

**Climate Responsive Housing for
Miami Beach**

by

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Virginia Polytechnic Institute and State
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of

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approved:

Gregory Hunt

Jaan Holt

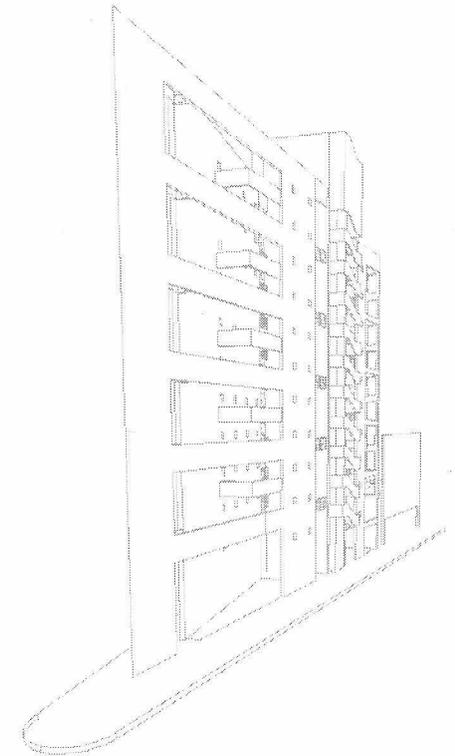
Susan Piedmont-Palladino

September 15th, 1995

Blacksburg, Virginia

Abstract:

The objective of my thesis is to study climate-responsive elements for housing. The word elements refers to the components of the building envelope. The term climate-responsive describes any building that reacts to local climate and also respects the physical environment. The hope is to arrive and establish a new set of elements that can transcend future housing developments, specifically in the Miami Beach area.



Acknowledgment:

A long time in the making, this book has gathered many binding gratitude.

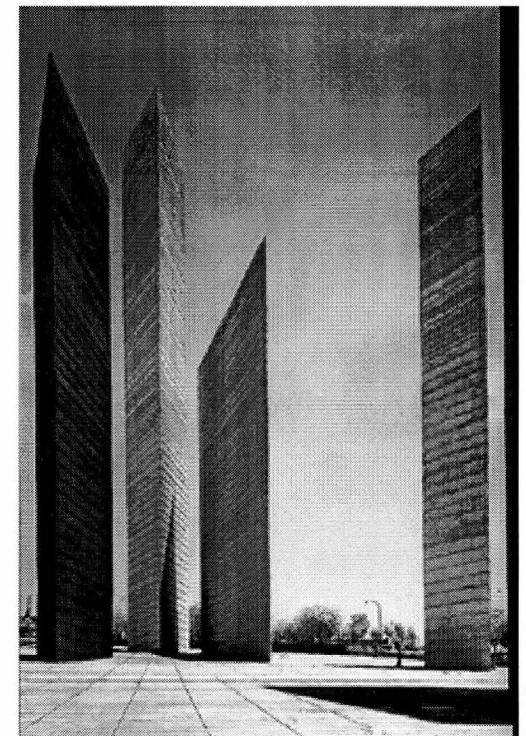
The three committee members of the

for the his words that gave energy to my work and inspired me to continue. for her devotion to teaching and architecture evident in all our discussions. for being, well,

My parents whom I love.

The diva of fashion, whose eye became a great guide.

And finally the love of my life, for her continuous and enthusiastic support that provided the strongest incentive for the making of this book.



*Satellite City Towers, Mexico City
by Luis Barragan*

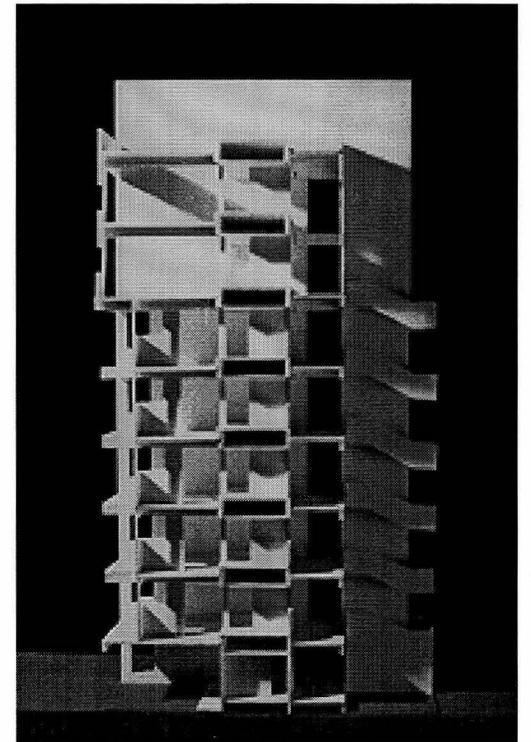
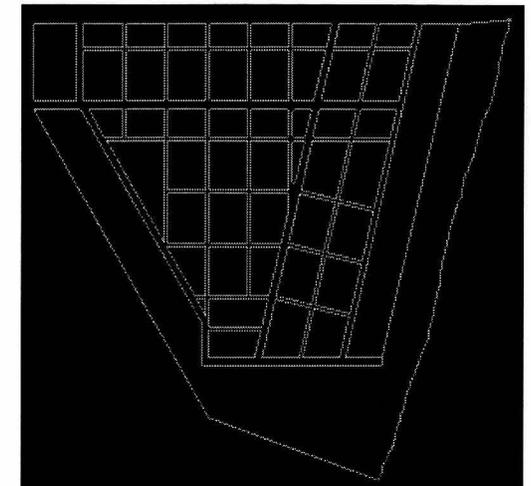


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Introduction:

In the past, housing projects have been profoundly criticized for their lack of ingenuity, particularly in the United States. One critic states that the buildings of modern housing appear to have "floundered among plain unimaginative projects with no character" (Modernity and Housing, Peter G. Rowe). Modern housing projects fail to meet the physical, psychological, and cultural needs of the people for whom they are designed. We are surrounded by housing developments that are efficient in storing people but neglect the fundamental of the human spirit. Furthermore, they do not grow from the desire to shape the world in ways that not only support our needs but also our dreams. To be warm, dry, cool, or safe bears no poetry in the making.

Housing throughout the world has changed radically in quality. These changes may be due to the diversity of cultural values placed on housing. For example, there are major differences in the way housing is constructed between the United States and Europe. In Europe, multi-unit housing is designed primarily for low- and middle-income families, whereas in the United States housing is essentially intended for middle- and higher-income families. Therefore, the public sector is the leading force of housing in Europe, whereas in the United States the private sector leads the field where the benefit is for one and not the community. In the United States developers build most of the housing projects and their personal benefit comes first.

In contrast, new design possibilities were created by Europe's public architecture. Design stimulated the spread of new ideas in multi-unit housing. In the end a new sensibility was created in the design of multi-unit housing benefiting people and their communities. This sensibility in the making of housing can be discerned and also implemented in American architecture. The quality of modern housing in the United States needs to embrace a larger vision, one that suggests a new set of rules for the design of building and their cities.

One of the American cities that presents an opportunity to embrace a new vision in the making of housing is Miami Beach. The growth and rehabilitation of this area has presented itself as a major effort during the past decade.

Miami Beach has gone through many radical changes. Within this time, social, economic and political forces shaped the built environment of this area. A few years back the area was home to crime bringing devastation in its path. The next step was a rehabilitation of the region. City developers, professionals, scholars, and other local government agencies began the efforts to incite the reconstruction of Miami Beach.

The fate of South Beach was an essential part in the rehabilitation of Miami Beach. The South Beach district constitutes a large portion of ocean front property. Small-scale entrepreneurs were the first people to reconstruct this waterfront. "Cafe owners, fashion impresarios, and club kids have transformed block after block of dilapidated art deco hotels into the

epicenter of south chic." (PeterWhoriskey, PA, November 1995.) South Pointe is only a fragment of the Miami Beach region. Regulations that apply to Miami Beach do not apply to South Pointe being that this area is not part of the "deco" district. Furthermore, in October 1992 height and other zoning restrictions were drafted but these new rules lacked city commission approval. This absence of restrictions and their adoption gave property owners plenty of time to file under the old law. The old rules have no height restrictions. South Pointe has become a developer's dream and a present and future residents' nightmare. The city and developers talked about a "village" atmosphere, but what they are making is something else. They are tearing down buildings with no regard to their valuable history, all for one reason: greed. They are blotting out the one thing that makes South Beach different from other waterfronts, a wide-open sky. The region is destined to become another concrete canyon.

On vital streets, like those in the deco district, shop fronts, lobbies, and apartments sit close to the street, making them human. In contrast, the new South Pointe sidewalks are faced with parking garages and blank walls subservient to the automobile and not considering pedestrians.

In recent times, some architects envisioned South Pointe as a place to walk again. I share this need to win back more human streets. The new buildings of South Pointe should embrace pedestrian activity that in turn will have a positive effect on neighborhood character.



Climate - Responsive Elements:

My interest and objective here is to study climate-responsive elements for housing. The word elements refers to the components of the building envelope which respond to the local climatic variables. The term climate-responsive describes any building that responds to its climate and respects its physical environment. The combination of these elements will create a stronger housing environment. The hope is to arrive and establish a new set of ideas that react well to local climatic forces.

The local climatic forces are, high temperatures, humidity, and hurricanes. These regional characteristics produce at times an uncomfortable experience. Miami's average temperatures reach the high eighties. The climate is characterized by very long summers and constant temperatures. Therefore heat and humidity are the comfort concerns. Solar shading, heat-gain reduction, and wind implementation are necessary.

The only consolation comes from the prevailing winds and breezes from the beaches. Within the greater Miami area, Miami Beach has its own local climate. The beaches provide for a natural source in promoting a climatic-responsive environment. Promoting cross ventilation appears to be the sensitive and efficient method responding to the harsh climate.

Comfort may be attained through natural means in very humid overheated areas by a constant movement of air across the skin. The temperature control is preserved by ventilation. The aim is to ventilate for dissipation of solar heat absorbed by the building shell as well as for the body cooling.

This response constitutes part of a passive method. Passive systems, in many cases, can produce comfortable conditions. Air movement can help to achieve such comfort through natural means. In turn, the use of passive systems can result in lower building costs and efficiency in energy. The use of air conditioning can be eliminated at some points during the year where before it predominated. Therefore, passive methods can substantially reduce cooling loads.

Passive techniques can be accomplished in many ways. Some of these techniques are,

sensitive placement of building in relation to the sun, efficient design of the building form, and internal load reductions. Passive methods work with nature instead of against it. The natural conditions should be viewed as resources to be manipulated through the design of the building envelope. Promoting ventilation is part of this manipulation. Ventilation is used to satisfy the fresh air requirements of the occupants, increase the rate of evaporative and sensible heat loss from the body, and to cool the building interior or structure.

The more specific passive elements that will promote solar shading, heat-gain reduction, and ventilation in this project are: walls, breezeways, shading devices, open plan interiors, courtyards, planting and water.

Walls:

The walls are the main architectural element, they are composed in their simplicity to react to many diverse issues. The orientation of walls helps to achieve a significant climatic response. The parallel walls, stretching east to west, embrace breezes approaching from the coast. The coast line is within a few blocks of the site, giving a great opportunity for embracing the winds coming from the sea. The walls are not only the main bearing structural element but they are the fins that gesture to the winds. The figure-ground is mainly composed by these walls, forming a linear plan that takes advantage of natural ventilation. The solid walls cast shadows in contrast to the almost transparent areas between them. The light colors of the concrete finish help reflect some of the sun's rays in order to reduce heat-gain.

