

ENVIRONMENTALLY RESPONSIVE ARCHITECTURE

by
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A THESIS
IN
ARCHITECTURE

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ARCHITECTURE

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Chapter I : Thesis research
Thesis Synthesis
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Thesis:

In response to today's wasteful consumption of man-made energy and quickly disappearing natural resources, a new environmentally responsive architecture must be created to apply to contemporary social housing needs.

Presently the natural environment has been an important public and governmental issue. There has been an increasing awareness that many of our natural resources are becoming exhausted at an alarming rate. Current architecture should respond to these issues. Housing, and in particular, suburban housing, is a vast and important frontier where environmentally responsive architecture must be demonstrated. Suburbia is the fastest growing entity of a city, thus having a most profound impact on the surrounding natural environment. Through such methods as natural resource utilization, xeriscaping, and use of recycled materials, new suburban architecture can have a positive effect on the environment. While making a low impact on the natural environment, this type of architecture can bring the user toward a closer understanding of the environment he or she lives in.

Context:

My site will be located in the 82nd and University Avenue area, in Lubbock, Texas. This area is a environment where current and future suburban growth will take place.

Facility:

The vehicle for my thesis will be a town house complex. The initial size of this complex will include 16 town homes with the potential to grow to 20 plus town homes as demand occurs. With all modern amenities provided, these residences will be marketed for the young, earth conscious professional.

Abstract
Thesis
Context
Facility



Thesis Synthesis:

In applying environmentally responsive architecture to contemporary housing needs, the user, through observation of his built environment, can become more aware of practical methods of conservation. In current housing design in suburbia, we can't focus on what we are doing to our environment. The endless suburban sprawl that consumes our natural environment is hard for many people to conceive. This is due to the fact that we are so abstracted from the situation. Many people can not comprehend what is being done to our environment. Abstraction is what dehumanizes us.

In order for an environmentally responsive architecture to be successful in a suburban setting, the needs and attitudes of the general users must be addressed. Today it is admirable to be environmentally conscious. Architecture that is environmentally responsive, sometimes coined "green architecture", has been proven effective in many building types. Green architecture has proven to be not only responsive to the natural environment, but very cost effective too.

In order for environmentally responsive architecture to be truly successful, the needs of the users must be met first and foremost. A residence for many is a place of comfort and security. A residence is more than a function of shelter, it must respond to the users psychological needs as well. Many residents of contemporary suburban communities chose to live in such a place to escape the crowded and congested way of living in the city. People living in the suburbs have a romantic desire to create their own homesteads in the vast undeveloped areas outlying the city. Current suburban residences in design look inward, isolating the home owner from the natural environment that surround them. I believe by creating housing that is sensitive and considerate to the environment, the user in turn will become more aware and sensitive to his or her environment.

The pallet of materials for environmentally responsive architecture may include the use of salvaged materials and low maintenance materials. With the abandonment of many industries in America and West Texas in particular, a great deal of building materials could feasibly be salvaged for use

in new construction. In many cases salvaged structure and exterior cladding of a industrial plant can be re-used as innovative structure and finish of a newly constructed building. By using salvaged materials, initial building costs, in most cases, tend to be very low.

Low maintenance materials used in new construction include redwood, aluminum, and galvanized steel. Redwood requires almost no material pre-treatment and weathers well no matter what the climate is like. Aluminum and galvanized steel are low maintenance materials because they won't rust and they maintain their appearance in almost any climate. Though all of these materials are relatively expensive, savings will be noticed with the absence of maintaining the integrity of the structure. In conjunction with reused materials, a very cost-effective, self-sustaining exterior and structure can be created. This is an important issue, considering cleaning and maintenance costs over a 20 year period on a cheaply building can escalate to more than 10 times the cost of the original building materials.

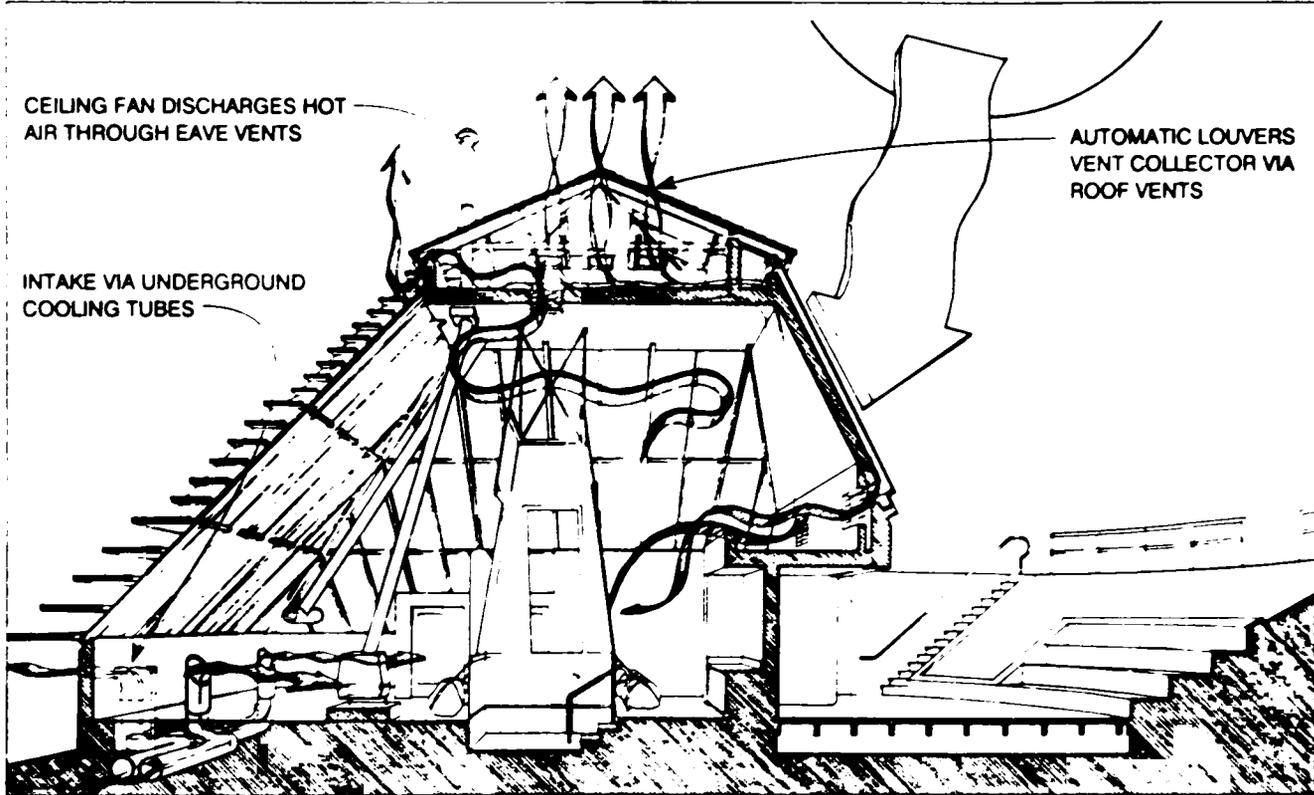
Thesis Case Study 01:
Spring Lake Park Visitors Center
Santa Rosa, California
Obie G. Bowman, architect

This visitor center is an excellent example of a building that utilizes both passive and active cooling and heating systems to function successfully. Though it is a structure that is very site specific, its principals of energy conservation can be applied in many different environments. The aesthetic quality of this building is derived from it's very mechanistic active and passive environmental systems. This building type gives the user a behind the scenes look at the mechanical systems of the structure. Similar to my thesis, the user, through observation of passive and active solar equipment at work, may recognize the opportunity to apply some of these methods in their own residences or places of business.

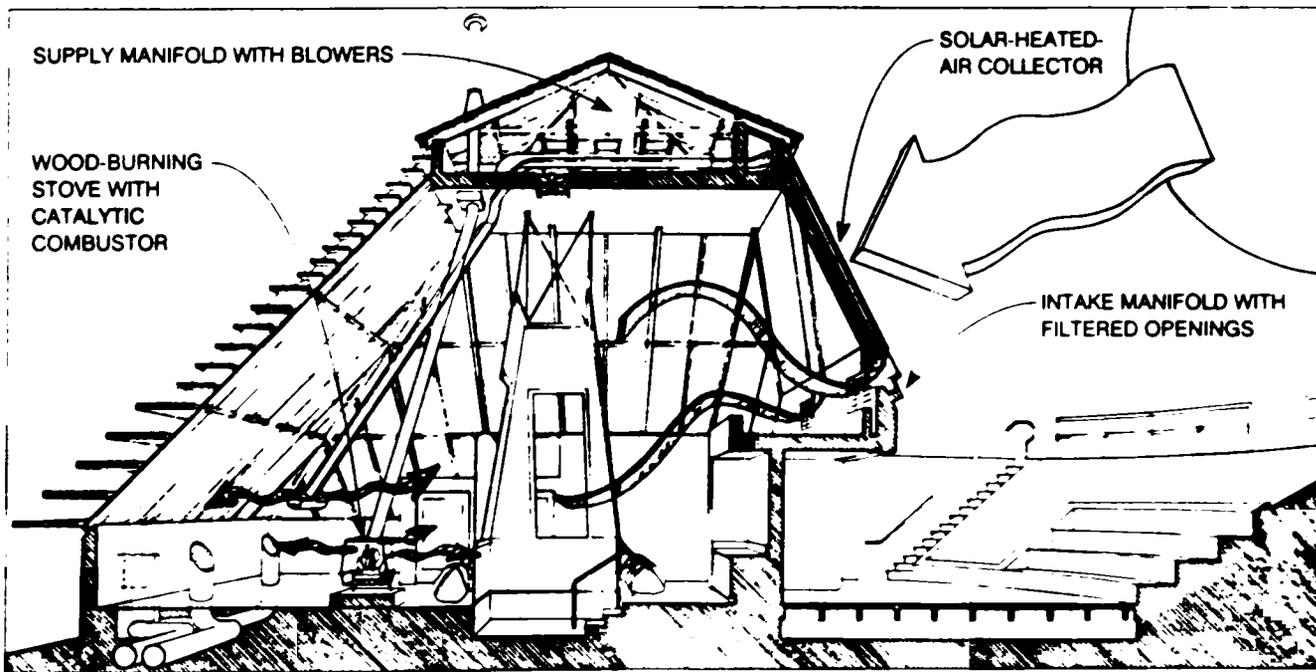


Progressive Architecture, 3/91

Thesis Case Study 01:



COOLING SECTION



HEATING SECTION

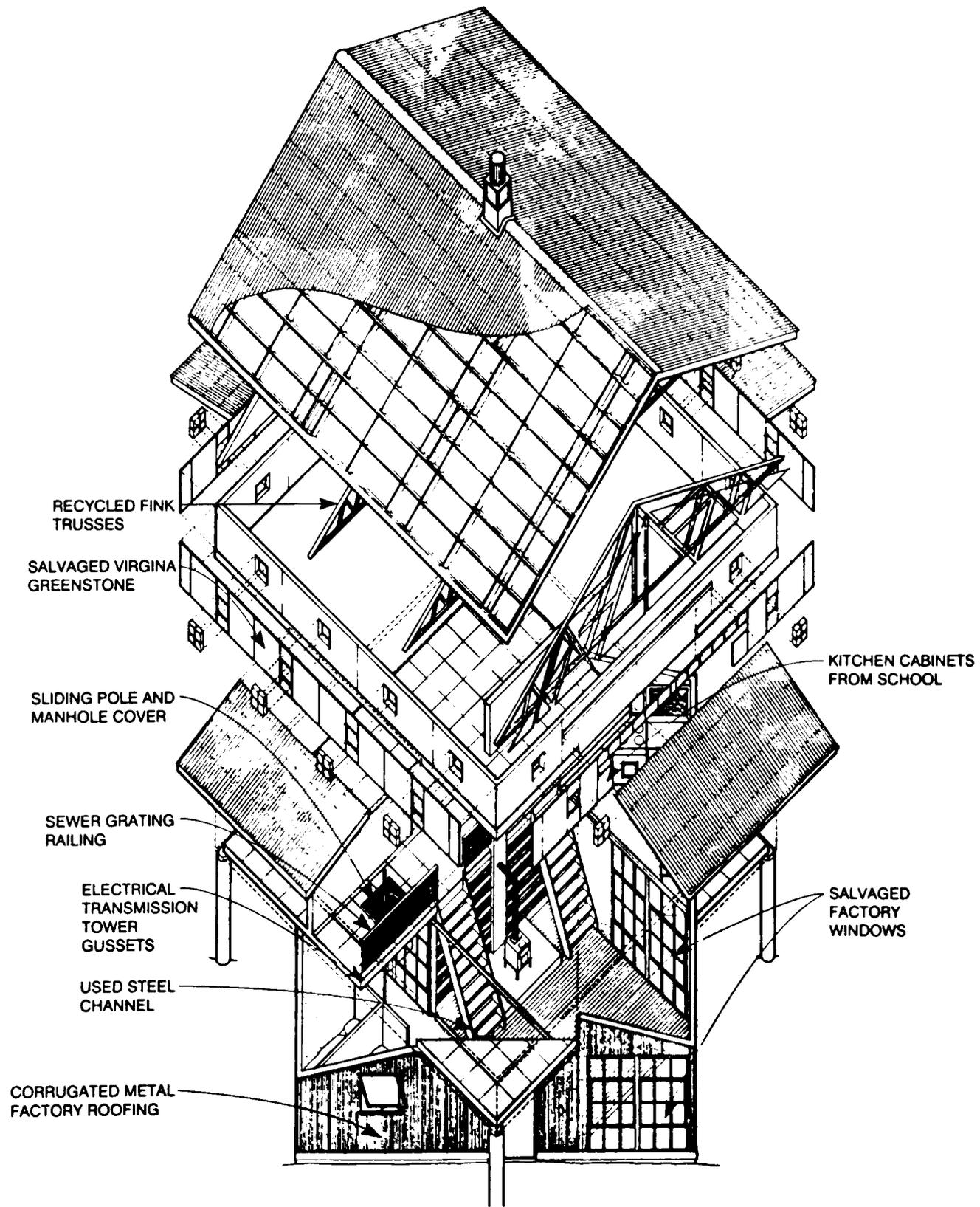
Thesis Case Study 02:
Makie House Lawrence, Kansas
Dan Rockhill & Associates, architect

This is an extreme case study in recycled materials applied to housing. Exterior finishes such as a corrugated steel roof from a abandon factory and windows from an old warehouse are effective design elements. Steel fink trusses from an old warehouse and used channeled steel are part of the house's structural system. Interior finishes include sewer grates, cabinets and sinks from an abandon school, and galvanized steel triangles from a transmission tower. These elements make a creative and very functional interior.



