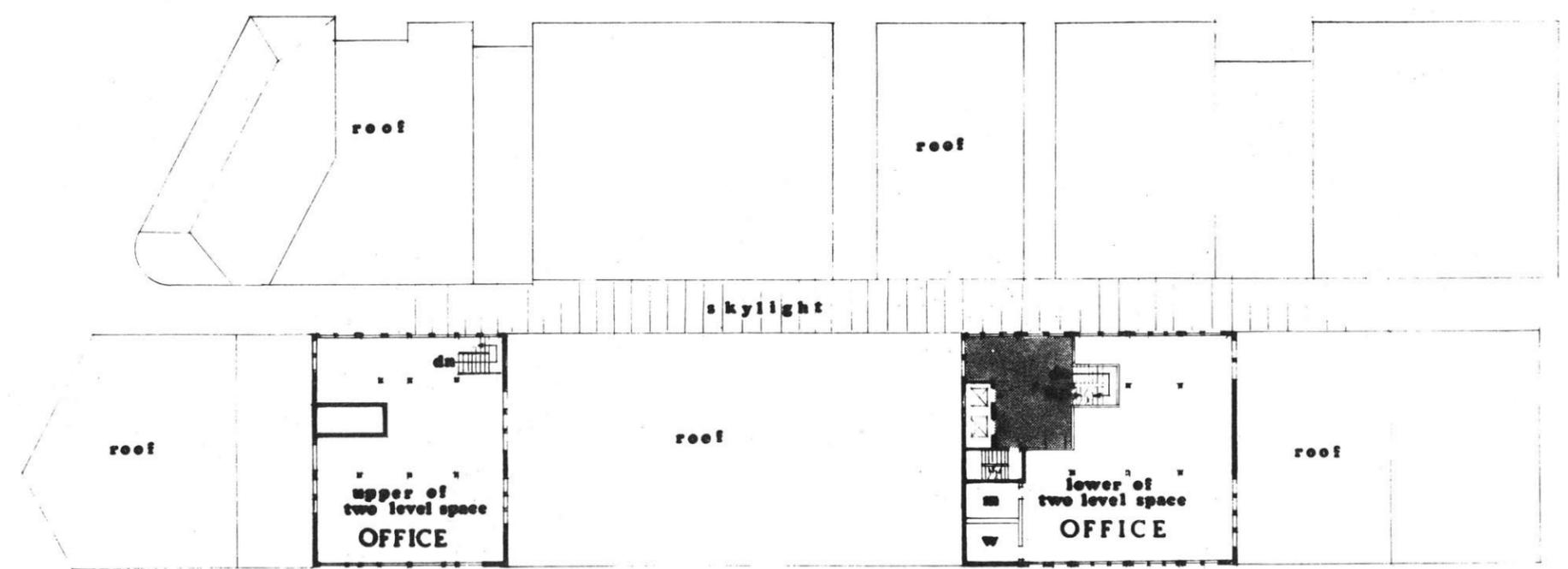
Lowell
PLAN
LEVEL 5





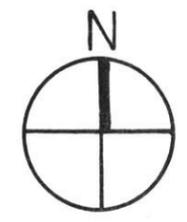
Lowell
PLAN
LEVEL 6



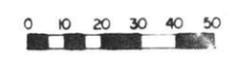


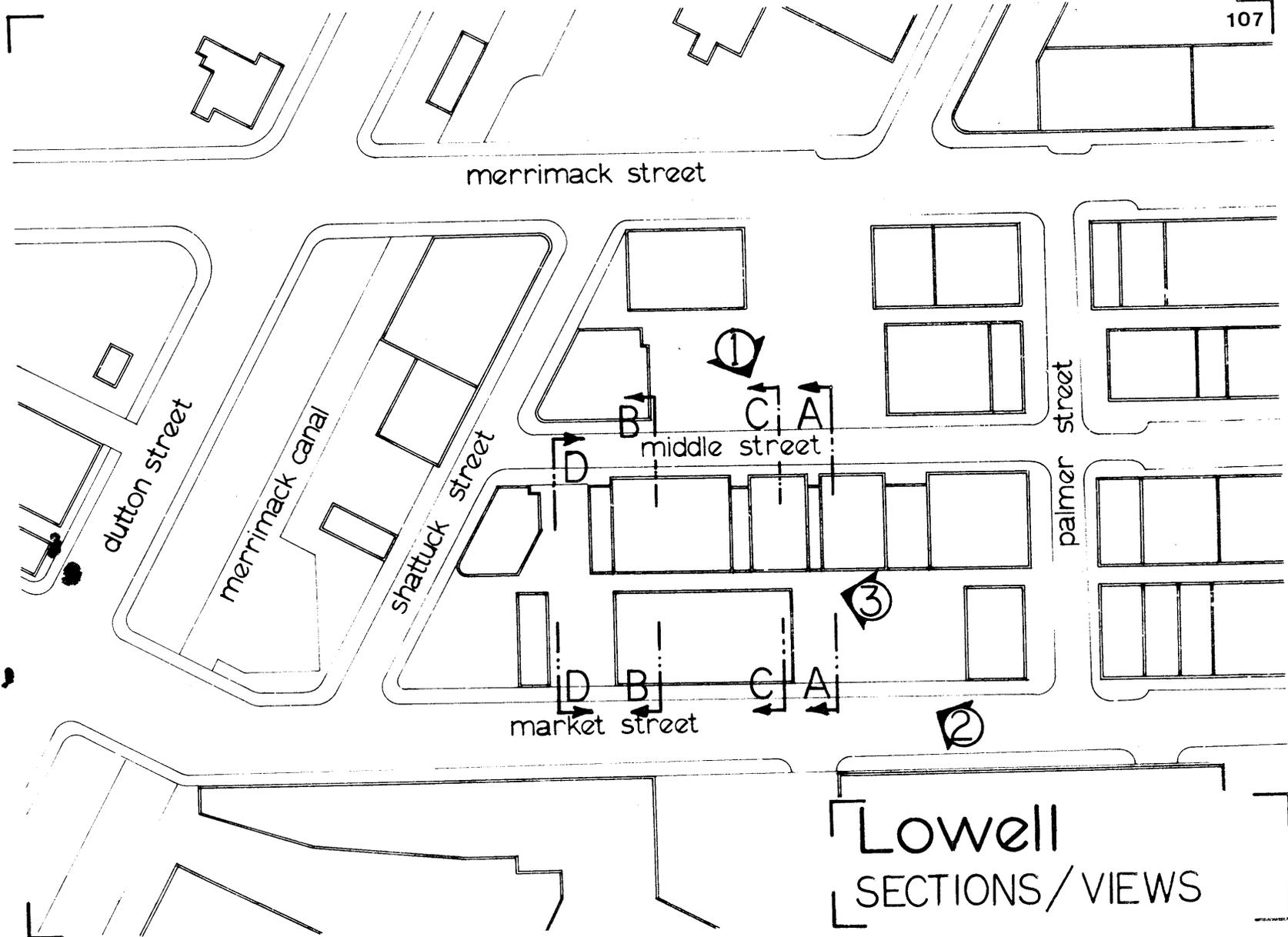
NO EIGHTH FLOOR