Breezeways:

The breezeways are created next to the walls. These breezeways are exterior pathways for winds and pedestrians. They are circulation areas for transition from the public sector to the private. The circulation of air comes from the east side of the site moving towards the west side. People who access the site, walk through these east to west path-ways where a light breeze

welcomes them. The breezeways are also protected from direct sunlight; shade dominates these pedestrian streets. But light still makes its journey. The different heights of walls versus the width of pathways create a play of shade and light. The presence of direct light is controlled from the open public areas to the enclosed private areas. Sunlight is diffused as it travels through semi-public to private spaces. On the east part of the site light is welcomed the most where shops are situated. The breezeways between the shops are under shade creating a zone that feels more semi-public. The breezeways and the stairs within become the gates into residential units. Behind the breezeways the next experience is a semi-public terrace in the north block or a set of connected small courtyards in the south block. These exterior rooms open up to the sky and light. To the west of these courts a circulation path running north to south makes places for shade again.

Shading Devices:

Exterior shading devices reduce the solar gain by intercepting the direct radiation from the sun. Fully shaded openings are desirable in this location, reducing a large percent of solar heat gain. Some of the methods employed for shading are vertical and horizontal projections, covered patios and trellises. The orientation of the east to west walls are an obvious vertical shading device. The projection of walls and slabs create deep shadows. Between the walls covered exterior patios are created. These patios known as breezeways are places where shade dominates making them pleasant exterior rooms to be in. On the west walls and on the roof tops, trellises are used as mediators of light and shadow.

Open Plan Interiors:

The interiors of the residential units are created as open plans to promote air flow. The connection between the exterior breezeways and the interior open plans allow for the continuity of air movement. Interior partitions or walls are adjusted to offer the least resistance to airflow.

Courtyards:

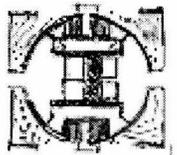
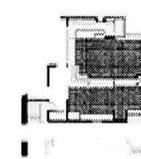
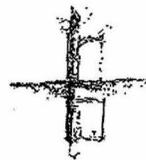
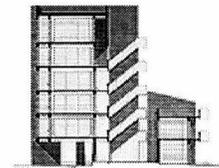
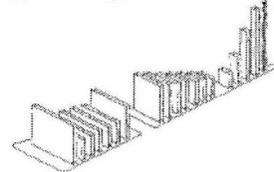
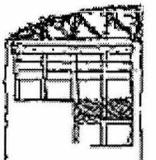
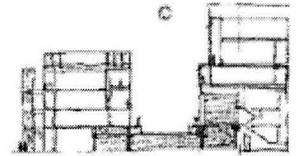
Elevated planes such as courtyards and terraces serve as the backyards for the housing units. These courtyards are elevated in order to maximize cross ventilation and direct light exposure. Sunlight and shadow are present in these exterior rooms. The interrelation of light and shade changes from morning to sundown. The choice of ambiance is there for tenants to make. People can choose to be under the sunlight or in the shade.

Planting:

On the trellises ivy can grow. The use of ivy as planting next to the building's skin performs many functions. The most apparent advantage of planting is its shading capability. Vegetation will intercept the sun's radiation before it reaches the building's skin. In return, planting will reduce the exterior surface temperature and heat conducted to the interior. The placement of planting is limited to a few desirable places so that the circulation of air is not trapped by this vegetation. The west elevation is where most of these trellises are. They protect the surface of the building from this harsh exposure. Also, trellises on the roofs are implemented to promote solar irradiation and cross ventilation as well.

Water:

The use of water is applied as a cooling effect. This passive element promotes a more psychological result. The presence of water and its sound will create a cooler atmosphere. There are many locations where water is present. The corner of 5th Street and Washington Avenue a water fountain becomes a place for sitting and a connection between two main urban streets. The sound of water echoes from the cylindrical tower between the office and the residential buildings. Also, water is present on the south block in the courtyards. In all instances water creates a pleasant experience and discovery.

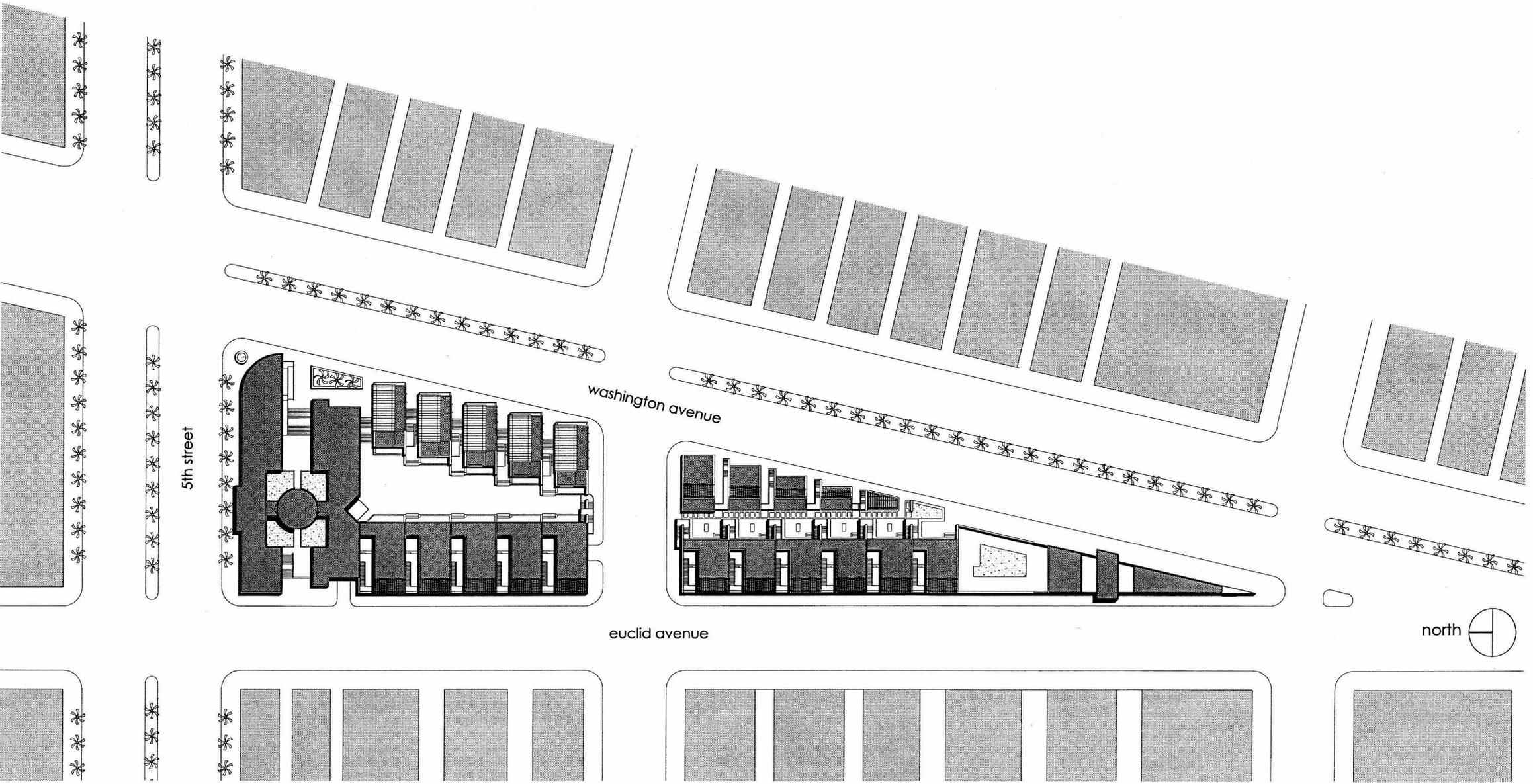


aerial view of the South Beach area

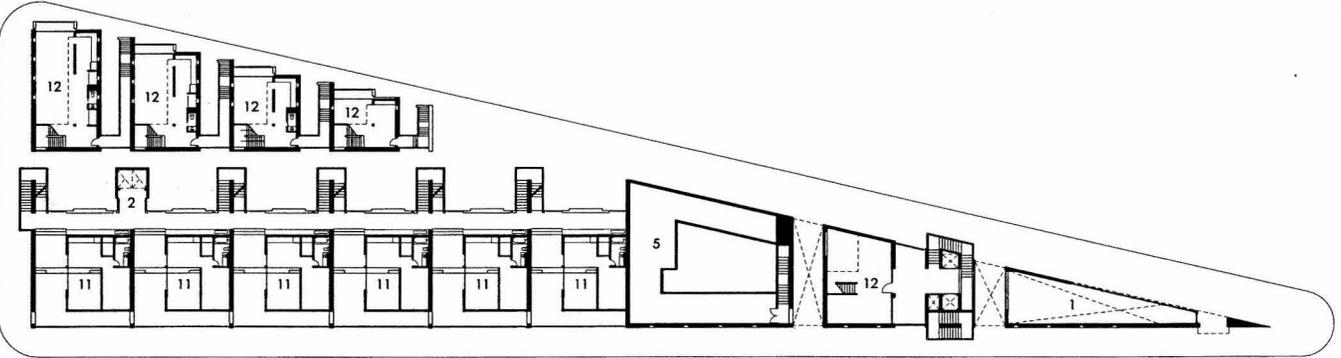
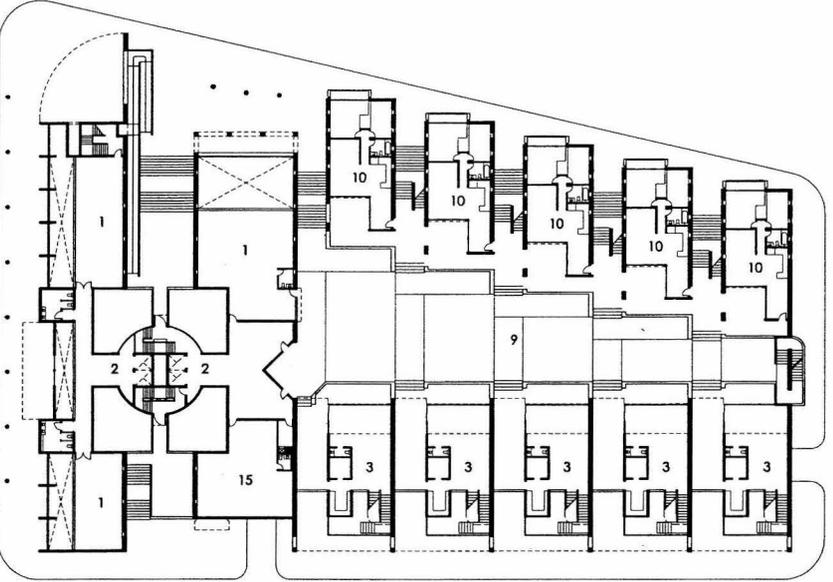


site / roof plan

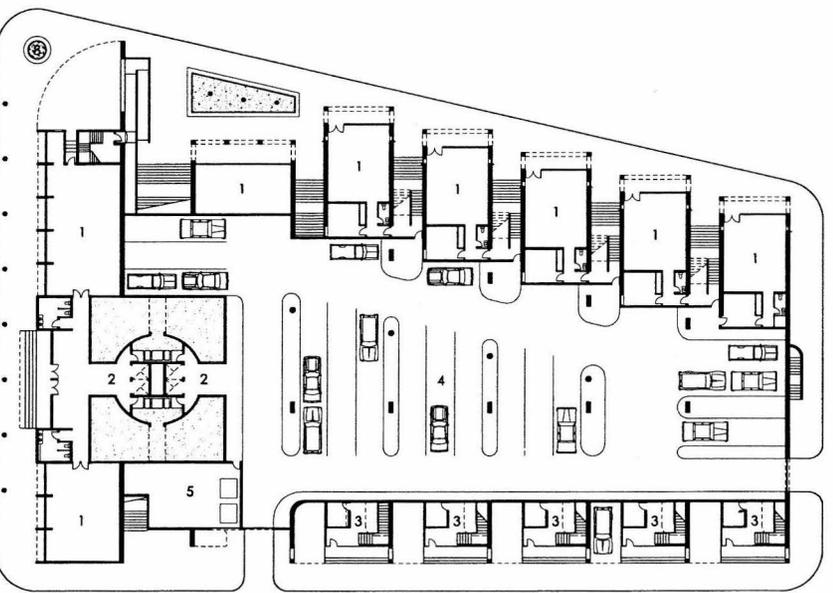
scale, 1:100



I think that a plan is a society of rooms. A real plan is one in which the rooms have spoken to each other.
Louis Kahn