Progressive Architecture, 3/91

Thesis Case Study 02:



Annotated bibliography:

Peter G. Rowe, 1991, Making a Middle Landscape, The MIT Press, Cambridge, Massachusetts.

This book was critical for me in defining the context of modern suburbia. Related topics included the suburb as monotonous conformity or individual comfort, placelessness or place, and social trends and variations. The most pertinent information out of this book was the discussion on mans need for suburban housing as an escape. Rowe also discusses the pitfalls of modern suburbia. Such things as the strip shopping center and mindless contemporary housing design leaves many disillusioned with modern suburbia.

Donald N. Rothblatt and Daniel J. Card, 1986, Suburbia, an International Assessment, St. Martins Press, New York, NY

This book was important in defining the importance of the housing environment and community services. Social patterns and psychological well-being of people in suburbia were discussed intensely. Rothblatt defined the importance of the balance between private and social needs. On one hand many suburban residents adore their privacy. On the other hand, there is an inherent need for social interaction and identity of community.

Jack Lessinger, Ph.D., 1990, Penturbia: Where Real Estate Will Boom After the Crash of Suburbia, Socio Economics, Inc., Seattle WA.

Penturbia refers to a new city type, the fifth since the beginning of industrialization in the 18th century. Suburbia was the fourth. Penturbia is a predicted new frontier of residential development. Lessinger claims that suburbia is headed for financial ruin and over development. He develops a theory that people will completely move out of the reach of existing urban and suburban frontiers to new uncharted areas to develop.

Robert AM Stern, 1981, Anglo American Suburb, Architectural Design Profile, London

Out of this book I gained insight in the design and creation of historical and recent suburban areas. Graphic and written examples of such famous suburbs as Riverside, Garden City, and Bedford Park were discussed. Organization around a central "green" area were common in many of the successful historical suburban housing developments.

Chris Fawcett, 1980, The New Japanese House, Harper and Row, New York, NY

This book was important in my understanding of houses in touch with nature and their surroundings. Strong geometries and the bringing of the garden into the house were some of the effective methods of housing design discussed. Efficient use of land was also an important issue in designing with the environment.

Progressive Architecture, 3/91, p. 69-88 "Architecture and the Environment"

This article covered the historical roots of environmentally conscious architecture and current practice and examples of innovative environmental design. Included were successful examples of contemporary housing. Though many of the examples were extreme in their philosophies or expensive in price, many innovative ideas about designing with nature were brought up.

The Architectural Review, 9/90, p. 37-93 "Green Architecture"

This article covered contemporary successful ecological designs. Techniques and methods for environmental planning were discussed. Included were already developed, working pieces of green architecture. Low maintenance costs, efficient environmental systems, and user comfort were highlighted extensively.

Robert Mc Carter, 1987, Pamphlet Architecture No.12,
Building Machines, Princeton Architectural Press, New York,
NY

This book gave me insight on how buildings could work as, and define aesthetics from a machine. Housing and building design that relies on the machine aesthetic proves to be an efficient and timeless way to approach design.

Chapter II : Context Issues

Cultural Context and Potential Response

Psychological Context and Potential Response

Built Context and Potential Response

Natural Context and Potential Response

Context Issue Case Studies

Annotated Bibliography



Cultural Context and Potential Response:

Attitudes towards contemporary housing in the West Texas area are very conservative. The general housing developments consist of typically flat faced ranch style housing. The development of Lubbock suburbs are typically formed on tight rectilinear grids. The forms of the houses and developments they are found in cater strictly to the automobile. West Texas is a very mobile culture. Most residents take pride in their automobiles. The automobile is defiantly a strong symbol of West Texas culture. Other elements of West Texas culture include a sense of Western life style. This is not to say every one is consumed by the "cowboy" culture, rather most feel the sense of openness and freedom of the open planes. Land in this area is abundant and people generally don't want to feel by their surrounding built environment.

The issue of access for automobiles must obviously be addressed for housing to be successful and accepted in this area. In addition to responding to the auto, the pedestrian must be given equal consideration. Pedestrian access must be given for social and recreational needs. The large and open paved suburban roads offer no opportunities for recreation or method of travel for the pedestrian. Creating a variety of access opportunities for the pedestrian and reducing the amount of paved area will provide a equilibrium between the auto and the pedestrian. In addition to meeting the needs of the users, the environment will be effected in a positive manner. By reducing large areas of pavement, natural rain water has a greater chance to stay on site and eliminates reliance on drainage ponds and street sewers. With the addition of greater pedestrian access, the users have a greater chance of exploring their immediate environment.

Psychological Context and Potential Response:

The psychological context of most of West Texas is one of independence and need for private space. An abundance of wide open land in West Texas attributes to most home owners wanting their own piece of property.

In creating successful environmentally responsive housing in a suburban context, the users psychological needs must be addressed. First is the need for privacy and silence. The whole concept of the suburb stemmed from a need to escape life in the industrialized city. The suburbs are a means of escape. In the suburban context though, there are many noises, especially in a townhouse or apartment type setting, that must be addressed. Such noises as laughing, voices, shrieks of greeting, coughs, sneezes, clearing of throats and baby's wailing are some displeasing sounds that the user should be protected from. Building techniques such as soft surfaces, non-parallel walls, vibration eliminators, insulation, and locating machinery underground are methods of creating a silent tranquil atmosphere. If a setting of enjoyable silence can be created, this psychological need for tranquility will be accomplished. In addition to sound, consideration must be given to visual zoning. Views should be clear and free of obstructions in public areas. In private areas, views should be controlled and focused.

In addition to privacy needs of the user, social needs must be met. As mentioned above, humans have the need for privacy. It is equally important in a housing situation for humans to have the opportunity for socialization. Opportunities must be given for home owners to interact and gather. If these social needs are met, a sense of community and identity for the user and whole community are achieved. This aspect is crucial since some residents will be young and single. This group has a great need to socialize and meet others of their age and economic group.

Built Context and Potential Response:

On a regional scale, the most noticeable aspect of the built context are components of the agriculture industry. Ten to twenty story cylindrical grain silos and pyramid type cotton storage facilities are the most noticeable architectural feature on the South Plains. These powerful monuments to the areas all important agriculture industry should be considered in determining a vernacular in this region. On a more local scale, the current housing situation in the South loop area is one of ambiguity and irrational housing design. This is to say, current housing styles in Lubbock are completely built without concern for solar orientation or climate factors. Additionally, there is a falseness present in many of the forms of most of the residences in Lubbock. There is a myth of creating the perfect homestead through front porches that don't function, columns that have no structural qualities, and materials that are inappropriate for this region. The typical housing development in this area consists of faceless "cookie-cutter" houses arranged on a tight grid. Very few to none of the residences has taken the environment and the users practical needs into consideration.

In a townhouse situation like the one I am proposing, the user is looking for a low maintenance residence, similar to a condominium or apartment, and the space and privacy of a private residence. Consideration must be taken for the users access to the major roads into Lubbock. The users privacy and access to recreational activities must also be considered to create a satisfactory built environment.

A potential response to the regional and local built context would be to consider pulling certain design elements from the area agricultural industry. This response would establish a vernacular for the complex and region. There are many existing access opportunities to the main roads to all parts of Lubbock, so this shouldn't be a major issue yet. In regards to the opportunity for access to recreational activities, consideration must be given to the design of natural green belts and possible built features, such as a pool and clubhouse area.

Natural Context and Potential Response:

The natural context of the South Plains region is characteristically flat, farm land, and grazing fields. Wind is defiantly a factor to be taken into consideration. The effects of the wind and flat terrain can be taken advantage of, if utilized properly. Sunny days most of the year are also characteristics of Lubbock's typical climate.

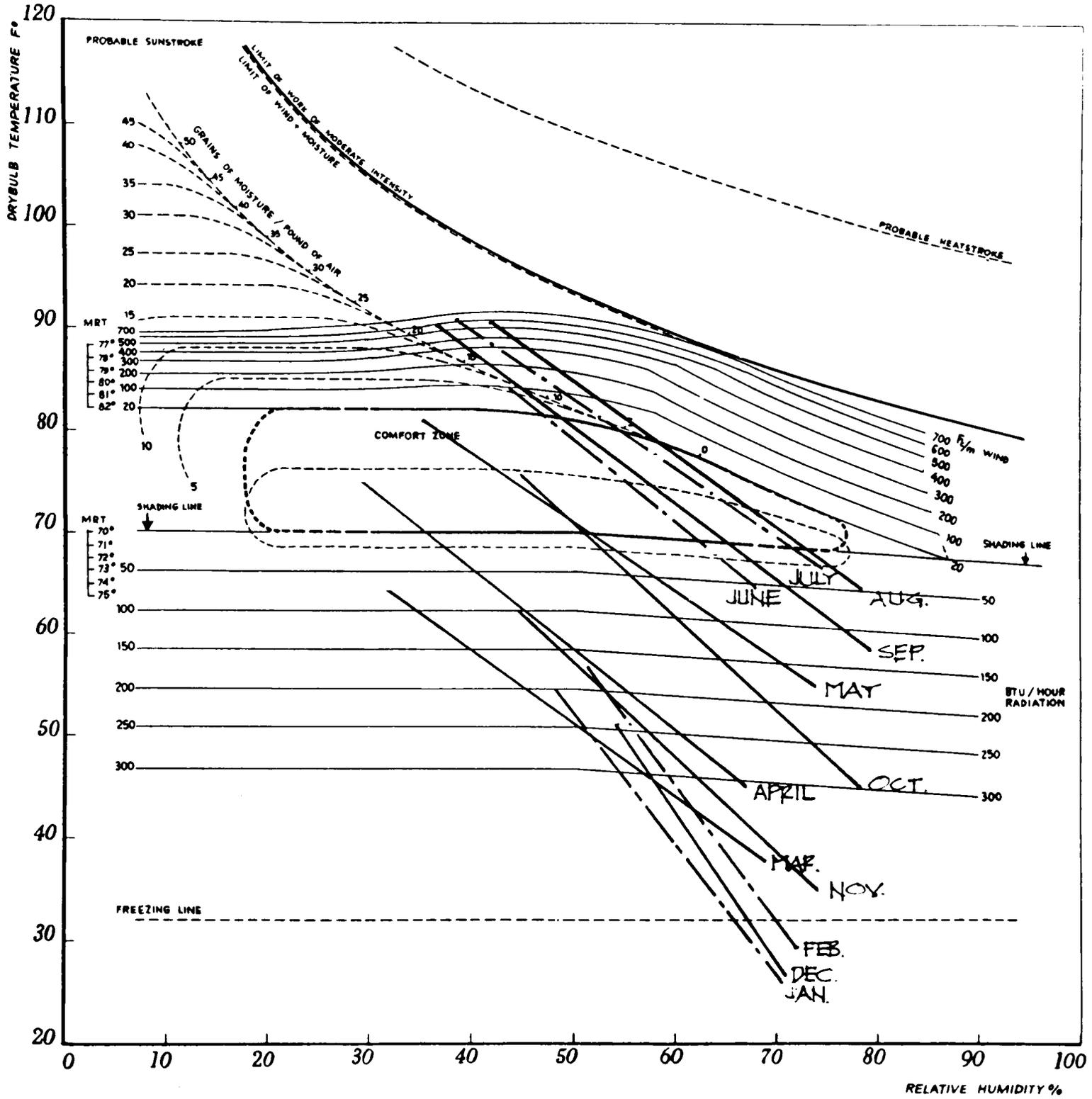
In the design of environmentally responsive architecture, the relation between man, the built environment, and the natural environment is very important. Pertinent natural concerns include minimizing developed areas and maximizing natural areas, water conservation, and developing the architecture to interact well with its natural environment. If these concerns can be met, the natural and built environment can exist in virtual harmony.

In the area of Lubbock I'm considering, much of the immediate land has long been utilized for agriculture production. I believe if my development can retain it's own rain water, provide wind protection, and maintain a grey water irrigation system, a virtual oasis can be created in South Lubbock. This is not to say exotic plantings and ground cover will be imported to this site. All landscape features will be indigenous to the West Texas area.

In developing environmentally responsive architecture, the climate of Lubbock must be examined carefully. The climate data presented on the following pages will establish the criteria on which to design a environmentally responsive residence. Provisions for cooling and heating will be provided throughout the residence. Methods for cooling include proper overhangs and orientation for utilization of solar rays and cooling winds. In addition, a traditional refrigerated air conditioning cooling system and radiant heating will be provided for skeptical buyers.

Climate Data

Comfort Index:



Bioclimatic Chart, for U.S. moderate zone inhabitants.

Design With Climate, Olgay

Bioclimatic Chart Summary:

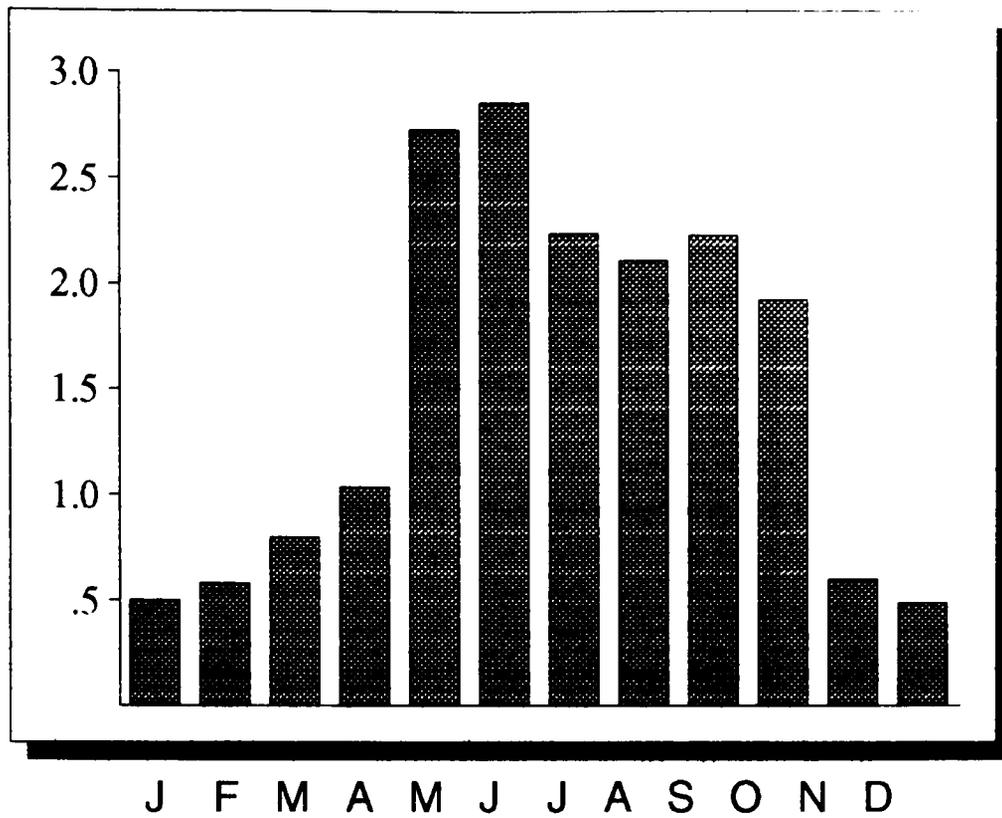
From this bioclimatic chart, information on when heating and cooling must be needed, the methods of shading and ventilation, and when moisture must be added or taken away from the air is provided.