EIGHTH FLOOR

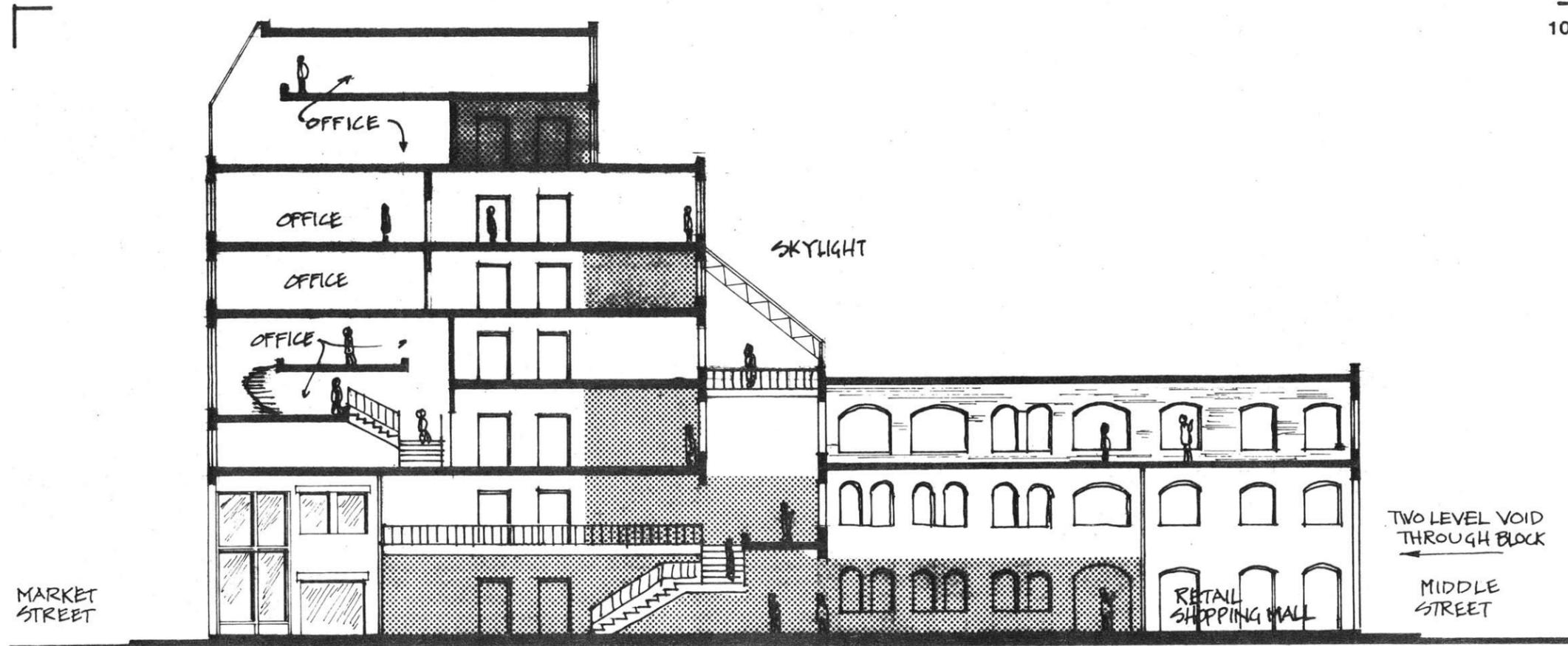


Lowell
PLAN
LEVELS 7,8



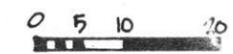


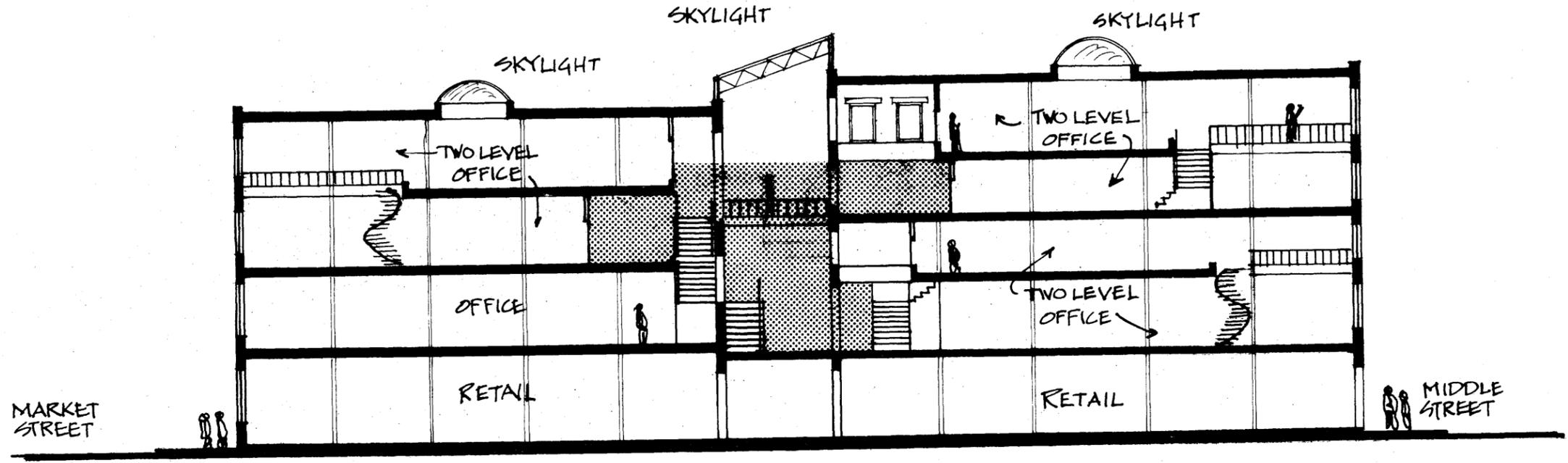
Lowell
SECTIONS/VIEWS



MAJOR PEDESTRIAN DISTRIBUTION

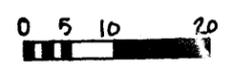