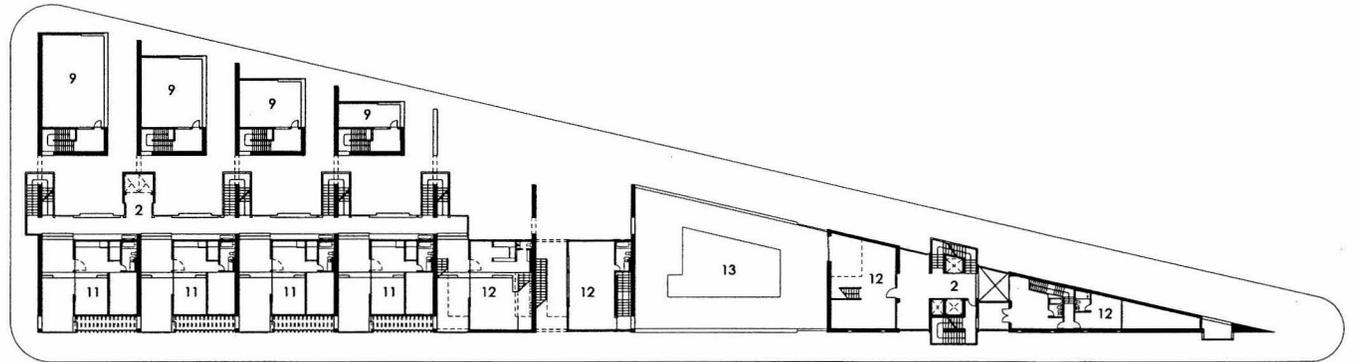
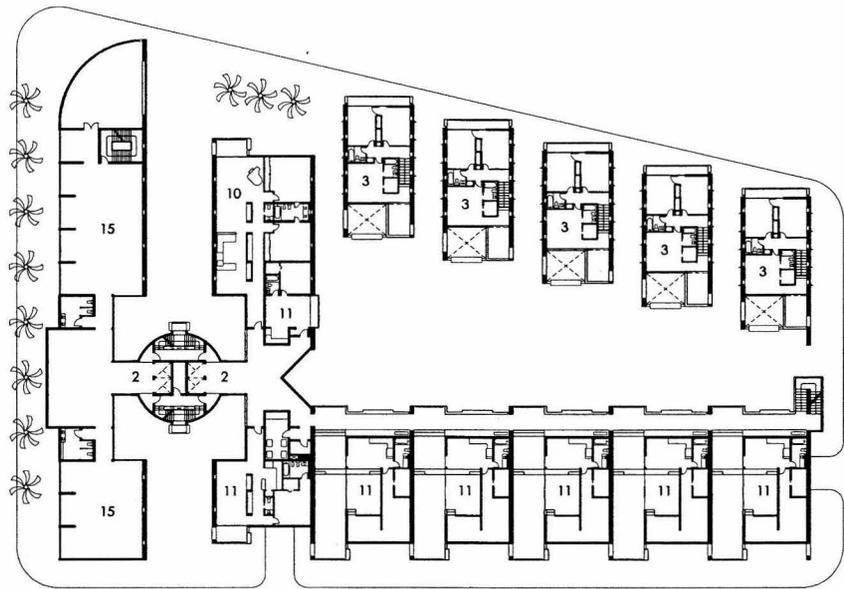
second floor plan
 scale, 1:70



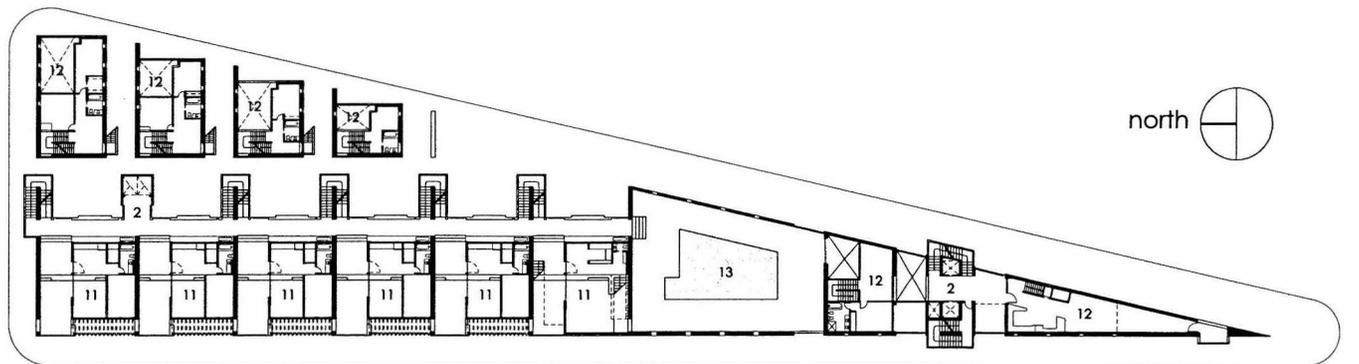
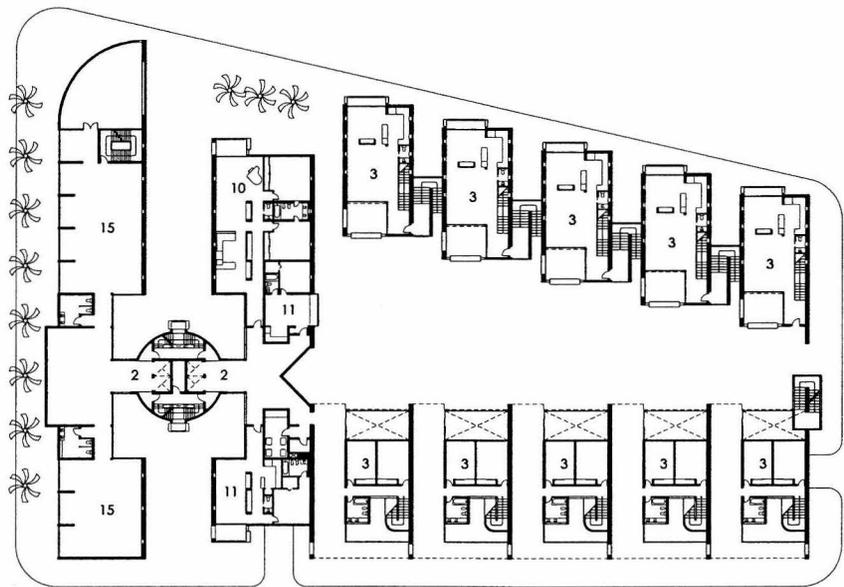
- 1 retail
- 2 elevator lobby
- 3 single family unit
- 4 parking
- 5 mechanical courtyard
- 6 courtyard
- 7 trellis
- 8 water fountain
- 9 terrace
- 10 two bedroom unit
- 11 one bedroom unit
- 12 loft unit
- 13 pool
- 14 laundry
- 15 office

ground floor plan
 scale, 1:70

It is the nature of any organic building to grow from its site, come out of the ground into the light.
Frank Lloyd Wright



fourth floor plan
 scale, 1:70

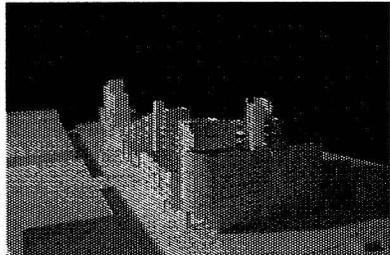
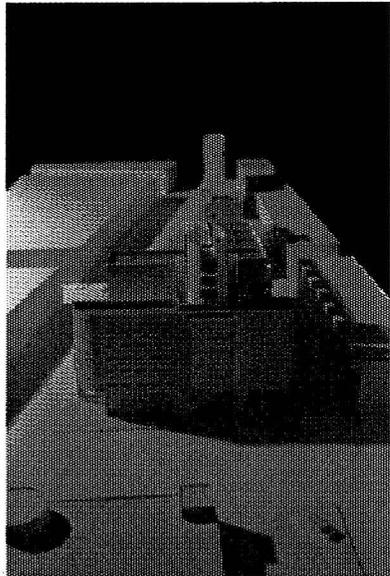
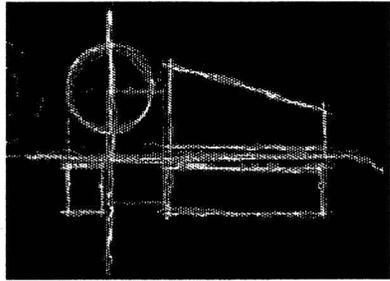
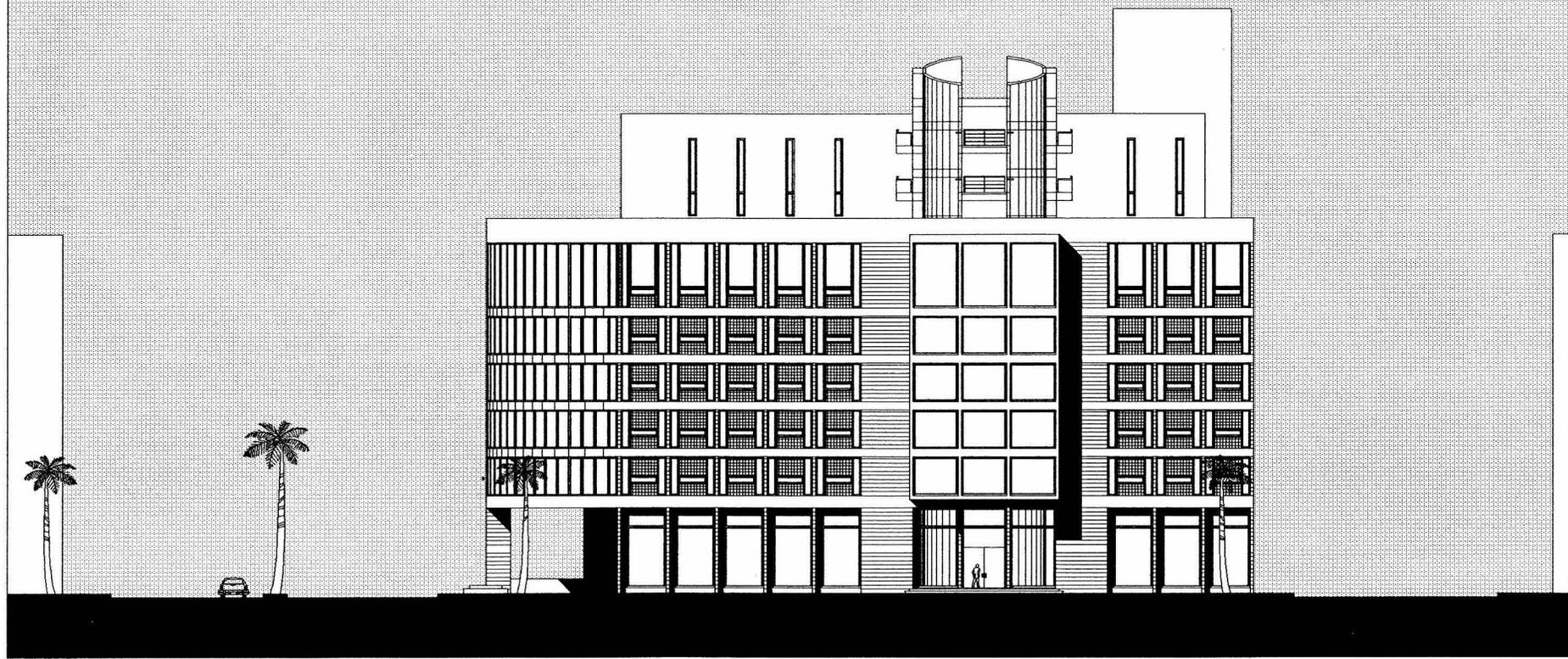