During the summer months in Lubbock is generally a time when most people want to be cooled. To accomplish this, air circulation and ventilation must be provided. To be specific, in August through September, winds and proper overhangs could be used for cooling. Extreme days in June through September are times when moisture should be added to the natural air circulation for proper cooling. During these months, it is important to note that high and low extreme temperatures occur on both sides of the comfort zone. Cooling can occur during the morning and thermal mass can recharge during the day. At night the thermal mass radiates it's heat and warms the space.

During the winter months, admitting maximum amounts of sun and blocking the wind will keep the occupants comfortable. During the day, solar exposure to a thermal mass should be at a maximum so heat can be stored and transferred at night. In the fall, sun will be needed just in the mornings during October and all day November thru February. Blocking the wind during these times will also be needed. Additionally, in the spring, admitting the sun and blocking the wind all day in February and on March mornings will keep the occupants comfortable.

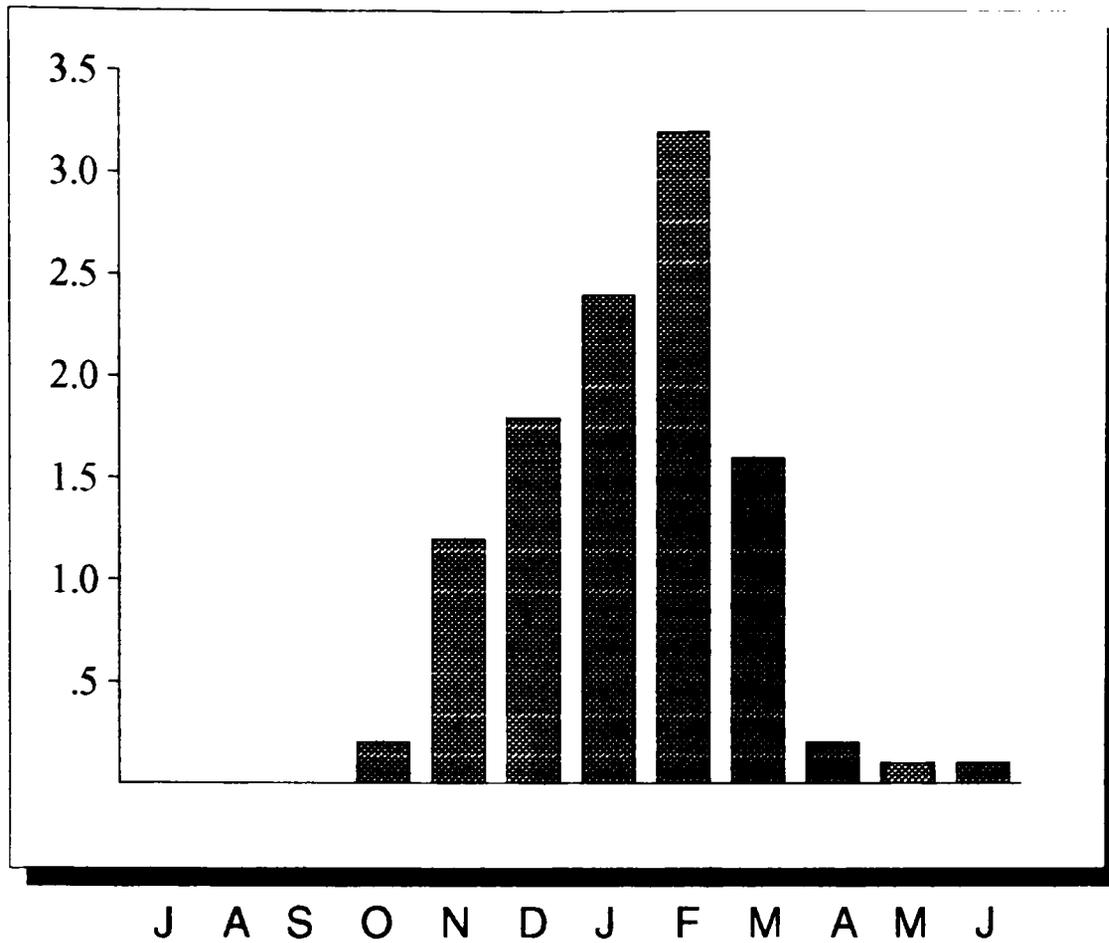
The climate information to follow is vital in developing my proposed townhouse complex. Issues such as mean precipitation, snowfall, wind direction and speed, and sun angle information is provided.

Monthly Mean Precipitation:



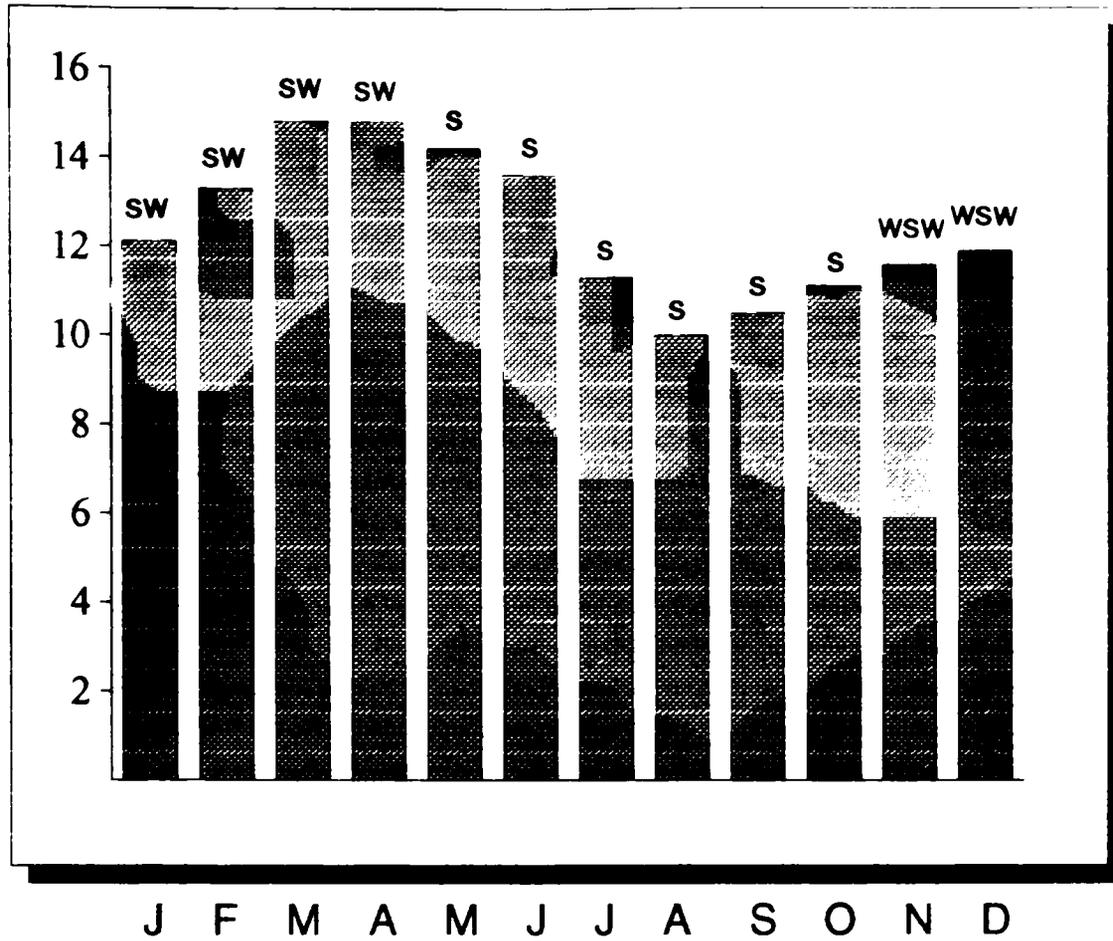
This graph shows that monthly, the most precipitation Lubbock receives are in the months May through October. With an annual rainfall amount of only 18.10 inches, site water retention is extremely important. Efforts must be made to retain all site rain water for the irrigation of landscape and maintenance of any water feature. In addition water features could cool the residence. Retention of water could take the form of a holding pond or small stream network.

Monthly Mean Snowfall:



This graph illustrates that there is not much concern for snow loads on the structure of the townhomes. It is important to retain the moisture received from the snow, just as it is important to retain water from general precipitation. Lubbock has a record snowfall of 16.3" in one day. This figure will be the standard for snow load calculations.

Wind Direction and Speed



This wind chart reflects a fairly constant wind throughout the year. It does not reflect peak gusts, which occur very often. When gusts do occur, they are generally from the north, ranging from 50 to 80 m.p.h. Wind will play an important part in passive cooling during the summer months. The placement of water features will depend on the direction of the wind. During the summer months, the built residences will want to pick up wind that has crossed the water features. Protection from the wind in all cases is important strictly in the winter months. Land scaping that includes indigenous trees will assist in breaking some of Lubbock's fierce wind gusts.

Context Issue Case Study 01:

**Albany Oaks Condominiums
San Francisco, California
Berger and Coplands, Inc., Architects**

The Albany Oaks development in San Francisco has responded successfully to the areas psychological and cultural needs. In this area, the last type of architecture people wanted was one that would impose itself on the hillside and detract from the natural landscape. Berger and Copland successfully blended this development into the site using natural building materials and leaving the development void of any unnatural coloring. As for the users psychological needs, this development has provided a virtual mountain hide away only minutes from the city.

The surrounding built context is one of houses and commercial structures imposing them selves brutally on the hillside. Closer to the Albany Oaks site is a public park. This development has responded sensitively to the park and it's users. In addition, the park actually acts as a buffer between Albany Oaks and other housing and commercial developments.

Conserving the natural environment, Albany Oaks has responded with great sensitivity. The housing units are actually built around existing trees and other natural landscape. The condominiums are lifted off the ground by concrete piers. This allows the area below to remain covered in natural vegetation. With this area growing undisturbed, it provides natural protection against erosion.



Context Issue Case Study 01:



Geomorphic Architecture, Berger

Context Issue Case Study 02:

Island House

Rhode Island

Bausman-Gill Associates, New York

Though this is a private residence, I believe it captures the local mind set of coastal Rhode Island inhabitants. This house reflects the local peoples attitudes of what residential architecture should be. Inspired by a picture of a small Pennsylvania 19th century church, the profile of this house is one that residents of this area can identify with.

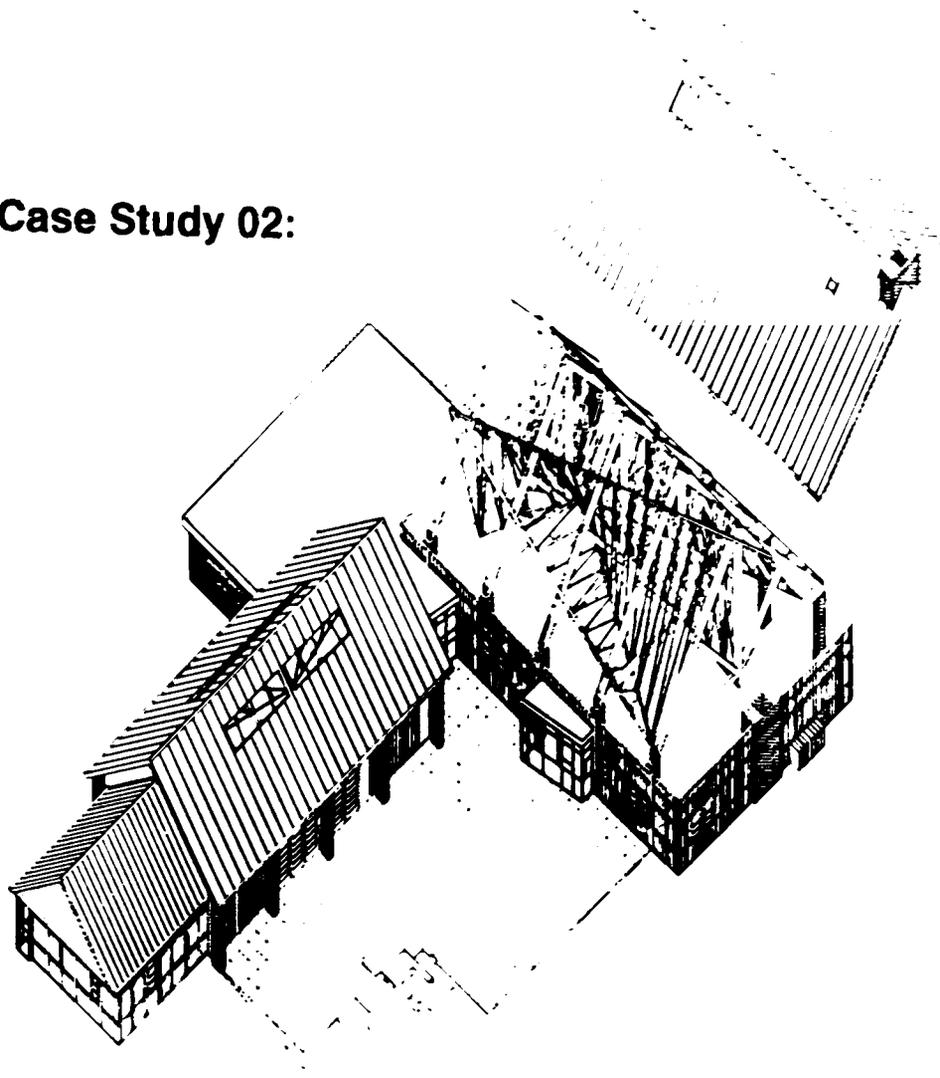
The Island House responds well to the local built environment. It picks up characteristics of old area barns reflected by its open truss work. The elevation of the house single story, with the combination of flat and traditional 45 degree angle roofs typical of this area. This style can be interpreted as classic fundamentalism of American architecture. All building features are typical to the area. These materials include metal roofs, shuttered windows and interior open truss systems.