Lowell
SECTION A-A

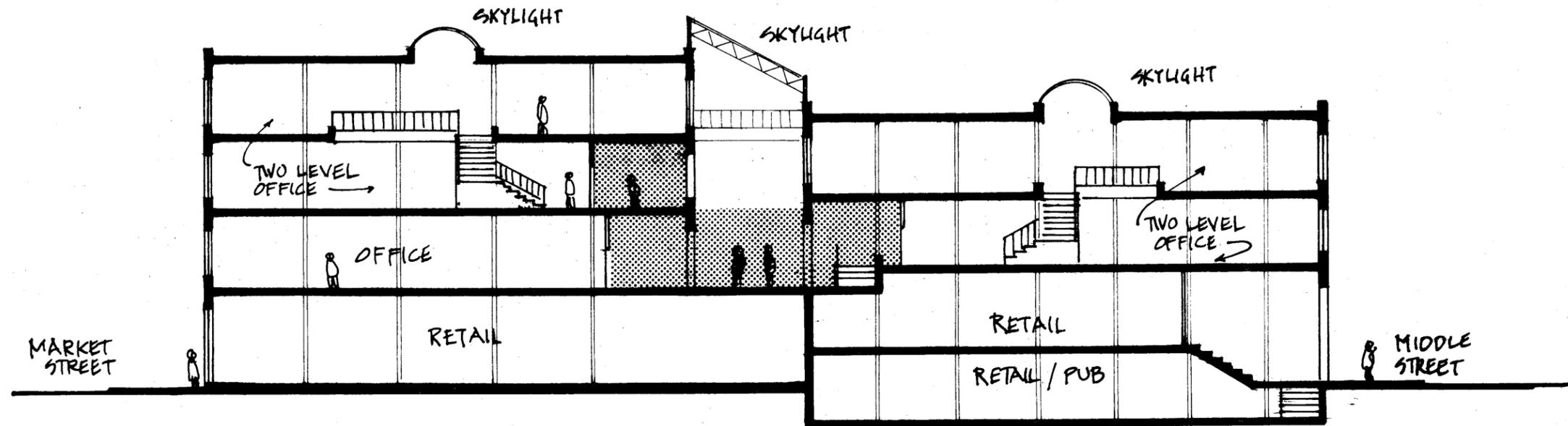




INDICATES MAJOR PEDESTRIAN DISTRIBUTION

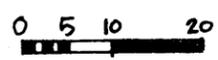
Lowell
SECTION B-B

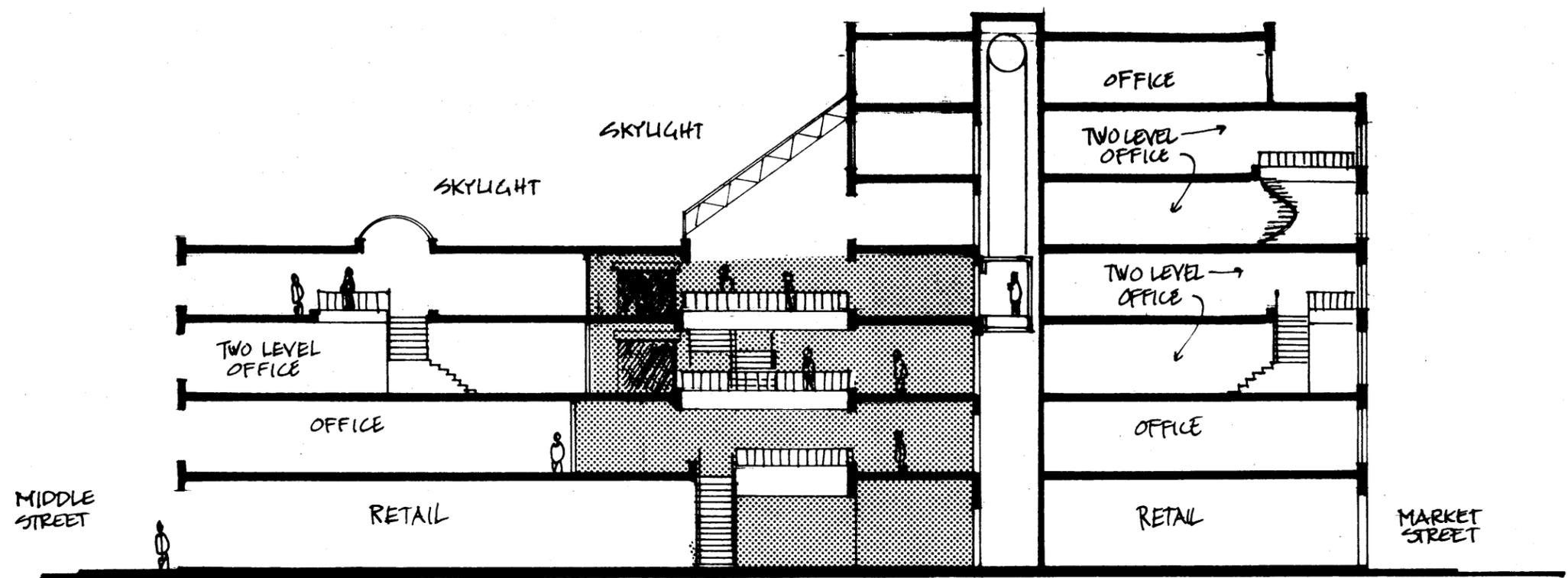