- 1 retail
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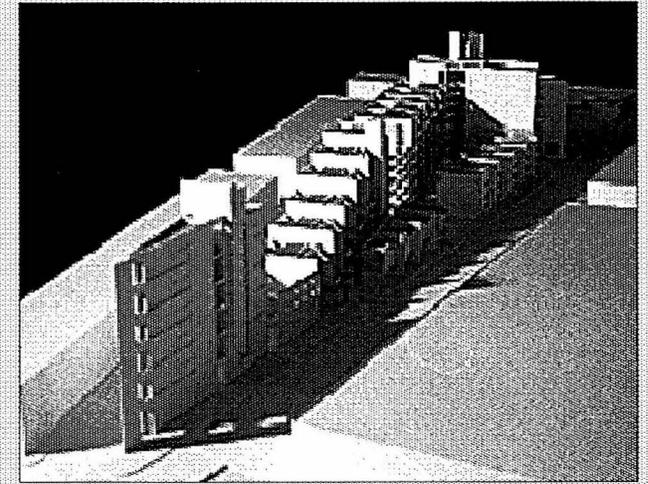
third floor plan
 scale, 1:70

north elevation
scale, 1:40

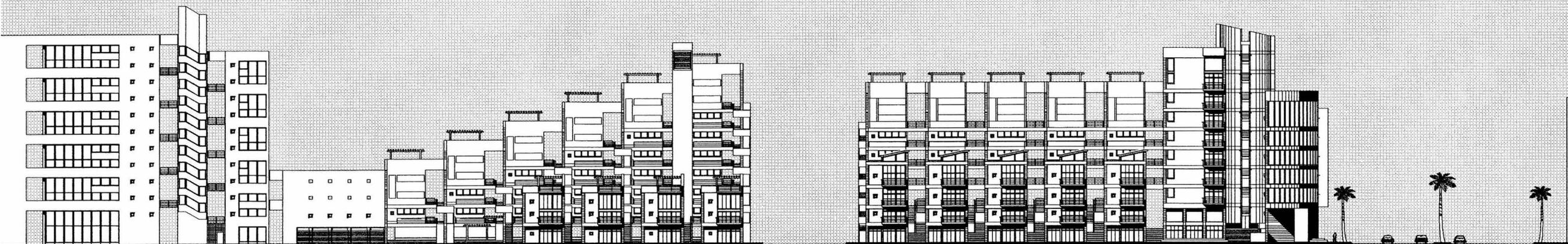


(above) photos of model. the sketch on the top is an earlier study of the north block's geometry.

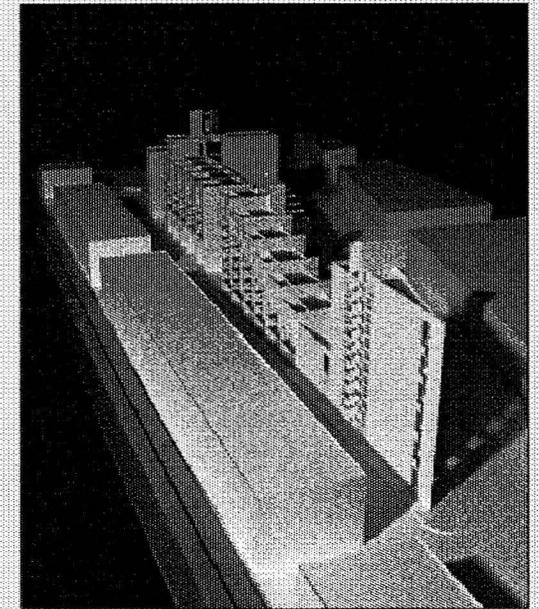
view of site from the east.



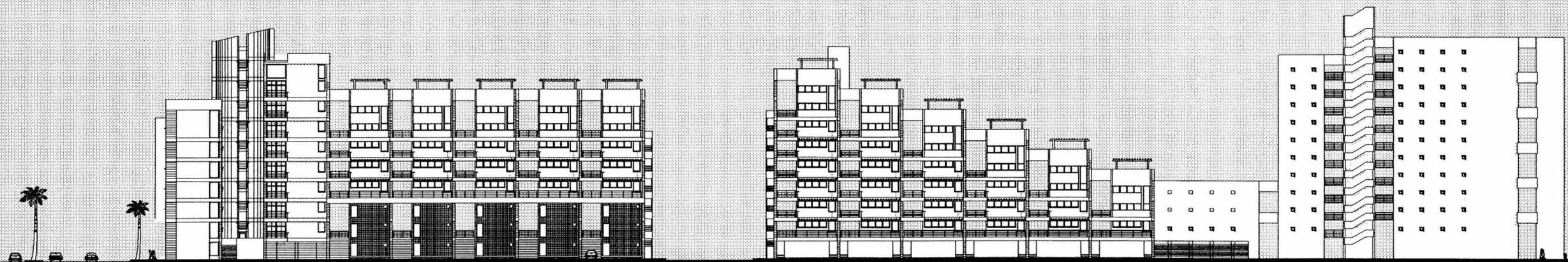
east elevation
scale, 1:70



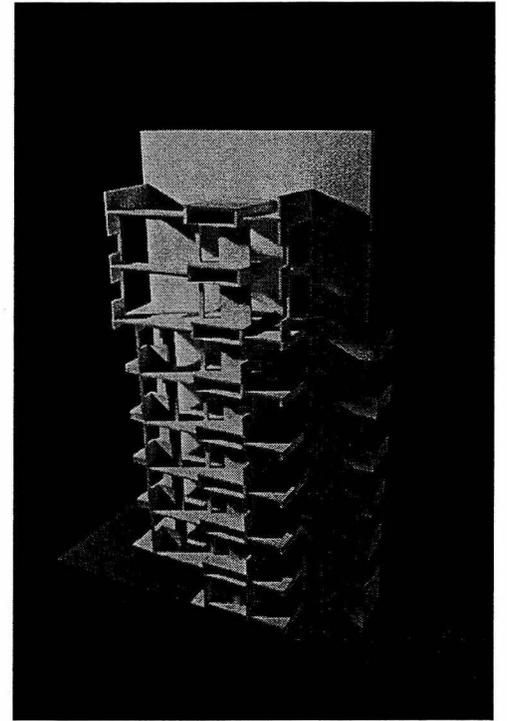
view of site from the west.



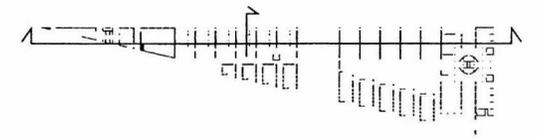
west elevation
scale, 1:70

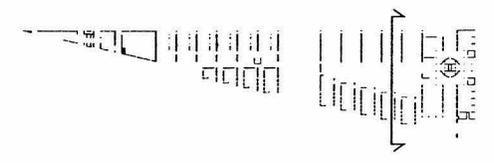


section model at typical residential unit.