Though this house does not positively effect the environment, its use of landscape materials and plantings work well. All plantings are indigenous and most of the rock came from the local area. The landscaping is designed to provide views for the user and to respond to the architecture.



The Architectural Review, 9/90

Context Issue Case Study 02:



Annotated Bibliography:

Robert Bennett, 1978, Sun Angles for Design, R. Bennett Pub., Bala Cynwyd, PA

This book provides sun angle charts for all latitudes of the United States. Along with each sun angle chart is a page of suggestions and recommendations for optimum solar response construction. These charts are pertinent in determining effective passive solar design and construction.

Malcome Wells, 1981, Gentle Architecture, McGraw-Hill, New York, NY

This book by Wells is a standard in designing environmentally responsive architecture. Discussed extensively is the concept of earth architecture. This is design that typically burrows underground or builds itself into the natural landscape. Wells's concepts of total responsiveness to the environment in many cases may be extreme, but are a good reference in designing with the environment.

Edmund Berger, 1986, Geomorphic Architecture, Van Nostrand Reinhold, New York, NY

This book explores the style of geomorphic architecture. This type of architecture develops itself off the contours of the existing site. Harmony with the existing natural environment is an important concept behind this theory.

Victor Olgay, 1963, Design With Climate - Bioclimatic Approach to Architectural Regionalism, Princeton Press, Princeton, NJ

This book discussed in detail many methods of passive solar development in different regions of the world. Included were techniques on proper building placement and orientation. Ventilation and solar gain for heating and cooling techniques rely solely on building placement and orientation.

Chapter III : Facility Program

Analysis of Activities

Overview

Primary Activities and Participants

Secondary Activities and Participants

Analysis of Spaces

Association with Activities

Typical Requirements and Characteristics

Unique Requirements and Characteristics

Relationship of Spaces

Relationships of Spaces for Adjacency/Separation

Relationships of Spaces for Community/Privacy

Relationships of Spaces for Construction

Relationships of Spaces for Other Criteria

Facility Case Studies

Annotated Bibliography



Analysis of Activities

Overview

Activities Overview:

Entry - Auto

Entry - Pedestrian

Circulation

Entertainment

Food Preparation

Eating

Bathing, Washing, and Excreting

Sleeping

Housekeeping

The users of this town house complex are people who want a high quality, energy efficient, and low maintenance residence. In addition to the residents basic needs, specific wants of the young earth conscious professional will be addressed. A residence of this sort should be relaxing and to a point luxurious without being flashy. In addition, the issue of environmental awareness should remain central and constant throughout the theme of these town house residences. Both exterior and interior finishes should reflect a dedication to bettering the environment by way of green architecture.

Primary Activities and Participants:

Entering:

Automobile - This will be an activity generally performed by the resident. The process of parking and entering the residence will occur in this area. Activities of a utilitarian type will be performed in this area.

Pedestrian - This form of entry will be separated from the auto entry. It will be utilized by visitors. Active greetings and short social interactions will occur in this area.

Food Preparation:

Accommodations should be made for both residents and visitors to socialize and prepare meals. Activities can include cooking, cleaning, storing food, preparing food, and socialization.

Bathing Washing and Excreting:

This area will be zoned separately for bathing washing and excreting for the residents and visitors.

Secondary Activities and Participants:

Entertainment:

In this area, such activities as socializing, audio, and video entertainment will take place. Users will include both residents and visitors. Both passive and active forms of entertainment can occur in this area.

Eating :

This activity will include both formal and informal dining. Participants will include both residents and visitors. In addition to eating, this activity can be a social function.

Sleeping:

This activity will be restricted to residents and selected visitors. Areas will be zoned for the resident and visitor. Opportunities for casual napping will also be provided outside the designated sleeping zone.

Housekeeping:

This area will be used generally by the resident. Here activities such as laundry, ironing, and storage of cleaning supplies will take place.

Analysis of Spaces

Association with Activities:

Master Bedroom - Sleeping

Master Bath - Bathing, washing, excreting

Guest Bedroom - Sleeping

Guest Bath - Bathing, washing, excreting

Dining - Eating

Kitchen - Food preparation

Utility - House keeping

Living - Entertainment

Entry - Pedestrian entering

Garage - Auto entering, residents entering

Porch - Entertaining, entering, sleeping

Typical Requirements and Characteristics:

Master Bedroom:

This is the area where the resident or residents sleep, make love, dress, and watch T.V... Consideration should be given for clothing storage, electrical outlets, cable outlets, and room for a king size bed and additional furniture. This room will be south facing and during the day utilize the daylight for lighting. Ceiling vents and fully adjustable windows will allow the user to regulate air flow for passive cooling. In cases of extreme external temperatures, an air conditioning return will be provided for summer months and radiant floor heating will be provided for winter heating. This area should reflect a feeling of tranquility and security for the user's).

Master Bath:

This area is used by the resident to wash, bath, excrete, and possibly dress. Amenities should include dual sinks, toilet, shower, bath, storage, electrical outlets, and fan. Task lighting will be provide for shaving and dressing.

Guest Bedroom:

This area will be used by selected visitors or a child to sleep and dress. Consideration should be given for clothing storage, electrical outlets, and selected furniture. This bedroom will be located on a North facing wall. Its ceiling will be lower than other South facing rooms for heating and cooling purposes. This room will also be provided with windows for natural ventilation, air conditioning returns for cool air, and radiant flooring for heat.

Guest Bath:

This area is used by the guest or spouse for washing, bathing, excreting, and possibly dressing. This area will house a toilet, sink, shower, electrical outlets, fan, and storage. Task lighting will be provided for shaving and dressing

Kitchen:

This area will be used by both guests and residents for cooking, cleaning, and socializing. The ceiling in this area will be high and well ventilated. Views of much of the residents will be available to the user along with easy access to the dining area and garage. Such amenities as a refrigerator, sink, oven/range, and trash compactor will be

provided. Specific task lighting will be made available for the user also. In association with ceiling fans, cool air returns will cool the area in extreme summer temperature conditions. For extreme winter conditions, radiant flooring will be provided. Flooring will be low maintenance tile for easy cleaning. The texture and finish of this area should be very utilitarian and efficient.

Utility:

This area will be used for laundry and a cleaning supply storage area. Space and outlets will be given for a washer and dryer. Overhead task lighting will be provided.

Dining:

This area will be used for both formal and informal dining. Area will be provided for intimate dining and large group dining. Ample area should be given for circulation and storage. Both overhead and indirect lighting will be provided for this area. Visually this area should be separated from the kitchen area.

Living:

This is a multipurpose area that changes function depending on the number of users. For the resident this space should house comfortable furniture including a large couch. Area should be given for audio and visual entertainment. In a large social situation this area should provide good acoustics, circulation, furniture, and appropriate lighting. South facing windows will provide air circulation and natural lighting. In addition, air conditioning returns and a radiant floor system will be provided for extreme weather conditions. Indirect and overhead lighting will be provided. A lofted ceiling could be an option to give a greater sense of social scale.

Entry:

This area will be created for visitors approaching from their cars and should appear formal and read as an entry from the exterior. Ample space should be given for group entry and closet space provided for coats. This space will receive overhead lighting to orient the visitor to the rest of the house. This entrance should be ceremonial since it will be the first thing seen when entering.

Unique Requirements and Characteristics:

Porch:

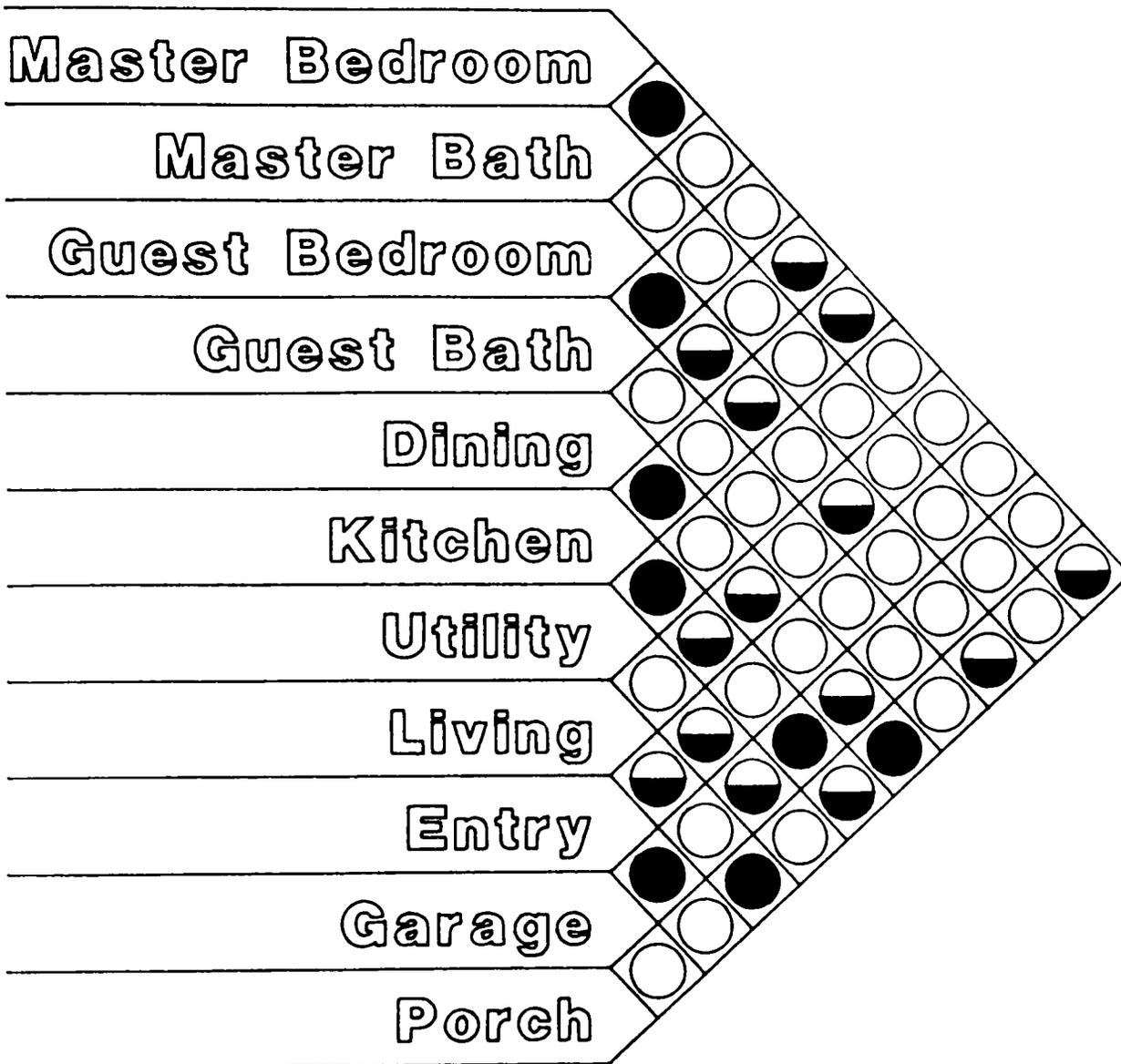
This area may be utilized for two major uses. First it may be used as a secondary pedestrian entry from the greenbelt and recreation areas. Secondly, it serves as a place for entertainment during fair weather situations. It should also provide space for outdoor furniture and circulation for a party situation. Consideration should also be given to mode of entry from the green belt. Flooring in the transition area between the house and the porch should be a low maintenance tile that absorbs solar radiation during the winter months for passive heating in the main house. This space will also act as a transition between outdoor and indoor living.

Garage:

This area will house the resident's automobile. Special consideration must be made for high clearance vehicles such as trucks and jeeps. This is in direct response to the cultural aspects of this region. Storage for other forms of transportation such as bikes, scooters, and motorcycles should also be provided. This area also offers an opportunity to utilize salvaged materials such as industrial sliding or roll up doors.

Relationship of Spaces

Relationship of Spaces for Adjacency/Separation



Adjacency Needed 

No Relationship 

Separation Needed 

Relationship of Spaces for Community/Privacy

**Master Bedroom:
Private**

**Master Bathroom:
Private**

**Guest Bedroom:
Semi-private**

**Guest Bathroom:
Semi-Private**

**Kitchen:
Public**

**Utility:
Private**

**Dining:
Public**

**Living:
Public**

**Porch:
Public**

**Garage:
Private**

Relationship of Spaces for Construction

Environmental control systems:

Though most of the residence can be heated and cooled by passive systems most of the year, Lubbock's climate is extreme enough to warrant a backup HVAC system. Heating will be controlled by radiant floor heating throughout the house, excluding the garage area. Cooling will be handled by a traditional central air-conditioning unit that will service all areas of the house, excluding the garage.

Structural System:

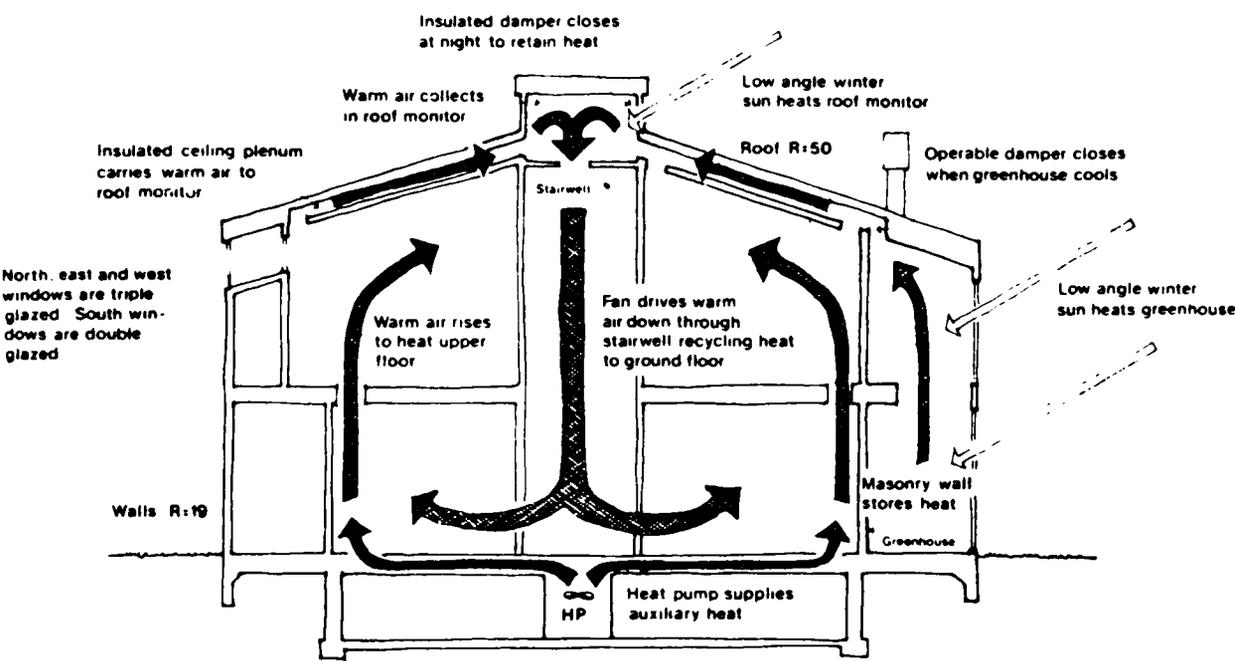
All South facing areas will require open ceiling, especially the living area. The long span could be handled by traditional post and beam methods. Interior spans, when possible, should make use salvaged steel truss work.