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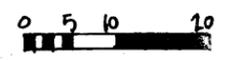
Lowell
SECTION C-C

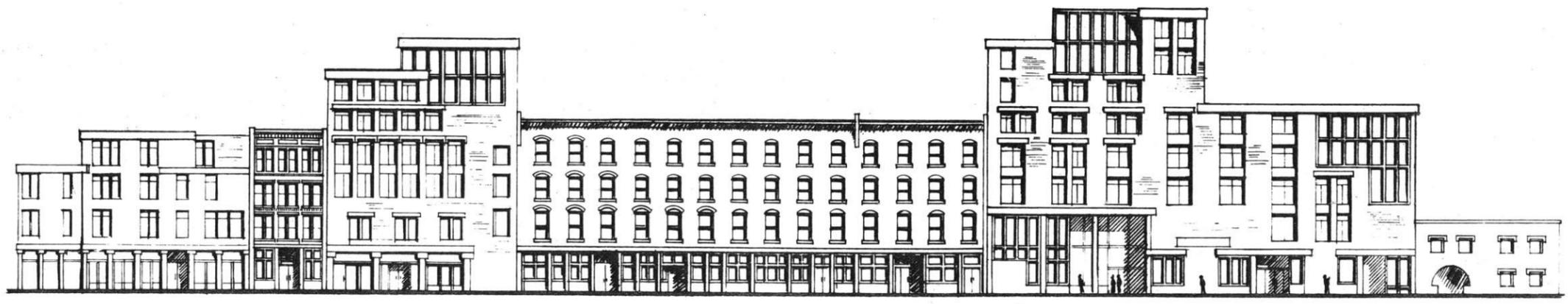




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Lowell
SECTION D-D





MERRIMACK STREET ELEVATION

Lowell
ELEVATION

A scale bar is located to the right of the Lowell Elevation label. It consists of a horizontal line with alternating black and white segments, and numerical markings at 0, 10, 20, 30, 40, and 50.