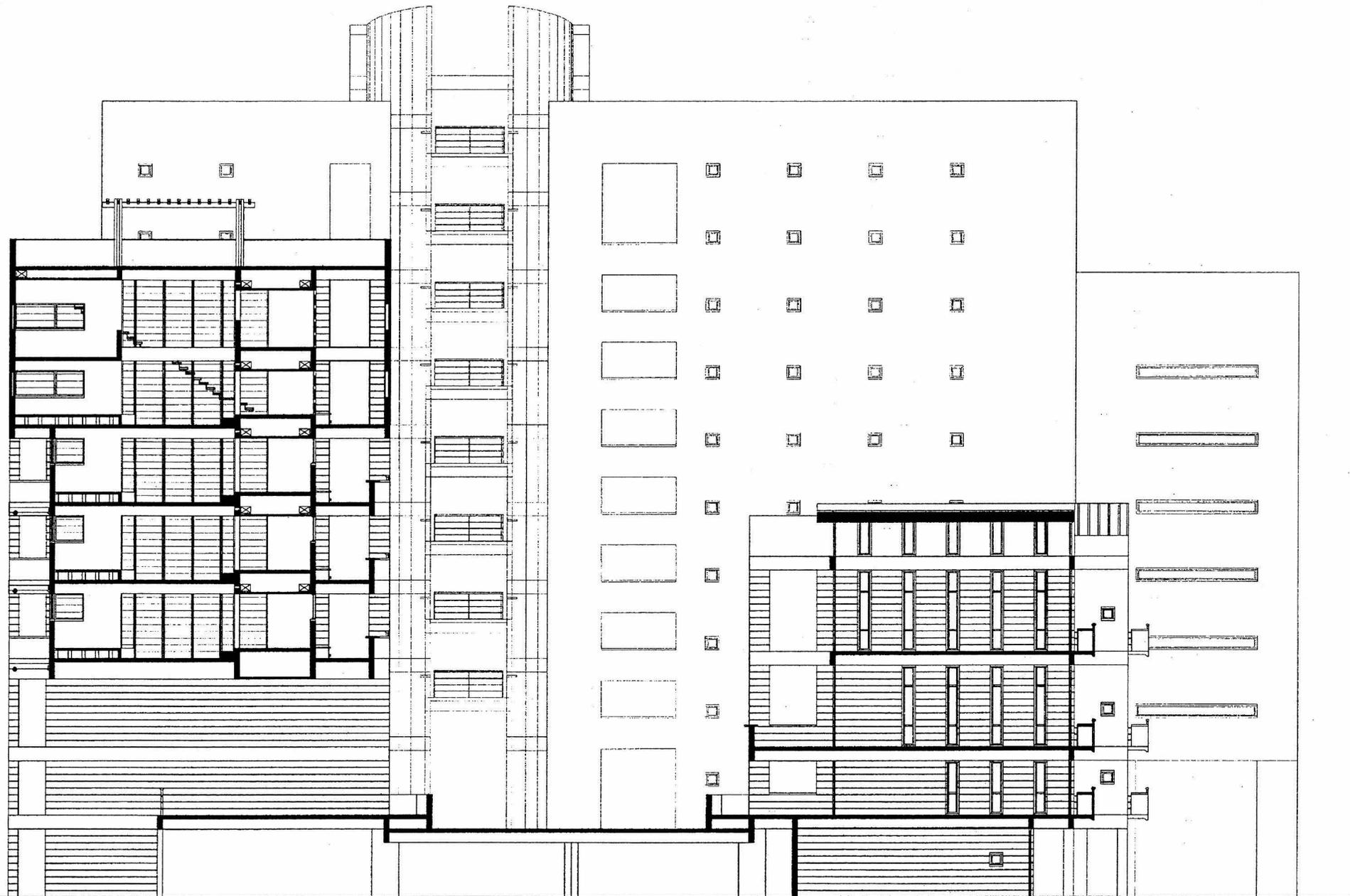
longitudinal section
scale, 1:70





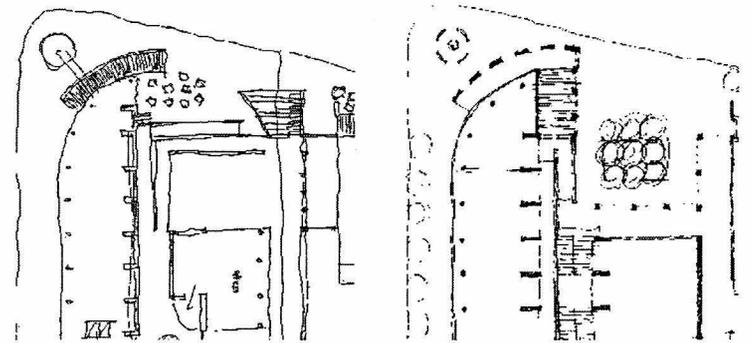
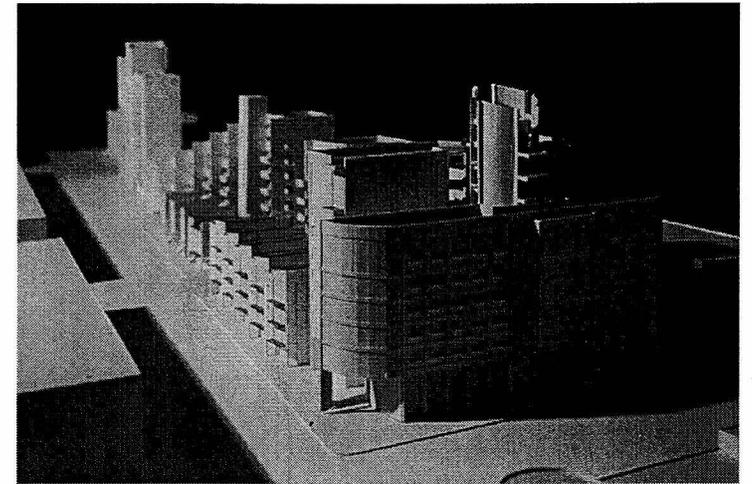
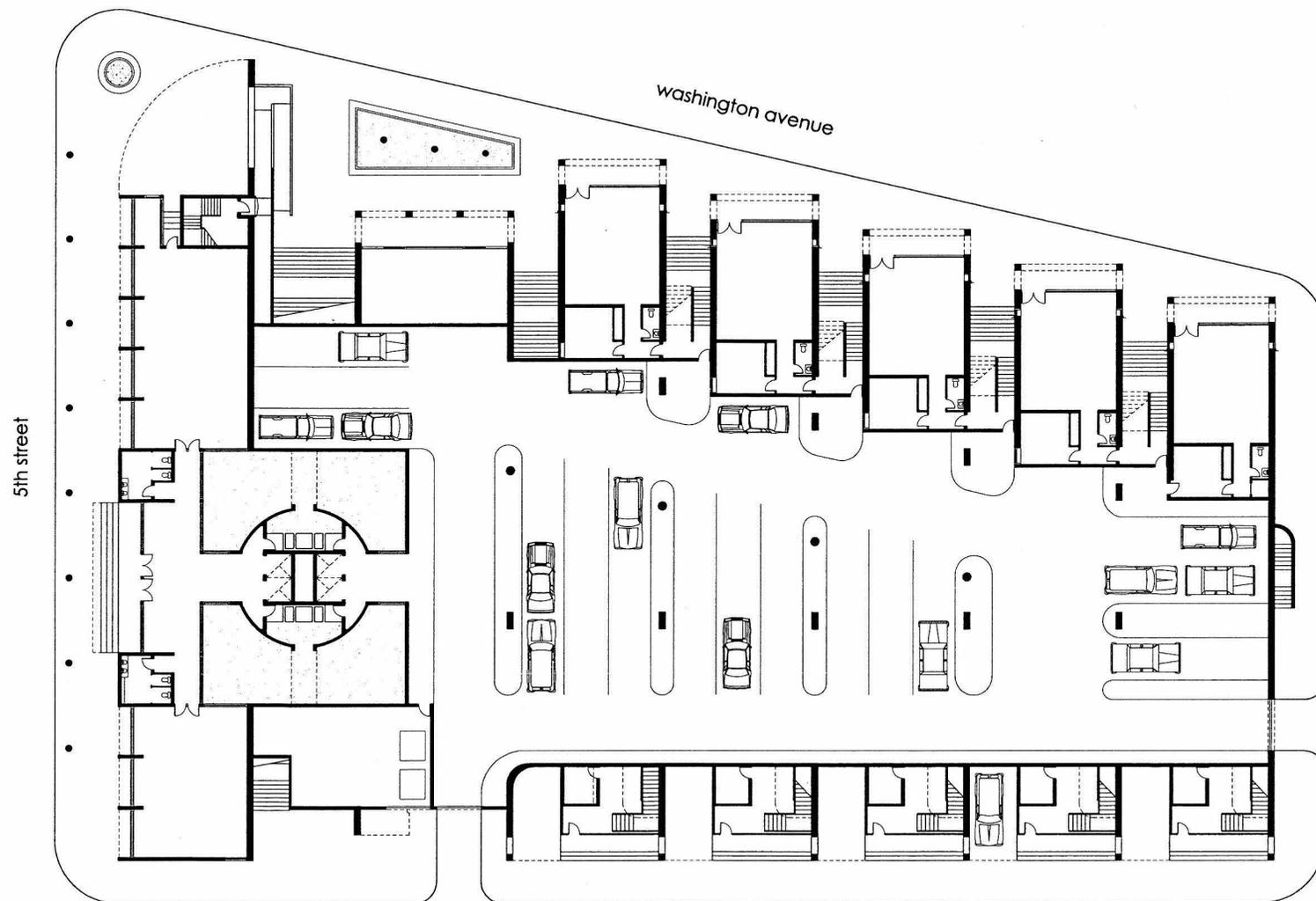
transverse section

scale, 1:20

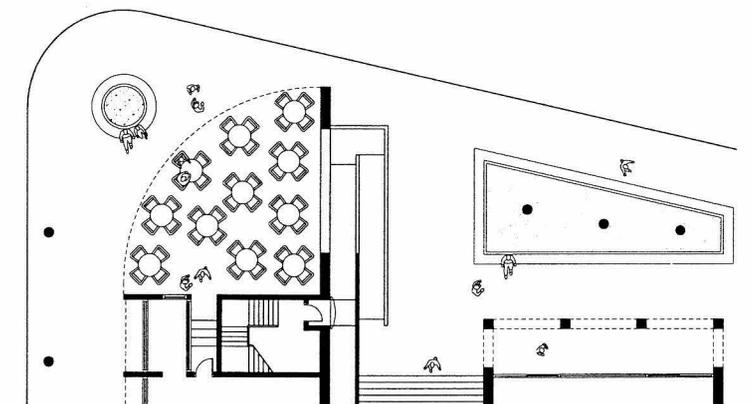


partial ground floor plan north block

scale, 1:40



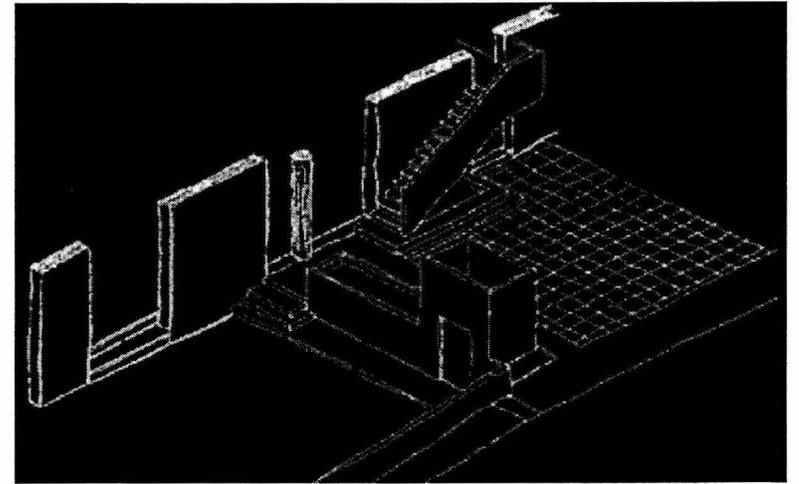
The sketches above are early studies of the corner of 5th street and Washington avenue. This corner is a vital part of the city. Two major streets of the area come together in this corner. Therefore, there is an opportunity to make a place for people to gather. The sketch on the left shows a place to gather under a trellis. On the right, a public court is developed but it becomes too detached from Washington avenue.



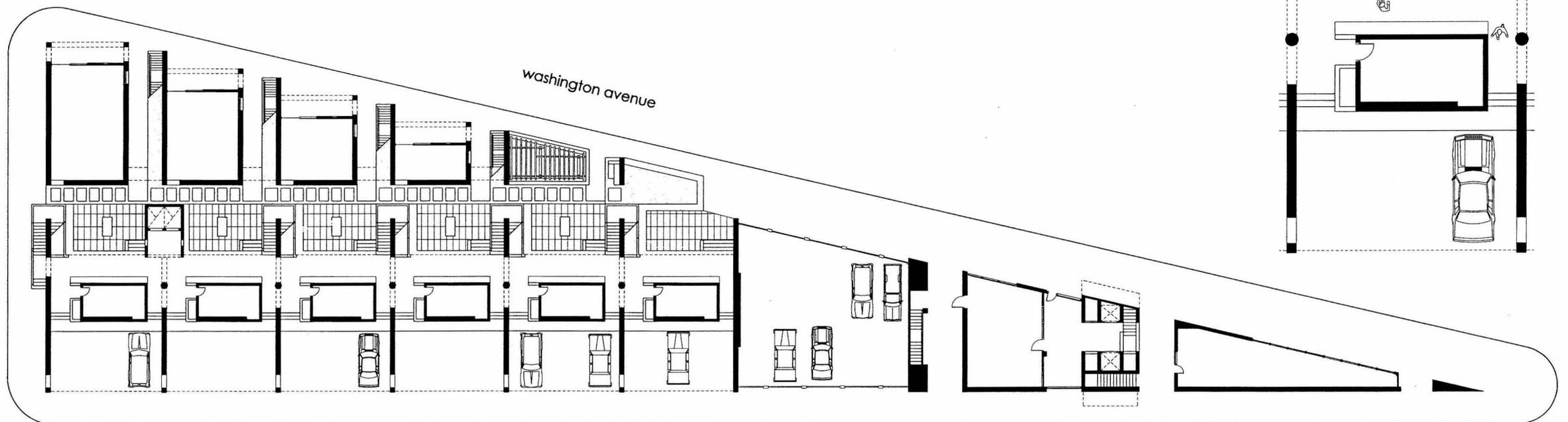
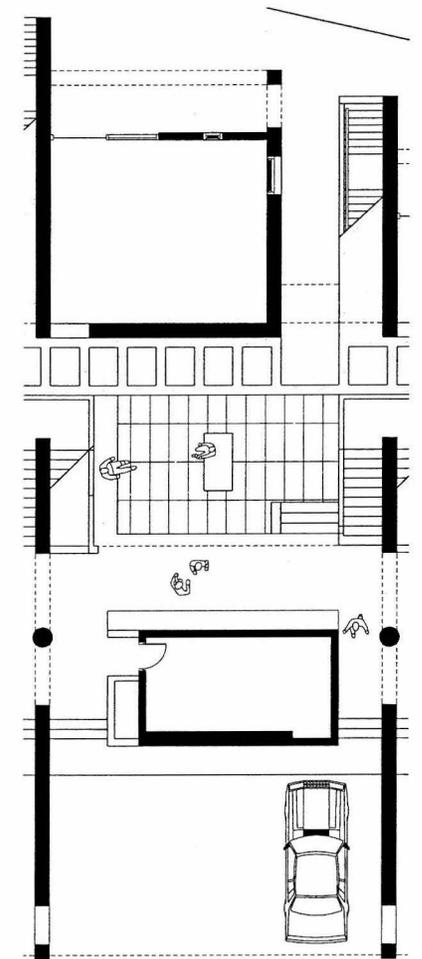
In the final scheme above an exterior room for the city is made. The corner of the office building opens up into a two story space at the pedestrian level. People can gather under shade and light. On the south part of this room a large opening act as the porthole that introduces the activity of Washington avenue. This exterior room seems to join both streets bringing more pedestrian activity.