Passive cooling and heating:

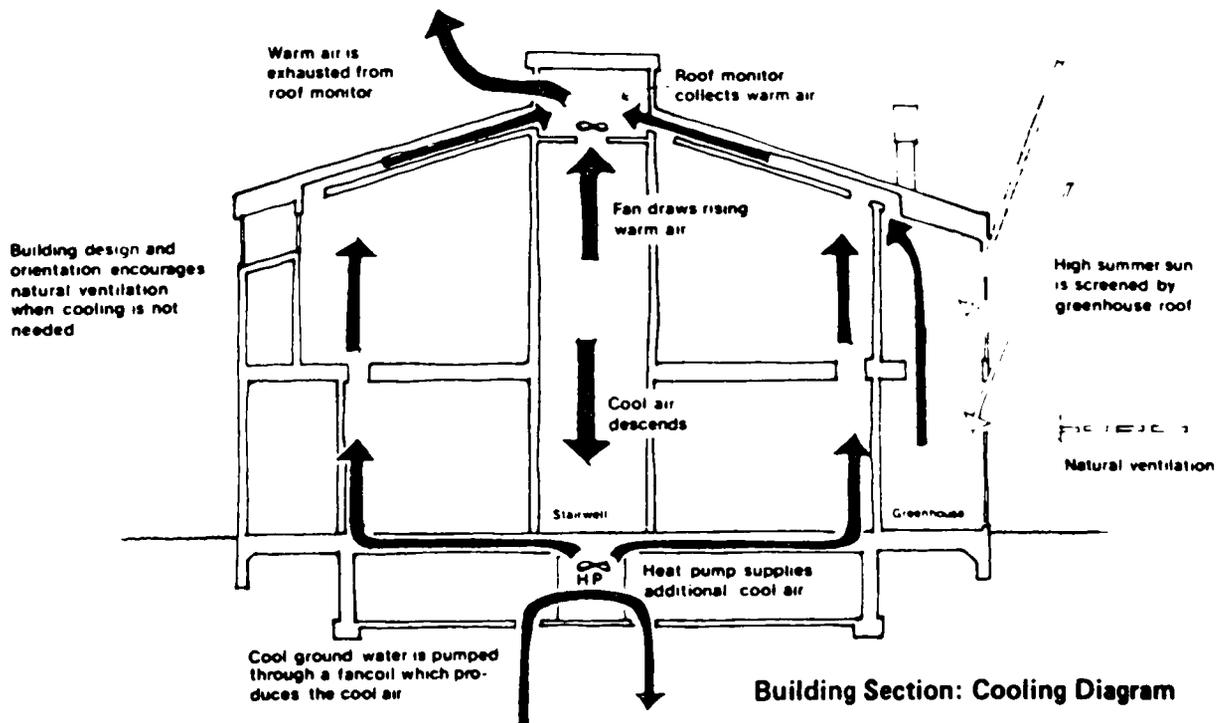
In constructing a residence that is efficient in cooling and heating without electricity, certain building criteria must be met. First, North facing walls should keep openings to a minimum. These walls will be well insulated to deter cold North winds. Second, South facing walls will contain large expanses of glass for natural lighting, solar heating during the winter months, and ventilation during the summer months. Special attention must be given the amount of overhang on the roof so hot spots are not created during the summer months. Thirdly, somewhere in the mid section of the residence, a masonry wall should be placed for thermal storage during the winter months. This construction could occur in the area of the house that divides the public from the private zones.

Relationship of Spaces for Other Criteria:

In assembling spaces to perform in a passive and active solar residence, certain precautions and specialized construction must be taken into account. As shown in the illustration below, special attention must be given to the arrangement of interior space in a active/passive solar house. Space must be allocated for a green house type area and proper ceiling space for consistent air circulation.



Building Section: Heating Diagram



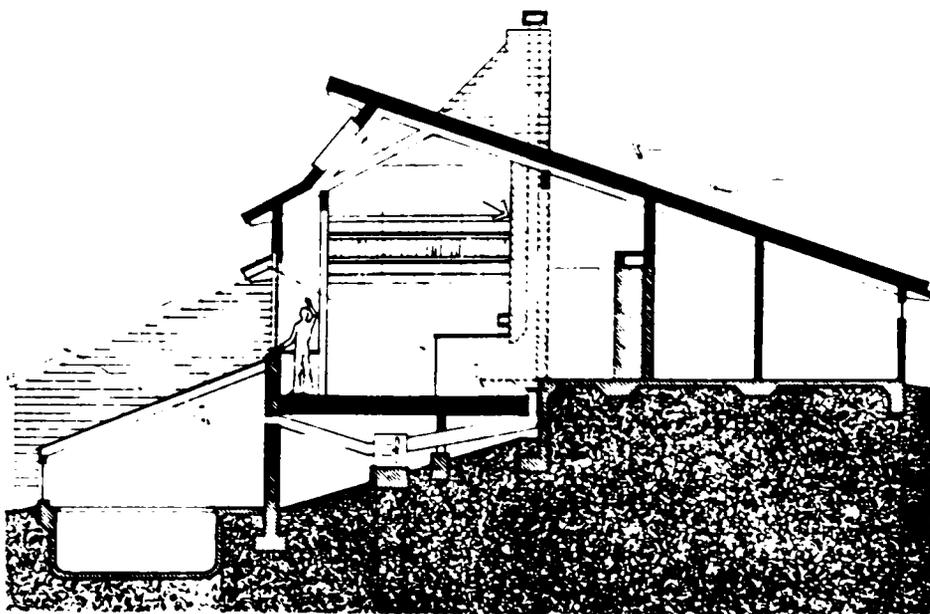
Building Section: Cooling Diagram

Facility Case Study 01:
The Johnson House
San Ramon, California
Jacobson, Silverstien Architects

Though this house was built for a specific clients needs, many features of this house represent programmed features for my proposed townhouse complex. There is a strong environmental theme behind this house. Utilizing the South sun and shielding itself from the North wind, a very energy efficient environment has been created.

Similar to my program requirements, the Johnson house locates the main entry along the North face of the house. The North zone of the house contains the utility room, pantry, guest bedroom and bathroom. All other areas take advantage of natural solar light and ventilation from South facing windows. The link between these two areas is a concrete block wall, which acts as thermal mass for the passive solar system.

Attention has also been given to the separation of public and private areas. The public areas are very open, light and airy. The private spaces are separated completely while maintaining natural light and the feeling of openness. The south facing windows are crucial for all these spaces for not only light and ventilation, but for views also. Attention was also given for the use of overhangs so the interior would not be overheated in the summer. Conversely, overhangs were also designed to let solar radiation in during the cold winter months.

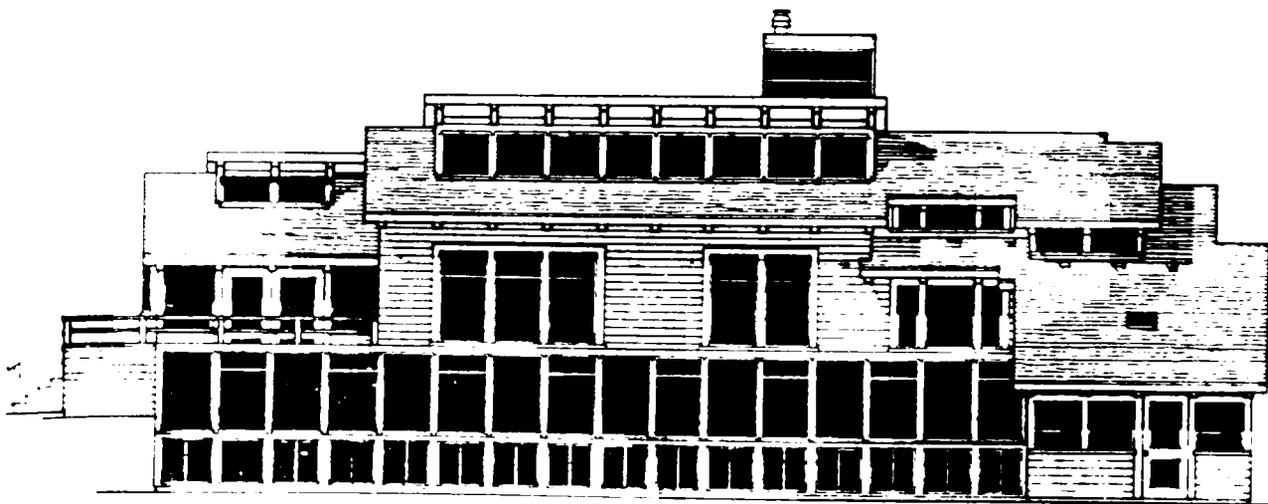


Johnson House

Facility Case Study 01:



The Good House, Jacobsen

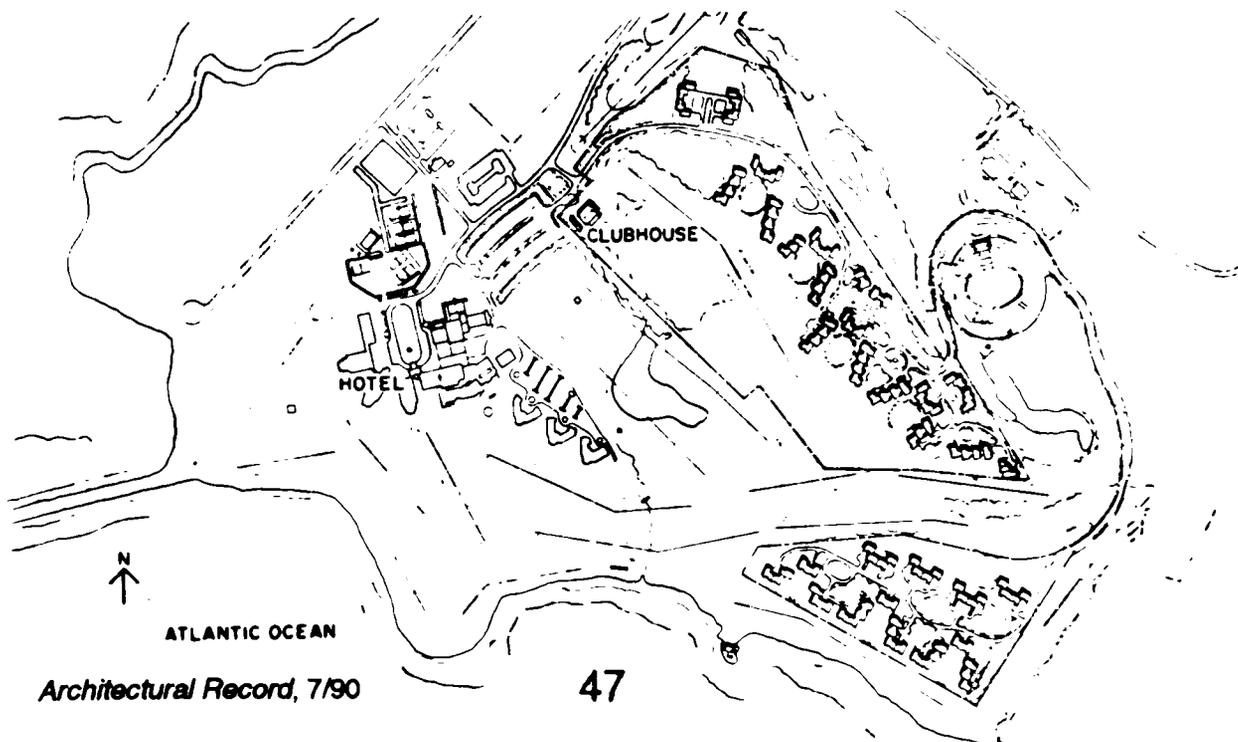


Facility Case Study 02:
Samoset Resort and Village
Rockport, Maine
Sasaik and Associates, Architects

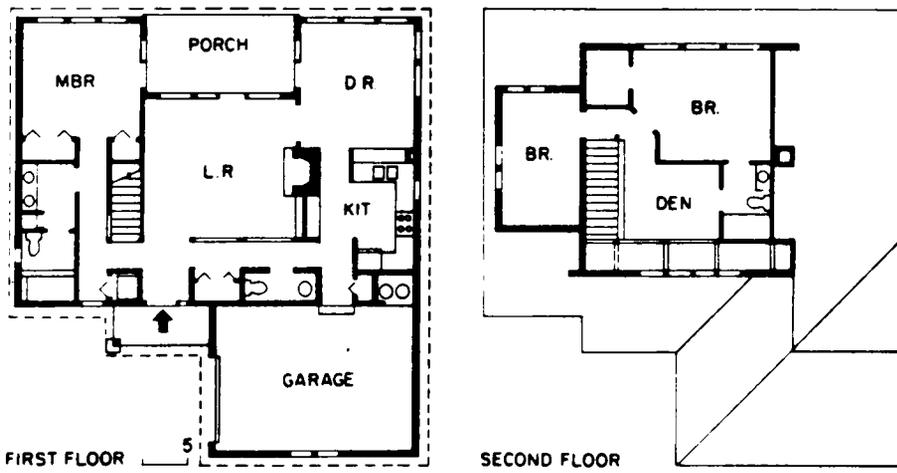
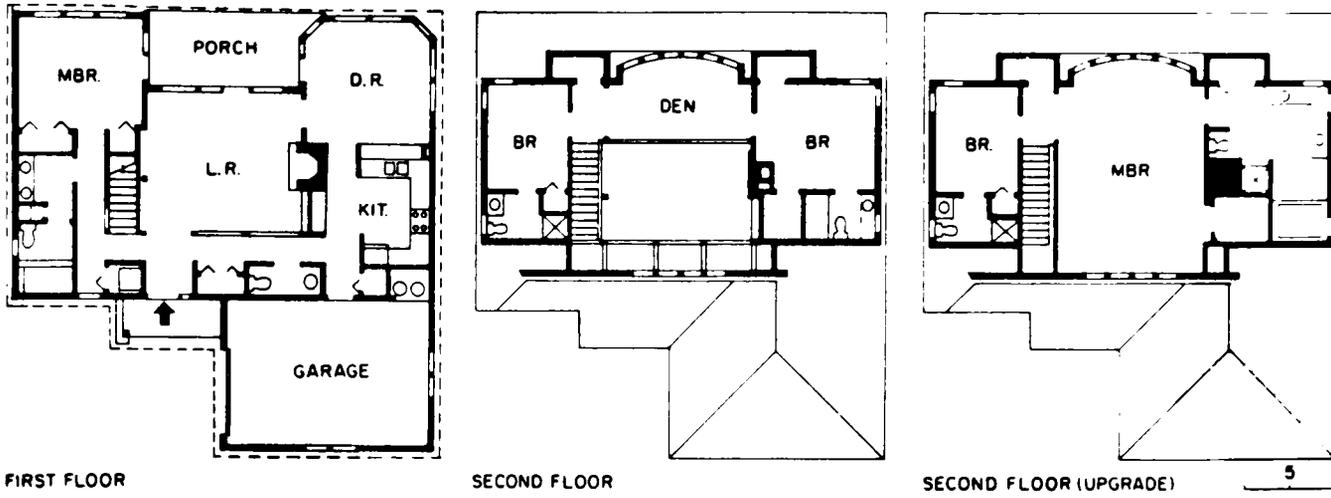
I chose this project as a case study for its efficient organization of interior space and for the overall organization of the development. In general the floor plans reflect a very tight separation of public and private space. The overall organization of each eight to twelve housing group is effective in its attempt to make the back of the house a main focal area.