VIEW OF MIDDLE ST.
ENTRANCE TO
PEDESTRIAN SPINE

Lowell
VIEW I



VIEW OF
MARKET STREET ENTRANCE
TO PEDESTRIAN SPINE

Lowell
VIEW 2



VIEW OF
PEDESTRIAN SPINE

Lowell
VIEW 3

SUMMARY & RELATED STUDIES

116

This thesis has shown that the downtown area of Lowell, Massachusetts, has great future potential for growth and development. Through a detailed analysis of the building stock, it has been found that the physical image of the area is definable in concrete terms and that certain rules or restraints concerning the image could be set. These restraints were used to push the density of the area to its physical limit, as a way to determine the maximum density which the image of the site can sustain. From an analysis of the functional needs of the building stock, it was found that most of the existing building stock had similar needs which could be fulfilled by new construction in a way which could make the area an exciting and vital place to use. Old buildings have been shown to have potential for reuse often in the past and those in Lowell are no exception. They will probably be found to be in good structural condition and the construction techniques lend themselves very well to

adaptive reuse.

This study has made several assumptions which should be mentioned. The thesis is based on the assumption that demand for rentable space will increase in the future, and that new and larger construction will be required. An interesting study might be an economic analysis of the area to determine a real potential in dollar terms. Another way to approach the problem could be to locate and talk to developers who have an interest in the area and who proposed structures which seem to destroy the character of the place. Working in the opposite direction of this thesis, it would be worthwhile to document the reasons why those structures violate the character of the place.

Parking has not been dealt with in accordance with the zoning laws, as to comply with these laws would have totally dominated the study. Realistically, however, it cannot be ignored. While Lowell's solution in the past has been to build many peripheral parking structures, it may be worth studying not only the ways in which parking could work in the downtown area, but also the ways in which a garage structure

could be detailed so as to use the elements of the physical image.

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This thesis has presented a workable proposal for revitalizing a particular block in downtown Lowell. As many industrial cities were planned in similar ways, one might find that this way to use older buildings is potentially useful in other locations.

REFERENCES

1. Conversation with Frank McCartin, Lowell businessman.
2. Report of the Lowell Historic District Canal Commission, p. 15.
3. Ibid., inside cover.
4. Ibid., p. 1.
5. Frenchman, Dennis, Connecting the Past to the Present: A Planning Strategy for Urban National Historic Parks.
6. Conversation with Phil Belanger of Lowell City Development Authority.
7. Ibid.
8. Ibid

RESOURCES

120

Early in the thesis process, research was done on adaptive reuse in general. Many completed projects were examined in detail to gain an understanding of the concept and its potentials and restrictions. Following are the books and articles studied:

_____, "Recycling: Another Route to More Productive Building" Arch. Record, December 1975.

_____, "New Life for Old Buildings" Arch. Record, December 1971.

_____, "Building Type Study 469: Conservation in the Context of Change" Arch. Record, June 1975.

BRA, "Recycled Boston", February 1976.

Costonis, John J., "Development Rights Transfer", Yale Law Journal, 85-75-103, 1974.

Costonis, John J., "Space Adrift: The Chicago Plan", Urbana: University of Illinois, (1974-1975).

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Dean, A. O., "Adaptive Reuse - Economic and Other Advantages", AIA Journal, June 1976.

Greenwald, Susan, Adaptive Rehabilitation of a Residential Block, M.Arch. Thesis, 1976.

Harvey, A. L., "Adaptive Reuse: Saving Energy (and Money) as Well as Historic Buildings", AIA Journal, August 1974.

Woodbury, Stephen R., "Transfer of Development Rights: A New Tool for Planners", JAIP, Vol. 41, #1, January 1975.

Background information on Lowell:

Frenchman, Dennis, Connecting the Past to the Present: A Planning Strategy for Urban National Historic Parks, M.C.P. Thesis, MIT, 1976.

Lowell Historic District Canal Commission, Report of the Lowell Historic District Canal Commission, U.S. Government Printing Office, Washington, D.C., 1977.

Plans, elevations, and details of the existing Lowell building stock provided by the Lowell City Development Authority.