partial ground floor plan south block

scale, 1:40

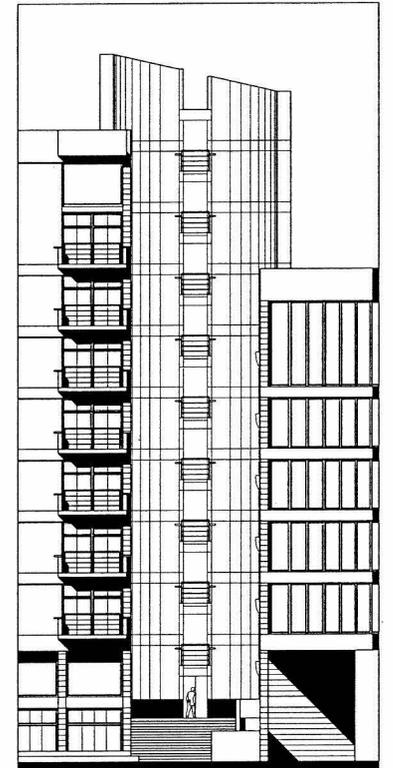
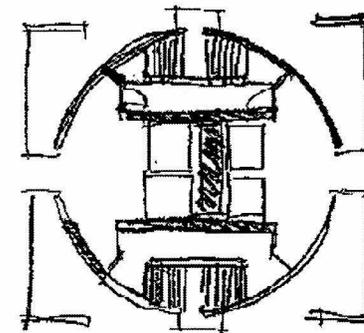
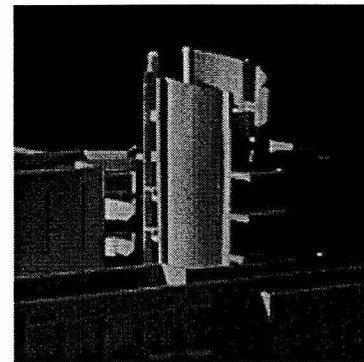
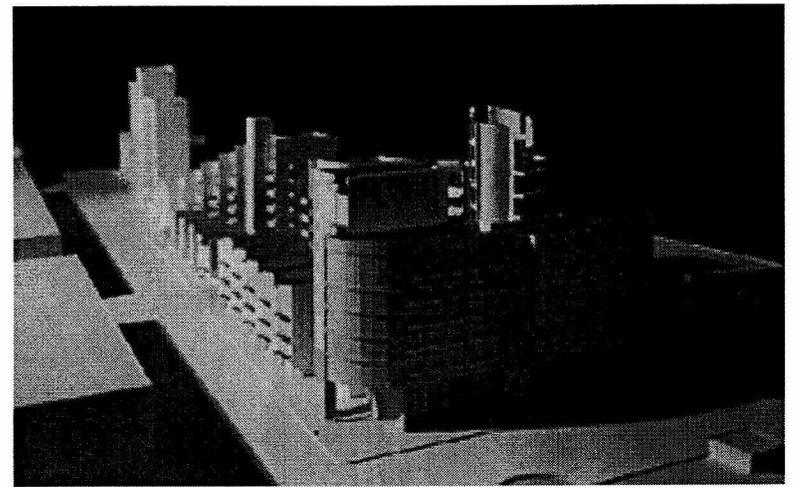
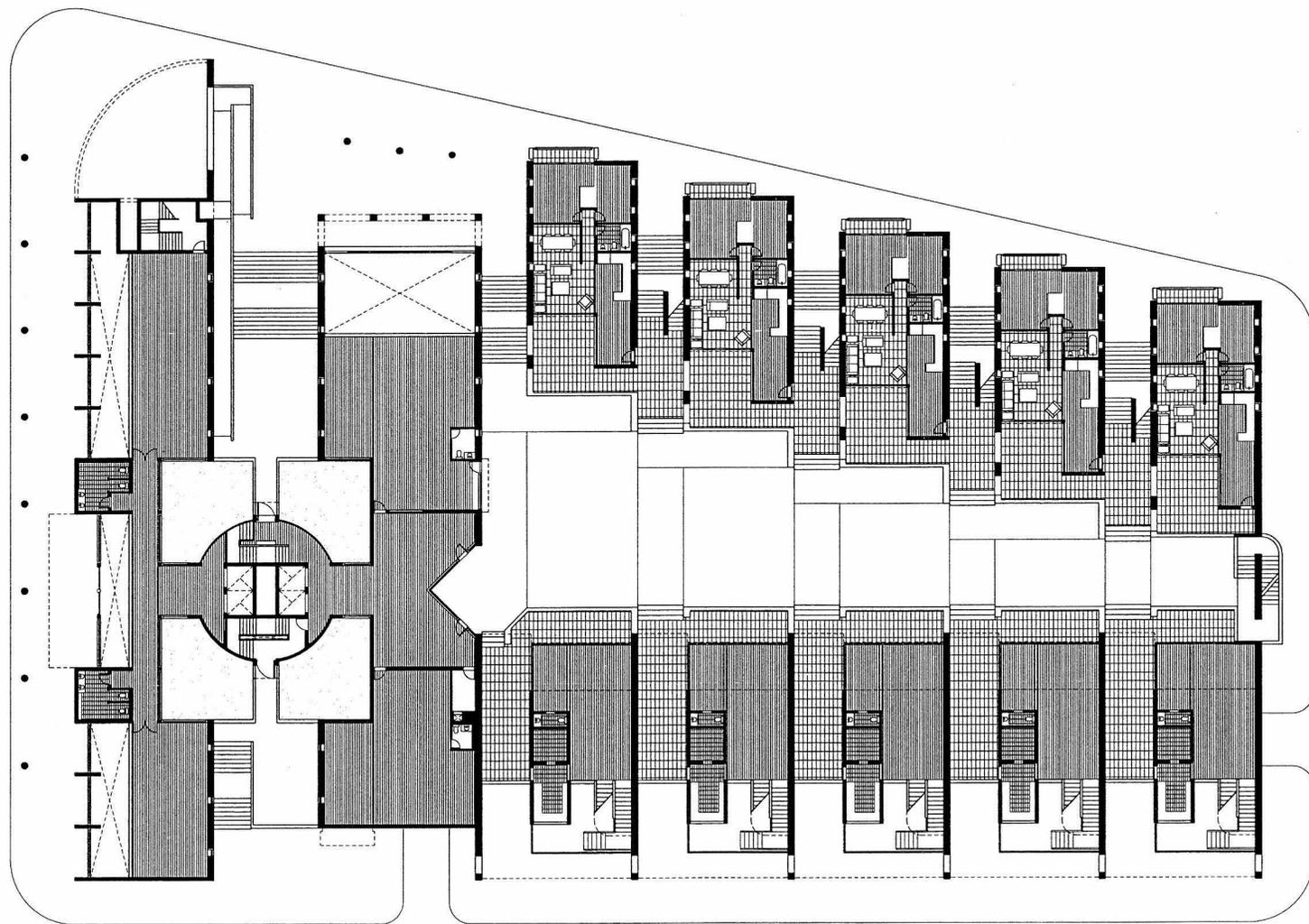


The sketch above shows the typical parking and courtyard bay on the south block. The direction of the east to west walls and open plan allow for maximum air movement. The partial plan on the right shows the courtyard as a place for tenants to enjoy. People can pause to sit, talk to someone or read. Breezes, sunshine, shade and sound are present. Winds from the ocean come from the east bringing a light breeze. The sun casts light and shadow on the walls and on surfaces. Also sound is there between large slate tiles.



partial second floor plan north block

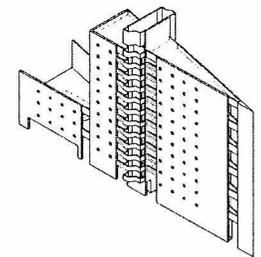
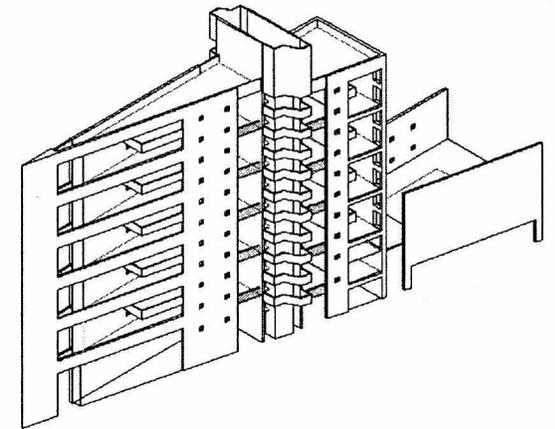
scale, 1:40



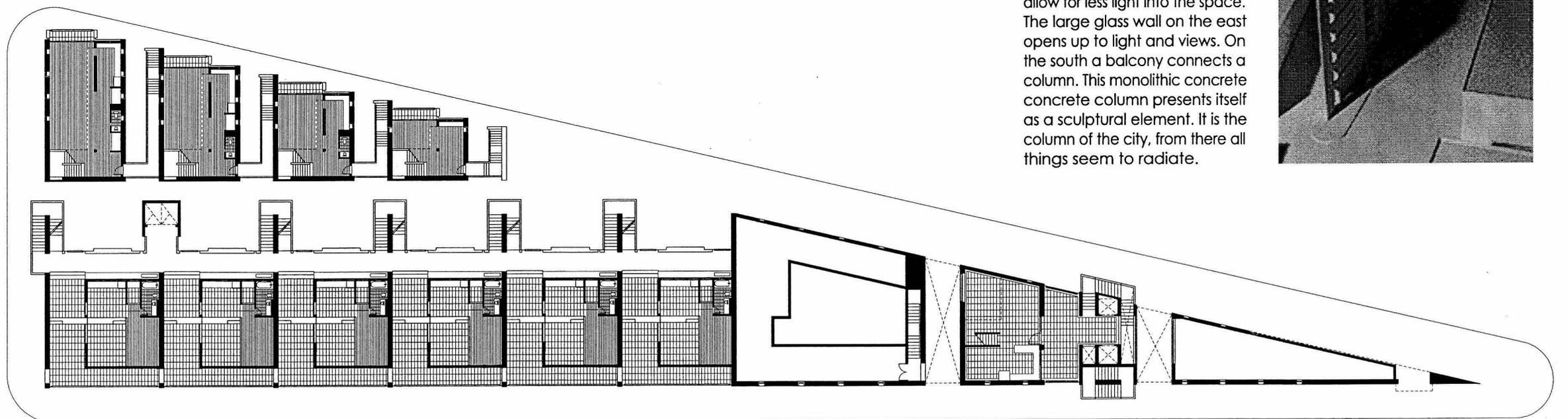
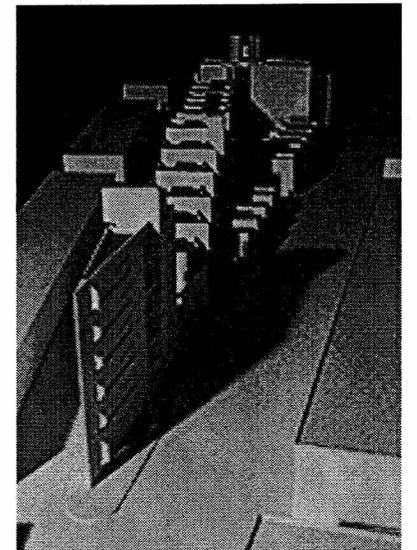
The photos and drawings above show the vertical circulation tower or core. The core is the element that engages and at the same time separates two different buildings. The core allows access to offices on one side and apartments on the other. The cylindrical shape of the core houses the elevators and stairs in an efficient and centralized manner. Vertical circulation for two buildings is located under one space. Access to the core is through all streets. The concrete structure extends far above the roof of the office building, making itself visible from the 5th street entry. Also, glass walls on the first and second floor of the office building reveal the tower at the pedestrian level. The concrete tower can be fully seen from the Euclid or Washington entrance. The sequence of approach is orchestrated by slow rising stairs or a ramp across a bridge over water, all under sound, light, shade and wind.