In plan these villas are very tight in their separation of public and private areas. This tight separation of spaces and presence of narrow halls is rather regressive, reminiscent of 19th century American housing. Another interesting feature of these plans is the option to upgrade, or open up certain spaces of the house. This may be an innovative idea in marketing my proposed townhouses in today's diverse market. The last noteworthy feature of this house is that the laundry is built into the garage. This may be a viable option if the garage is insulated properly.

The overall organization of the homes work well at creating a new perspective of the back of the house. The houses are arranged in a "u" shaped pattern around communal gardens and lawn. This arrangement allows for residents access to these village greens for social and recreational activities.



Facility Case Study 02:



Annotated Bibliography:

Robert Kennedy, 1953, The House and the Art of it's Design, Reinhold Pub. Corp., NY, New York

This book outlined requirements and organizations of successful housing. An extensive overview of activities spaces and their relationships were discussed in detail.

Jacobson, 1990, The Good House, Taunton Press, Newtown, CT

This book was very helpful in my study of contemporary solar houses. Less emphasis was given to active solar techniques and greater concern was given to the study of passive solar solutions.

Architectural Record, July, 1990, "Down Home in Maine."

This Article simply gave me one of my case studies.

Pearce & Smith, 1984, The Times Book, World Weather Guide, Times Books, NY, New York p. 1-20.

This book gave me a general overview of the West Texas climate. While it wasn't specific to Lubbock, it still gave me insight on the regions average climate.

Chapter IV : Summary of Spaces and Relationships

Space Allocations
Users Related to Spaces



Space Allocations:

Space:	Sq. Ft.
Master Bedroom	300
Master Bath	120
Guest Bedroom	200
Guest Bath	100
Kitchen	200
Utility	20
Dining	140
Living	300
Entry	50
Garage	550
Porch	100
Total:	2080

Users Related to Spaces:

Space:	# of users:
Master Bedroom	1-2
Master Bath	1-2
Guest Bedroom	1-2
Guest Bath	1-2
Kitchen	2-4
Utility	1
Dining	2-8
Living	2-12
Entry	2
Garage	2
Porch	2-12

Complex Recreational Spaces:

Pool	40-50
Club House	40-50

Chapter V : Economic Analysis

Project Income

Project Cost

Method and Justification



Project Income

The developments projected income will be calculated by the units individual value. The profit can be multiplied by how ever many units are constructed.

Profit Per Residence:

Building cost	\$90,650
Selling Price	\$99,715
Profit	\$9,065

In addition to income from the individual units, an annual home owners fee will be added for grounds and street maintenance, security and any private recreational activities offered.

Project Cost

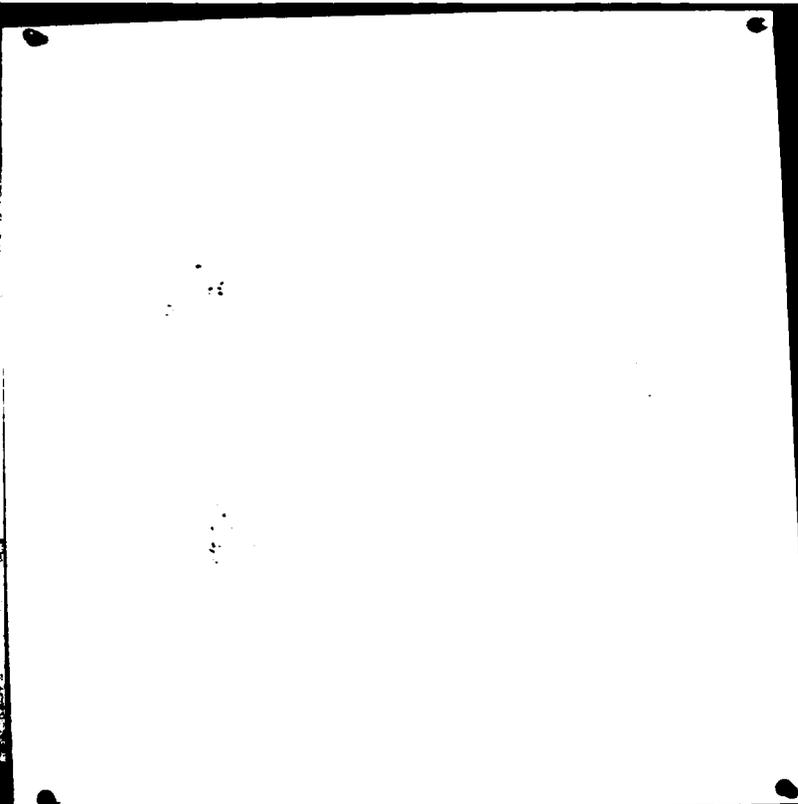
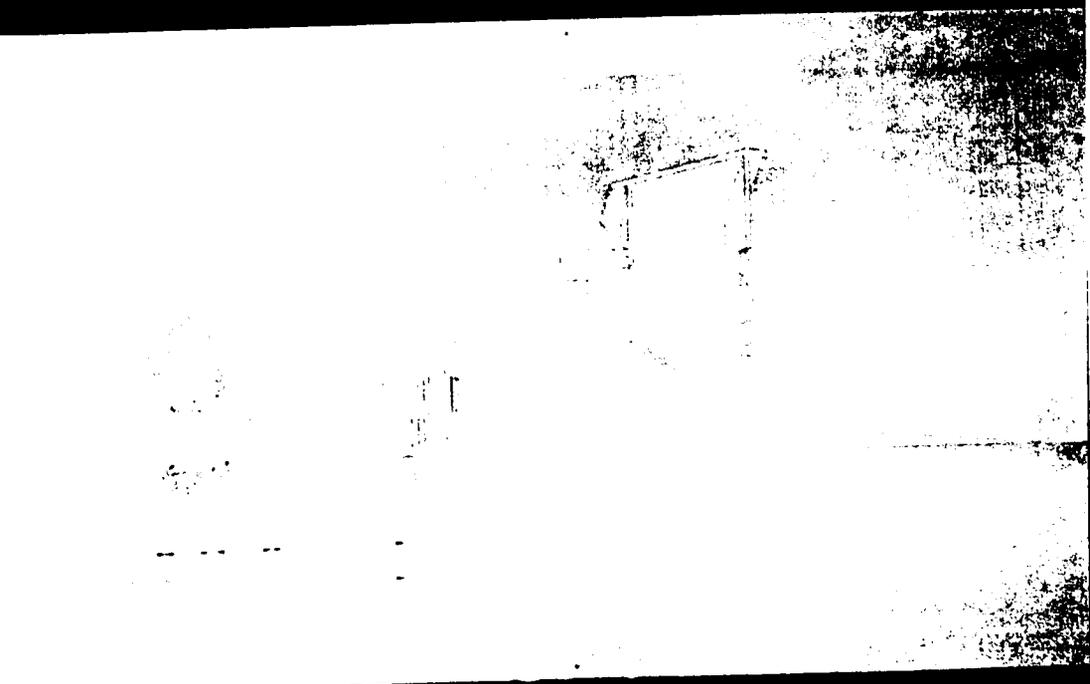
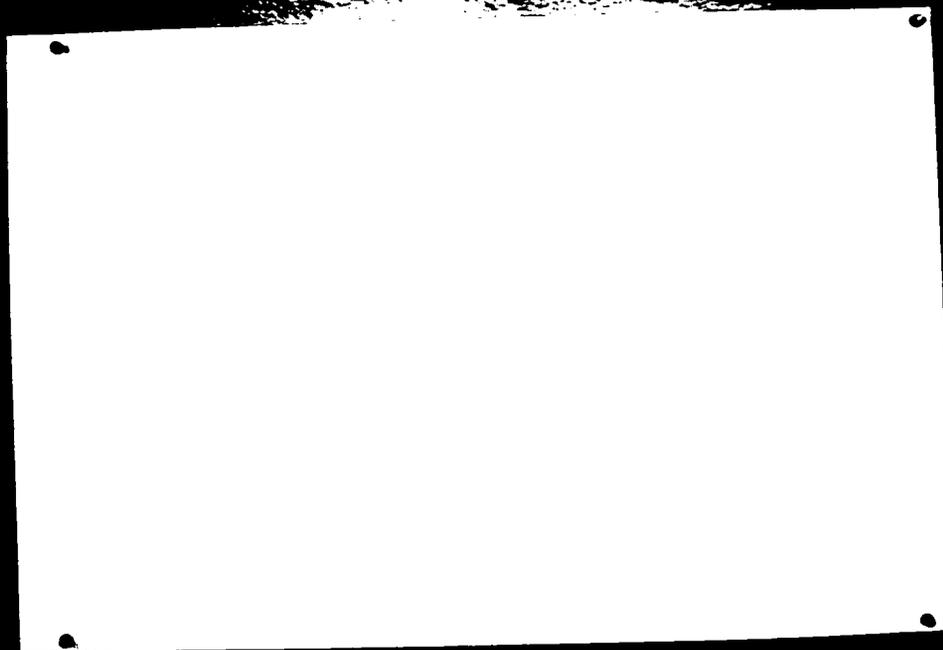
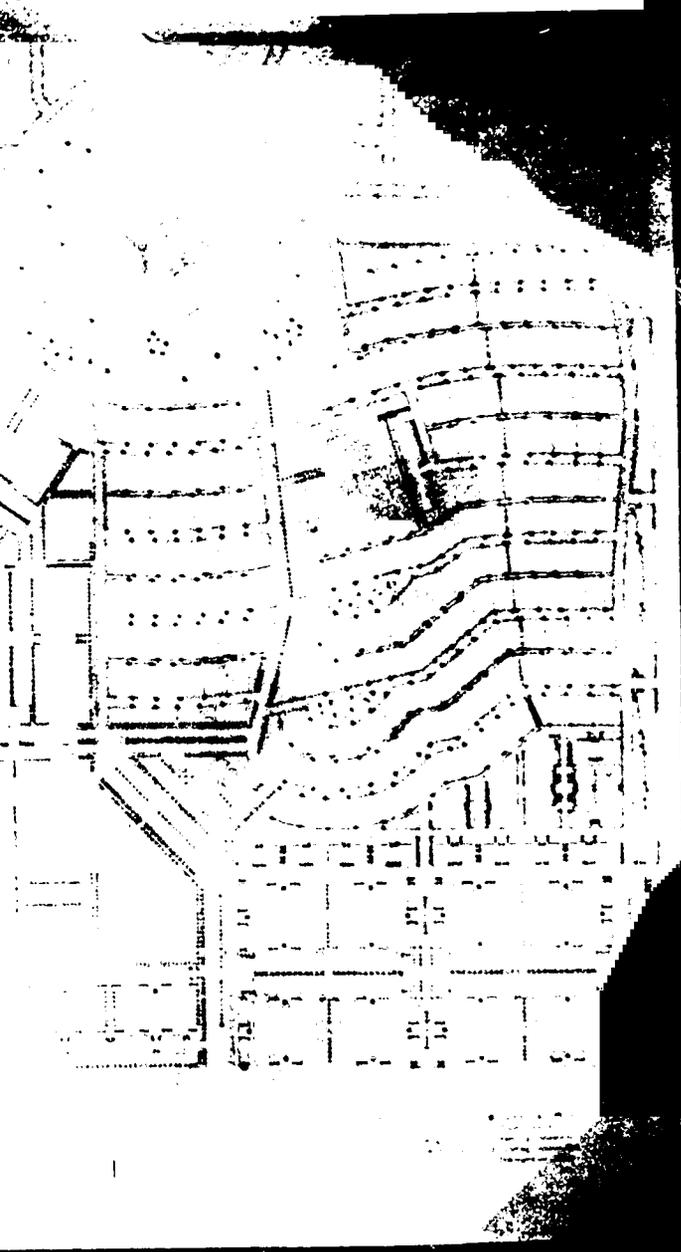
In comprising my cost analysis I utilized Mean's Residential/ Light Commercial Cost Data reference manual. I chose the construction category Luxury 1 1/2 story for my general construction type because at this stage, I cannot fully determine whether the townhomes will be physically connected. The cost per square foot may be reduced, depending on how much of the building material or components can be salvaged from exiting structures. In this cost analysis, I am assuming very little to none of the material used for construction will be salvaged material. In making this assumption, the square footage cost will define the upper limit cost of these units.