partial second floor plan south block

scale, 1:40

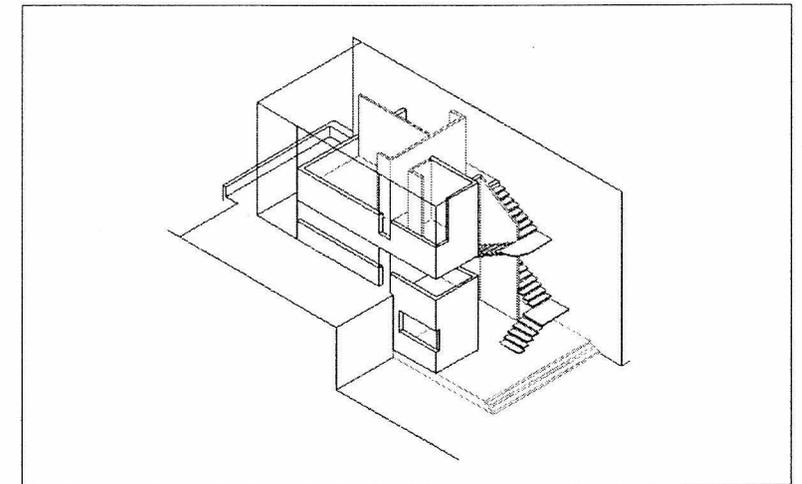
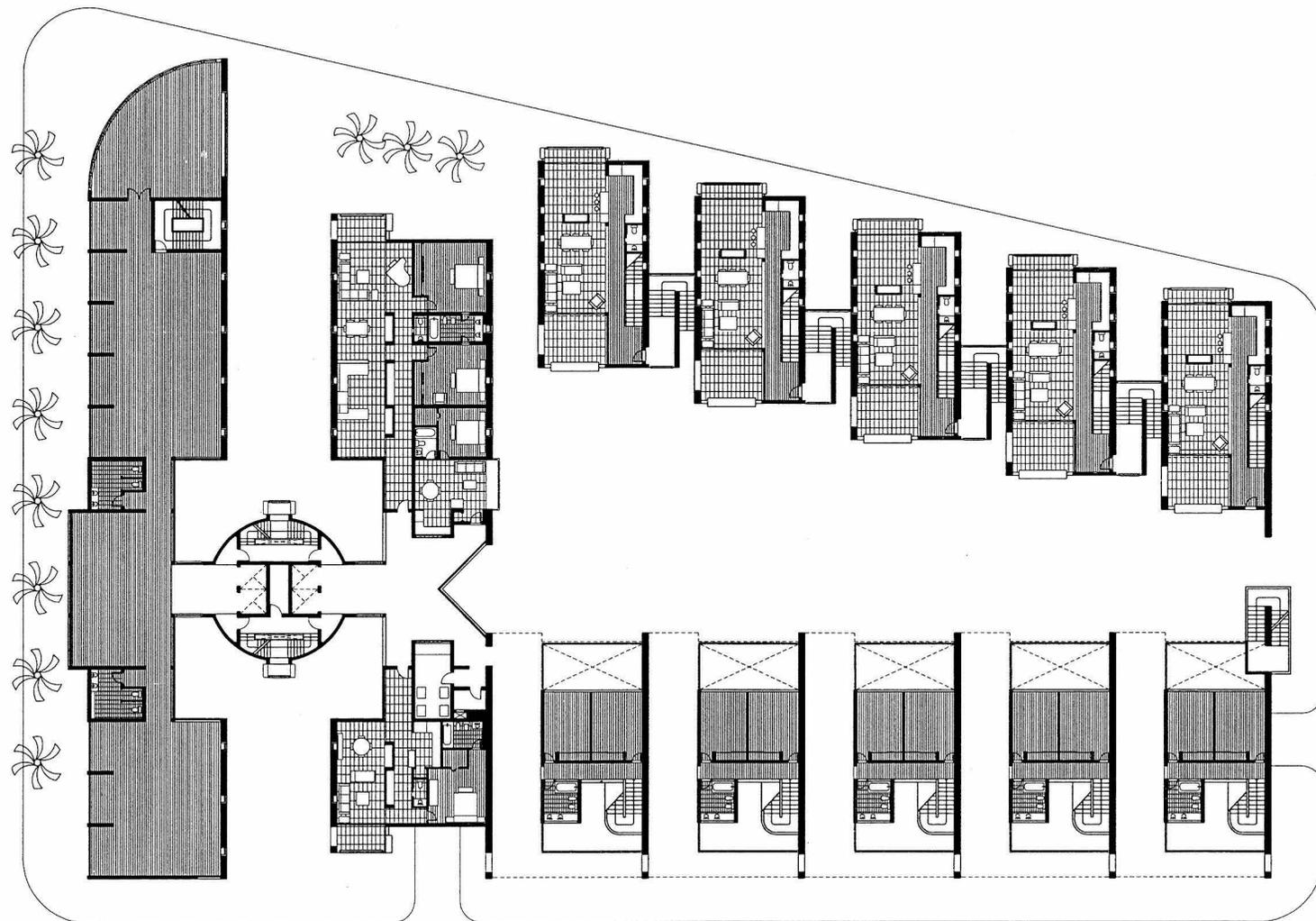


Above and on the right are two axonometrics showing the south tower on the intersection of Euclid and Washington avenue. This part of the site with its sharp wedge shape presents the most challenge. Because of this odd geometry inhabitable spaces are difficult to make. But the opportunity to make something special is evident. The constriction of room exists. Long narrow spaces are created by the triangular shape. The solution was to make double story spaces with large glass walls. The contrast between the solidity of the west wall and the east glass wall gives the living space meaning. The small openings on the west wall allow for less light into the space. The large glass wall on the east opens up to light and views. On the south a balcony connects a column. This monolithic concrete concrete column presents itself as a sculptural element. It is the column of the city, from there all things seem to radiate.

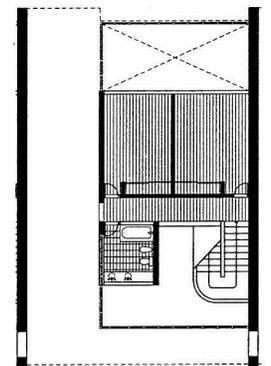


partial third floor plan north block

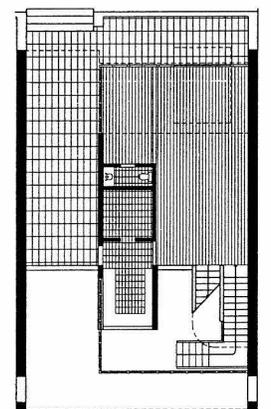
scale, 1:40



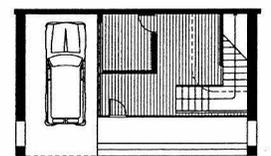
The axo above shows the single family unit on Euclid Avenue. The east to west orientation of the plan promotes cross ventilation. One of the elements that promotes ventilation is the breezeway which becomes an extension of the interior spaces. The exterior is separated by glass walls on the east, west and north. These walls bring natural light into the unit. The slight recess of the east and west glass walls from the building line result in a combination of shade and light. Glass blocks and clear glass are combined to allow privacy and translucency. Also, operable windows allow for cross ventilation. The one story living space becomes a two story, where a large window opens up to a patio and further to the terrace.



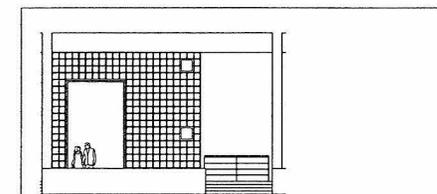
third floor plan



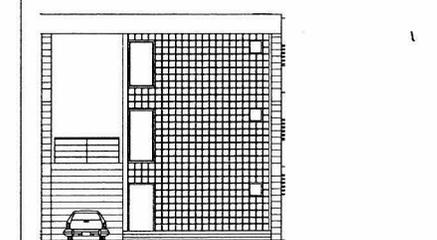
second floor plan



ground floor plan



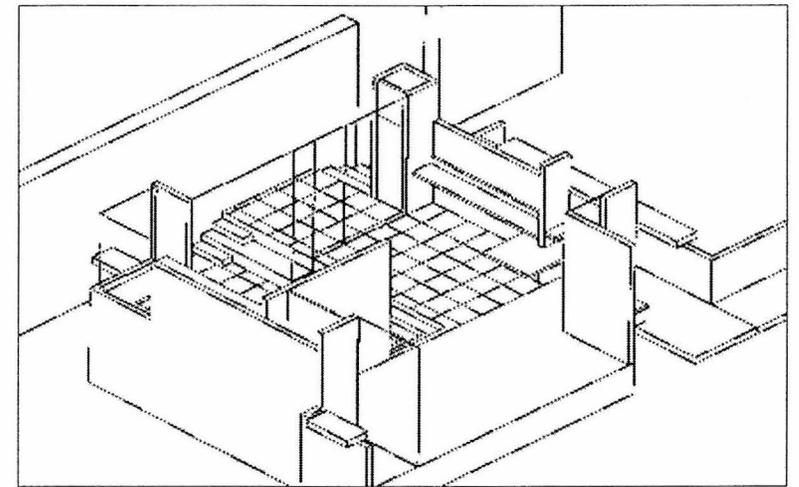
east elevation



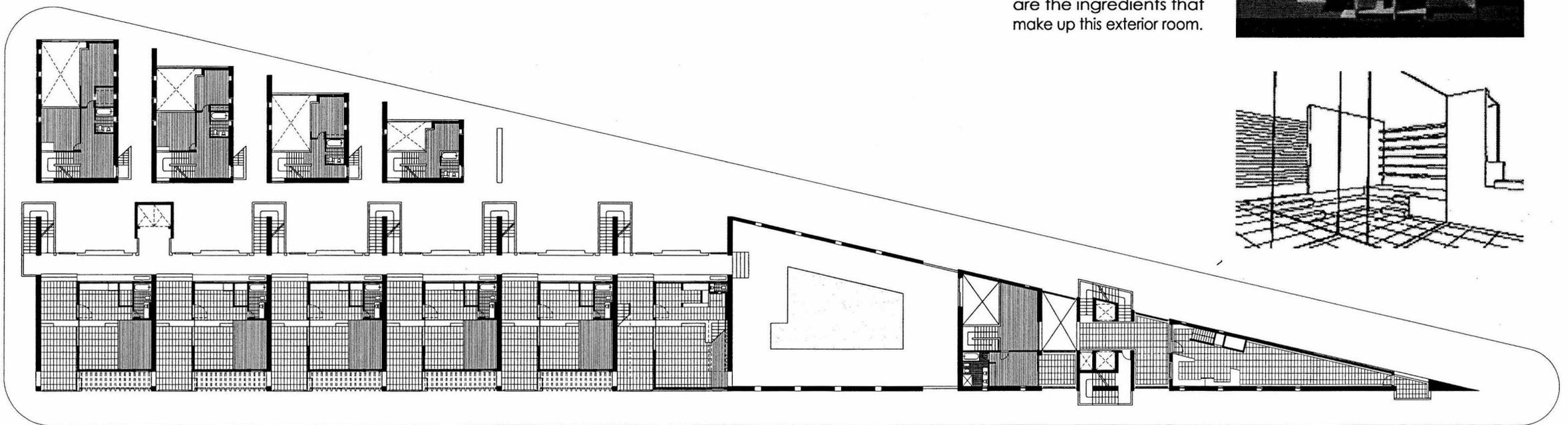
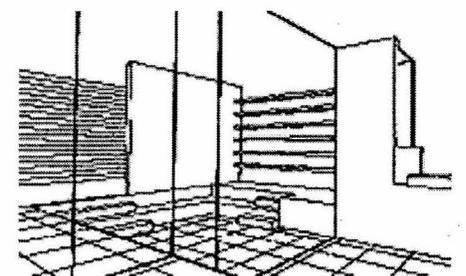
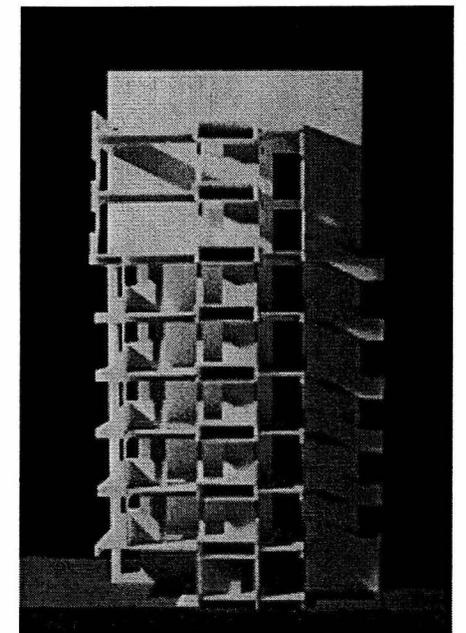
west elevation