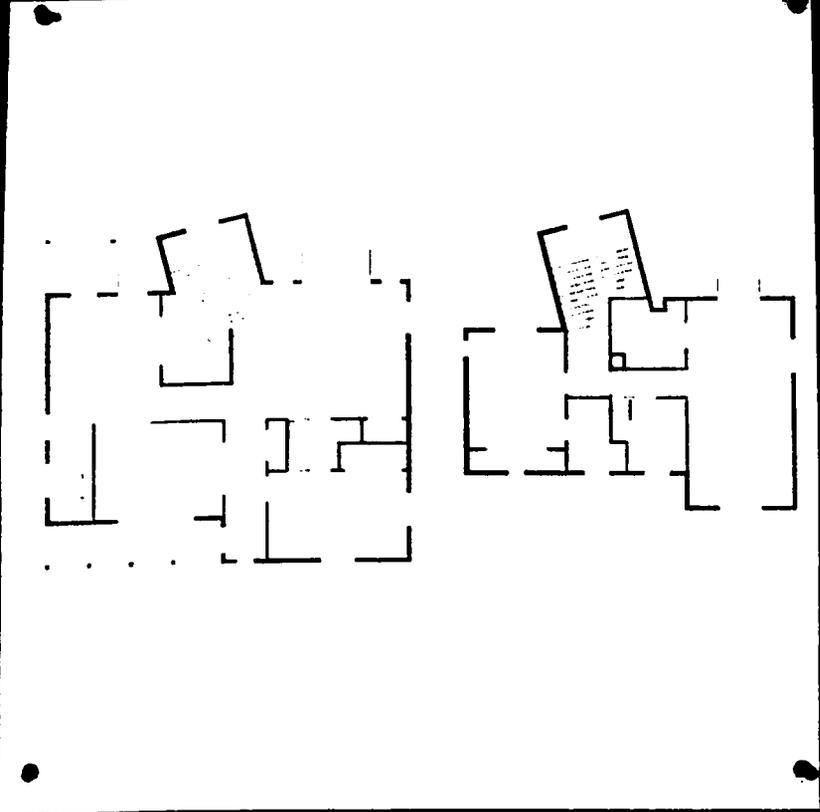
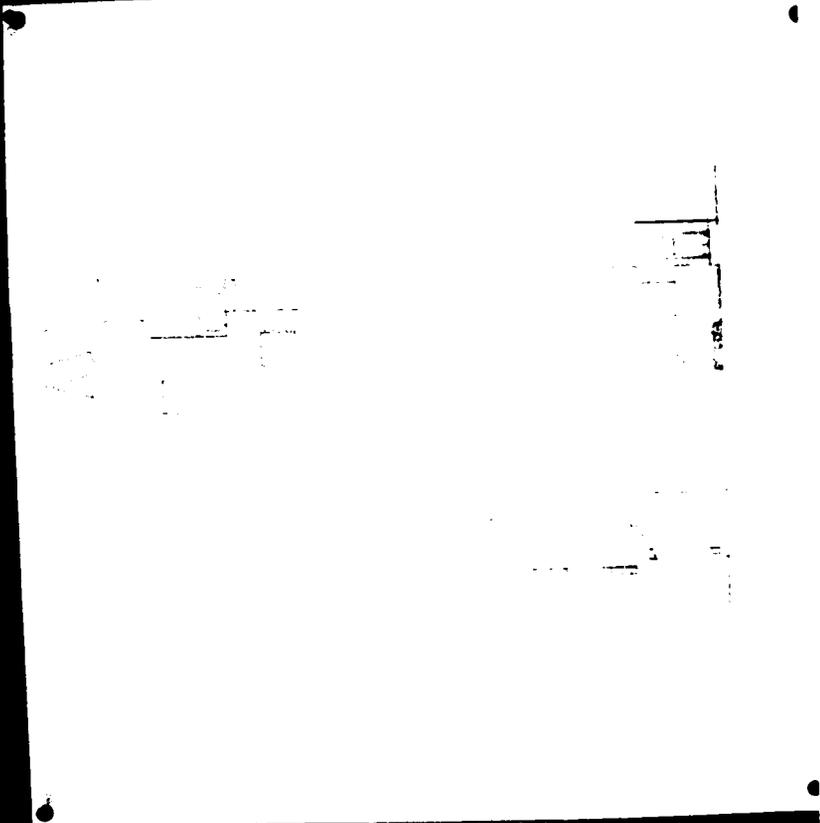
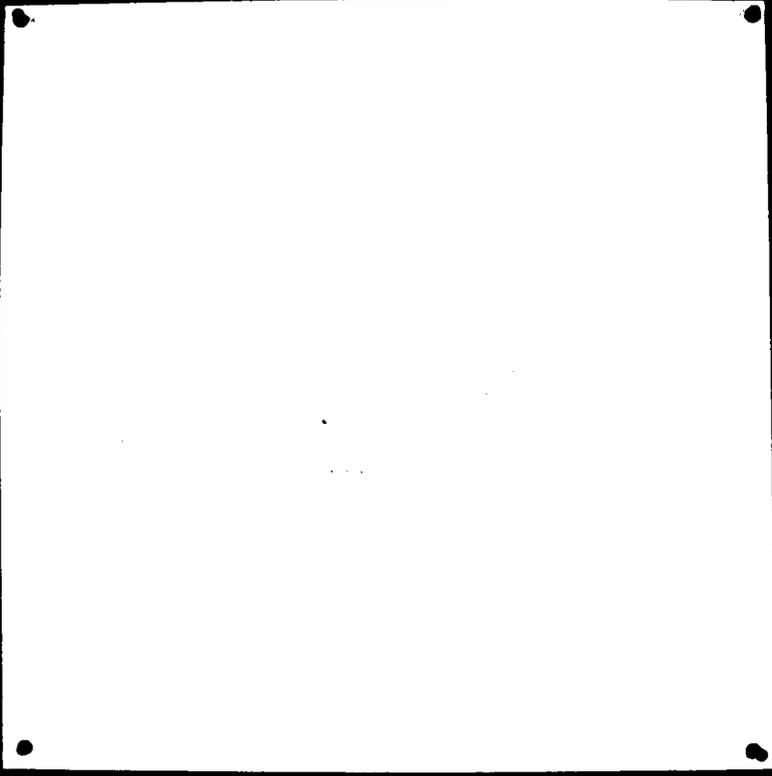
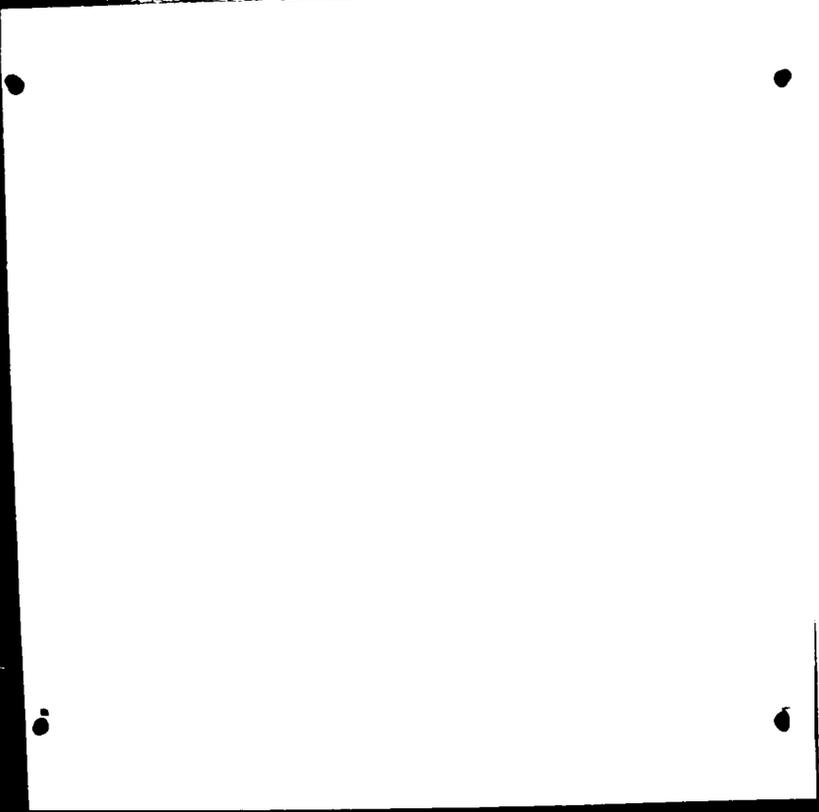
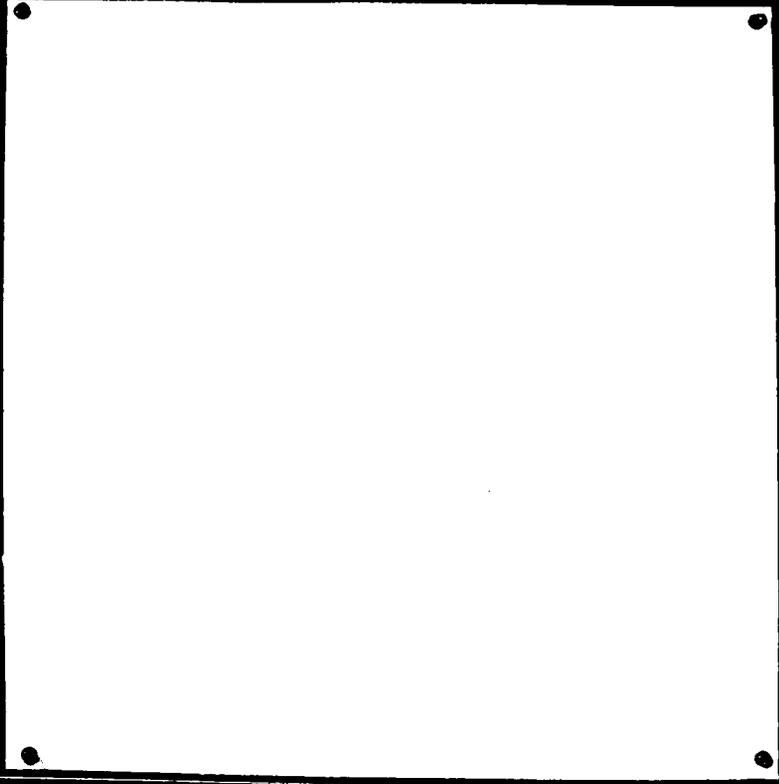
Cost Per Residence:

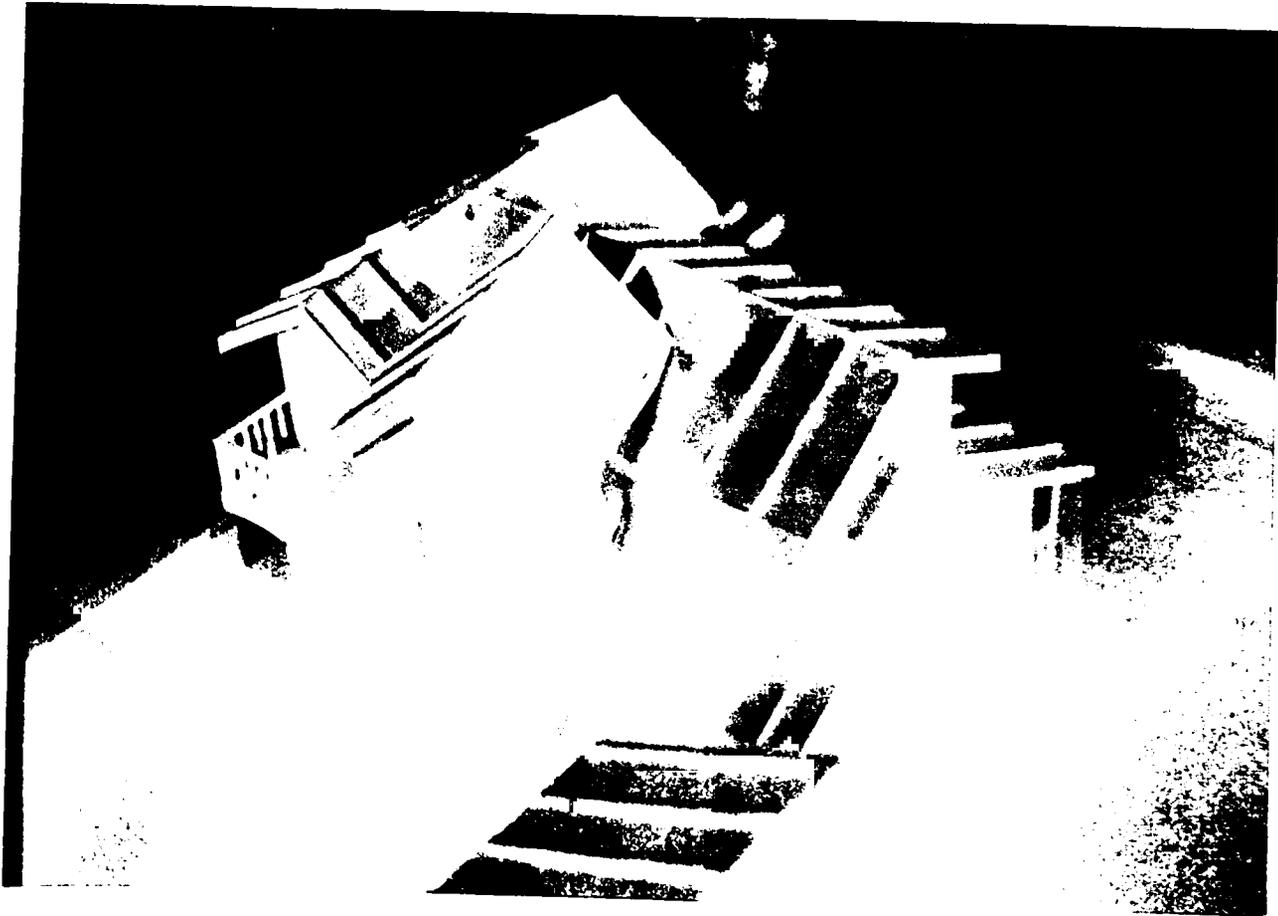
Living area & Site Development	1530 x \$55.00	\$84,150.00
Site Cost		\$2,500.00
2 car garage		\$4,000.00
Total		\$90,650.00

Method and Justification

In determining the cost of my structure I utilized the Mean's Residential /Light Commercial Construction Hand Book. Once I arrived on a building cost figure that included site cost and development, I began to research the current market value for a townhouse development similar to the one I am developing. I verbally contacted residential real estate agents from Re-Max of Lubbock, Century 21, and West Mark Realtors. In summary I was given a low asking price of \$66,000 and a high asking price of \$110,000 dollars as a realistic range of pricing. I gave the development a fair profit of 10% per unit. In conjunction with a home owner fee, this development at capacity would be very profitable for the builder or owner. Site cost was calculated from a figure of \$5,000 per 2 units. This figure was given to me by McQueen Reality, the brokers for the land I am proposing to build on.