partial third floor plan south block

scale, 1:40

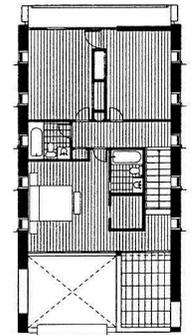
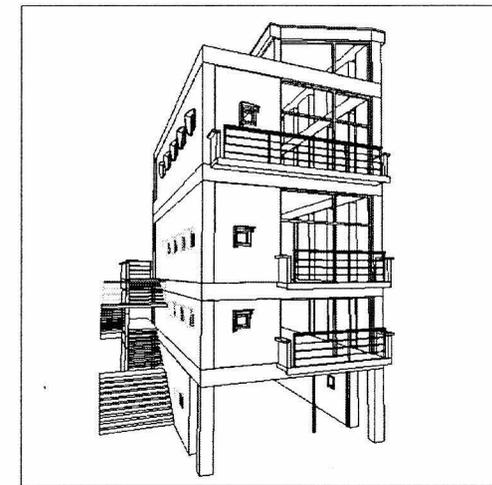
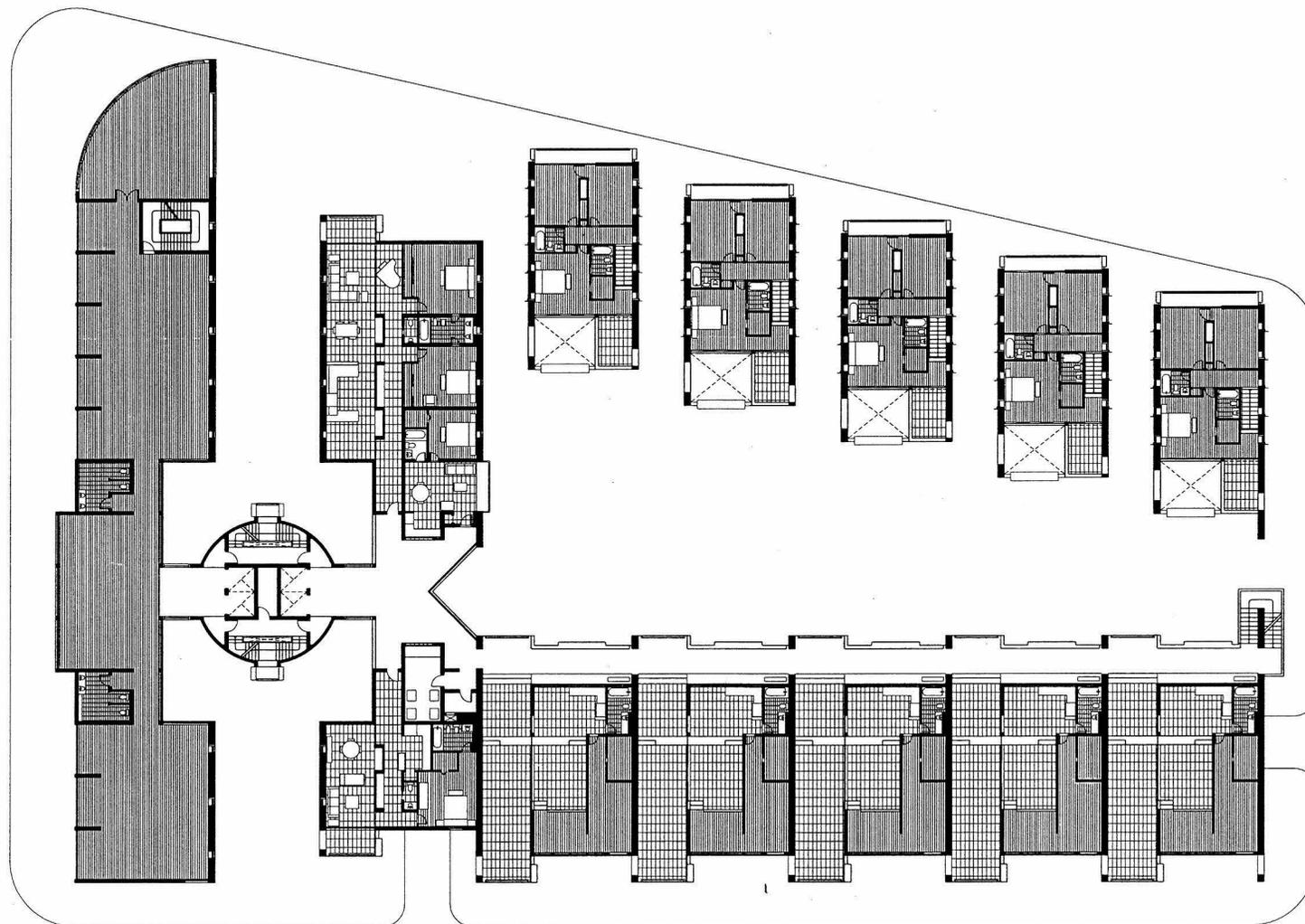


The sketch above is an early study of a typical one bedroom unit. The perspective on the bottom right looks from the breezeway into a typical unit. The main idea that began to surface here is interior and exterior rooms as one. The exterior room, shown on the section model on the right, becomes the breezeway where cross ventilation is promoted. In this room people can enjoy different activities such as gardening, reading or dining. The breezes, light and shade are the ingredients that make up this exterior room.

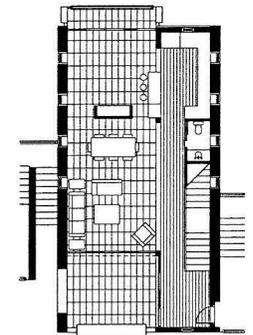


partial fourth floor plan north block

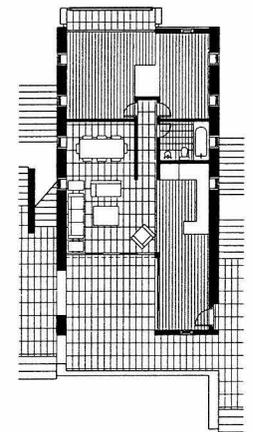
scale, 1:40



fourth floor plan



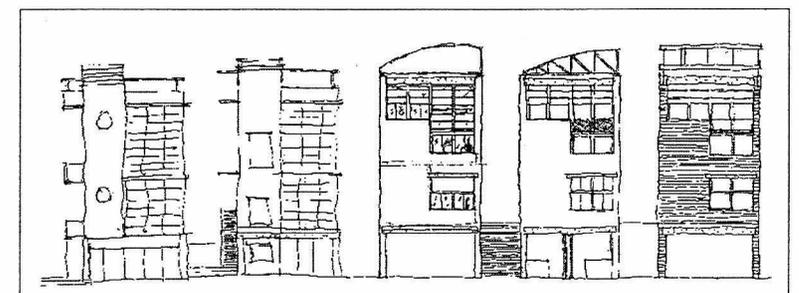
third floor plan



second floor plan

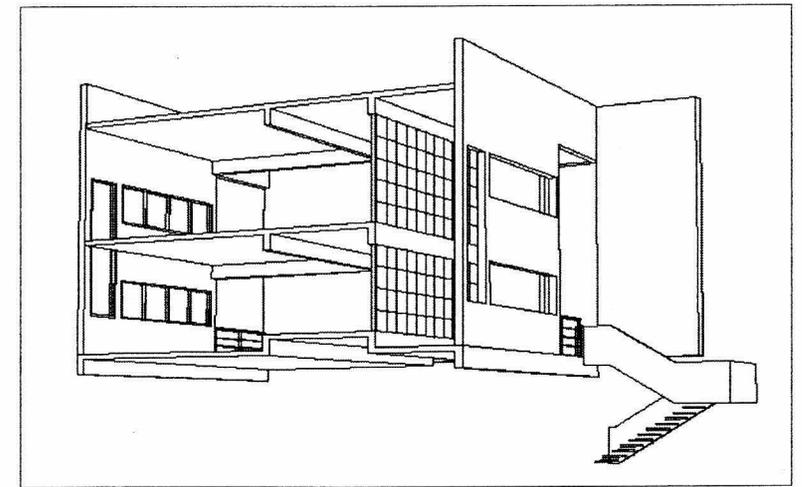
The perspective above shows one of the buildings facing Washington avenue. This buildings are a combination of retail and residential. The retail occurs at the pedestrian level or ground floor. Washington avenue is the main street for access southbound. On this vital street, shop fronts and apartments sit close to the street, the result is more human. Above the small stores are two residential units. One of the units is on the second floor and the other takes third and fourth floor. On the west side of these residential units there are private patios that act as thresholds between indoor and outdoor. The plans on the right show those private patios that face the semi-public terrace. These exterior rooms delineate the interior of the units. Inside the living versus service spaces are well defined. The living spaces are adjacent to the patios where large glass walls separate the inside from the outside. These glass walls on the east and west can bring ventilation and light into the units.

the sketches below are early studies of elevations. living versus service spaces began to be expressed.

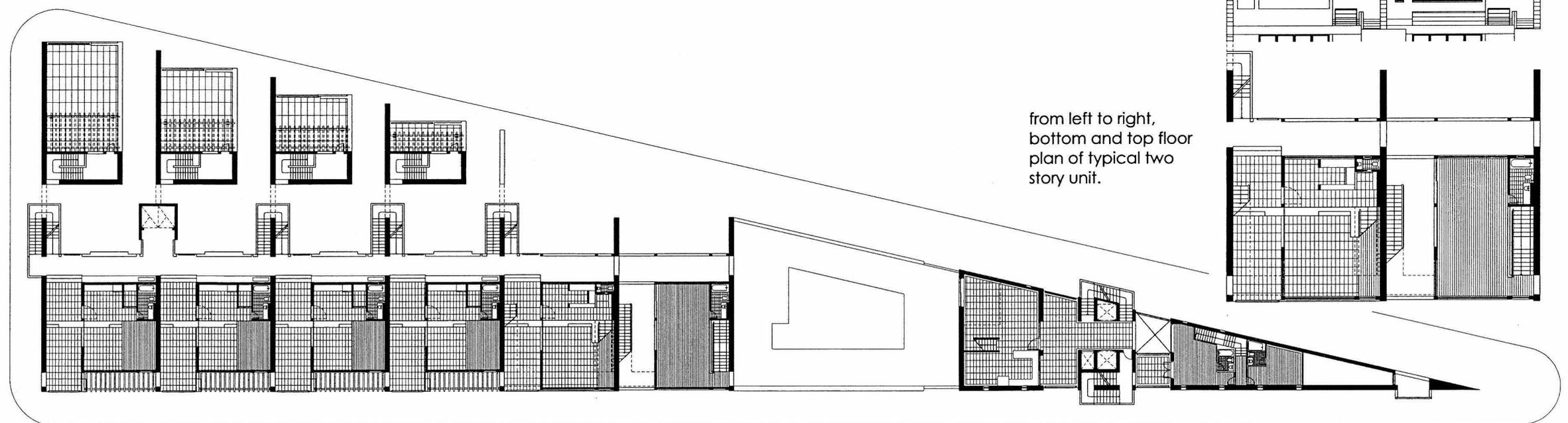


partial fourth floor plan south block

scale, 1:40



The perspective above shows a typical two story unit on the top floors of the south block. In these top floor units the public corridors end into a semi-private corridor with double story heights. The breezeway within these units also become a two story space where the sky is the ceiling. The sides of this room is enclosed by the solid wall on the north and a glass wall on the south side. The separation between inside and outside is created by the glass wall. But the transparency of this wall allows for the north wall to be perceived as part of the interior. Light and shadow is cast on the north wall where a stair rises from it up to what seems to be the sky.



partial elevation from
the east side.

from left to right,
bottom and top floor
plan of typical two
story unit.

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**The vita has been removed from
the scanned document**

*A few hundred feet from the Pyramid,
I bent down, scooped a handful of sand and then, let it spill.
Under my breath I said: I am modifying the Sahara.
The deed was minimal but the words
that were scarcely ingenious were exact and
I considered that I had needed an entire life to say them.*

Jorge Luis Borges