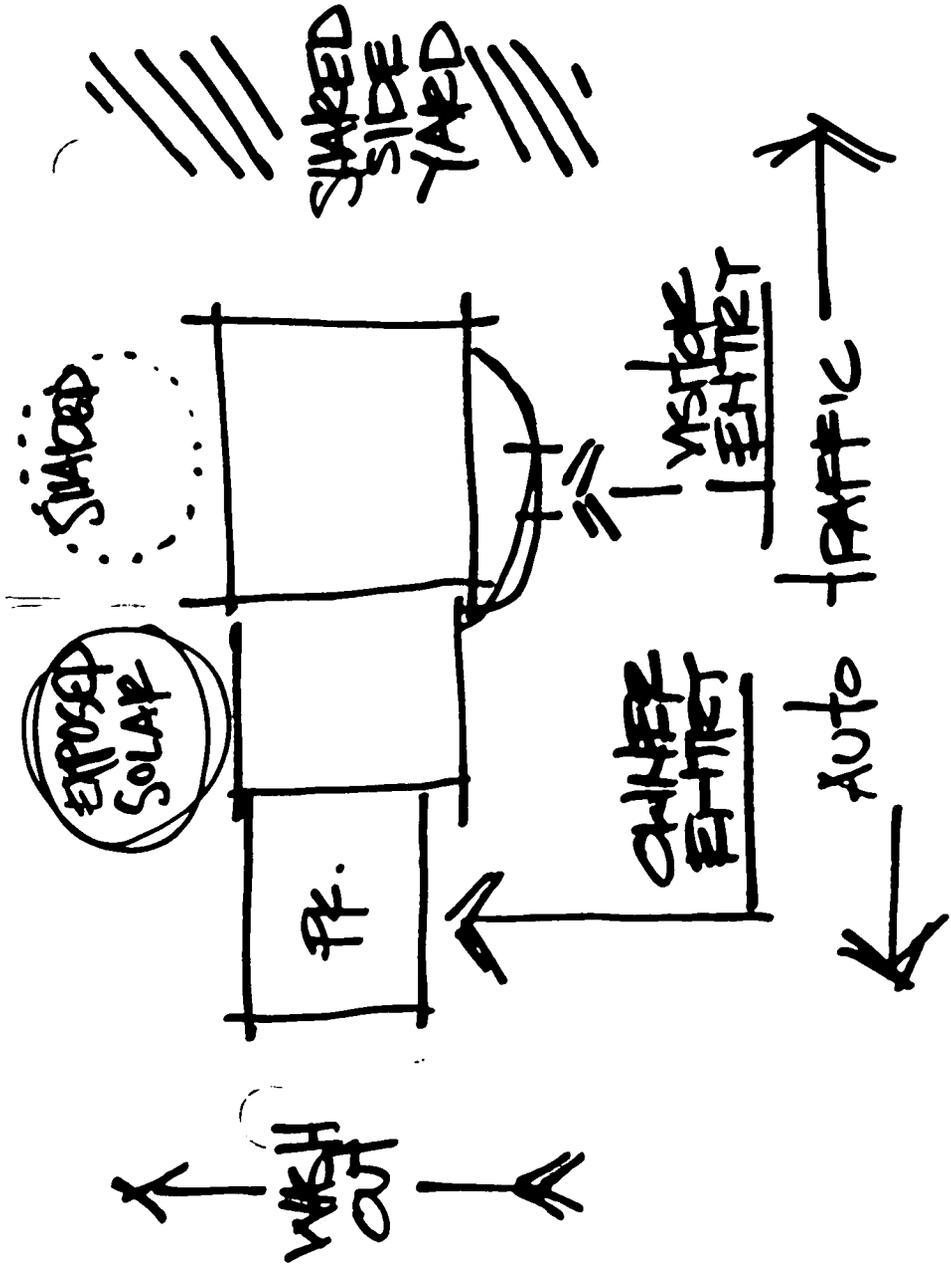




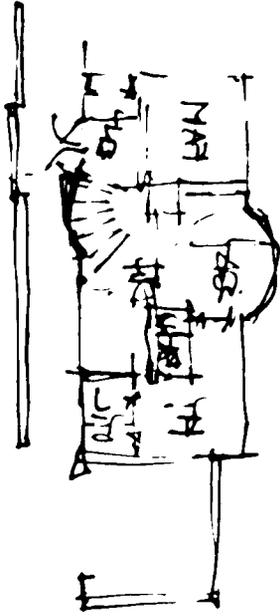
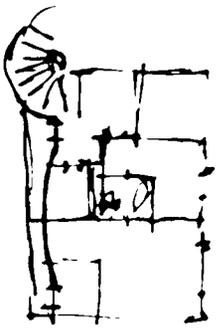
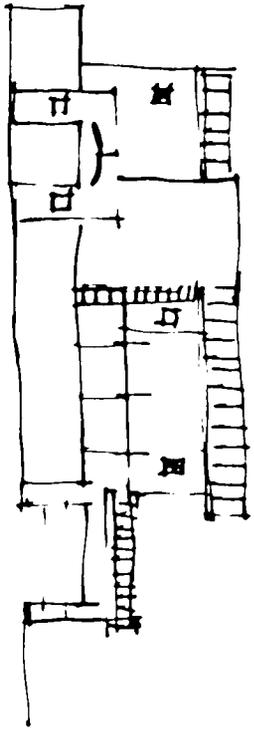




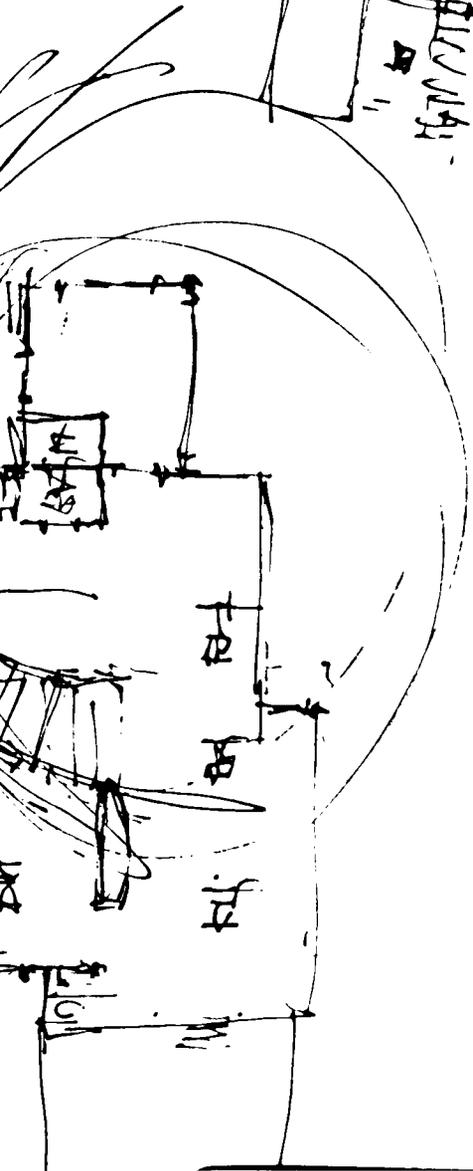
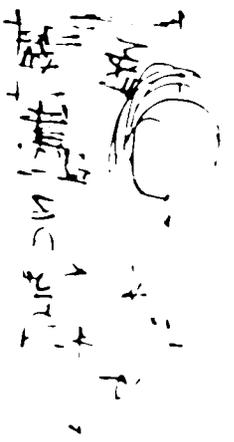
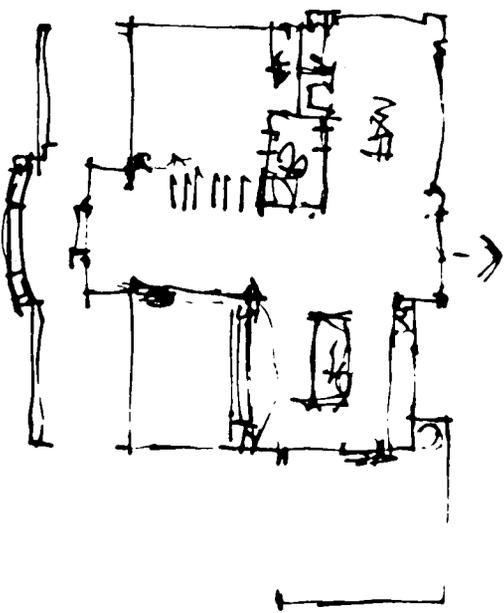
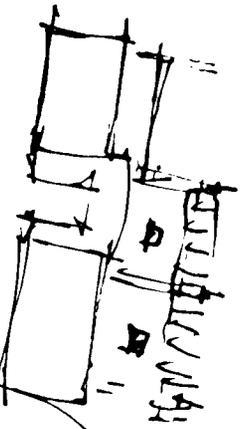
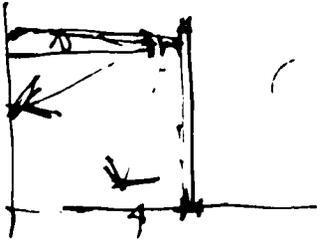
PEDESTRIAN ACCESS →

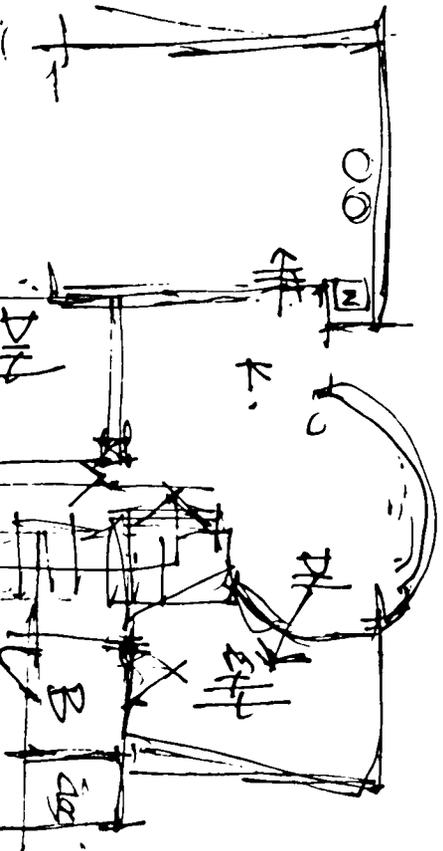
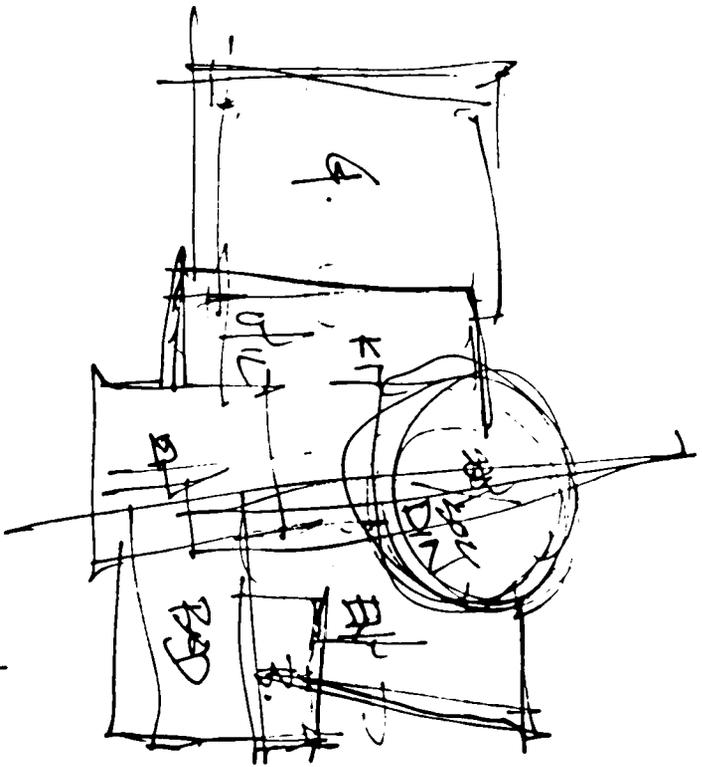
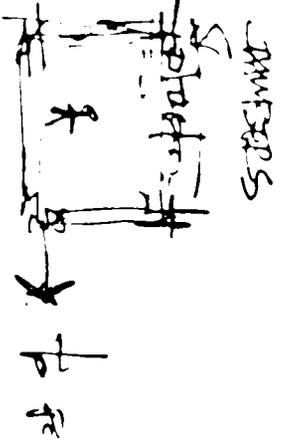
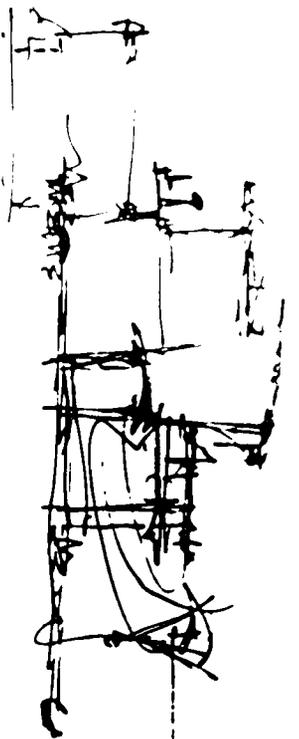
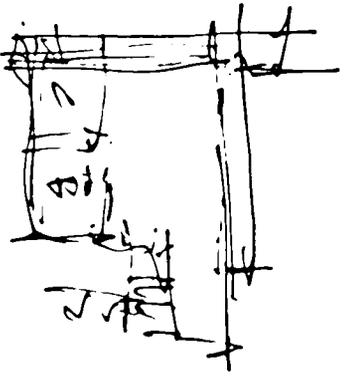
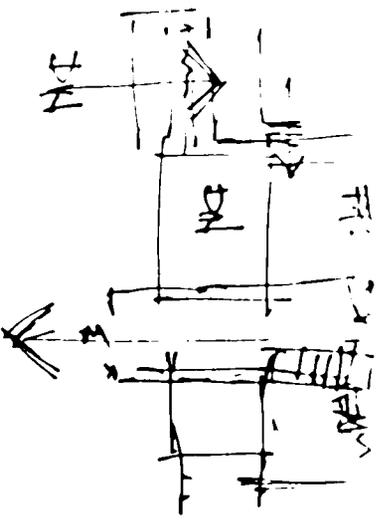


10/21

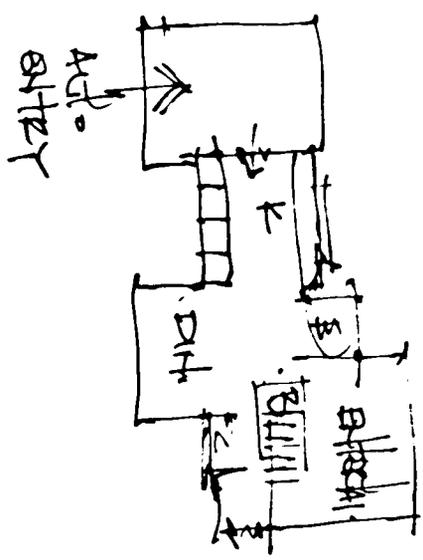
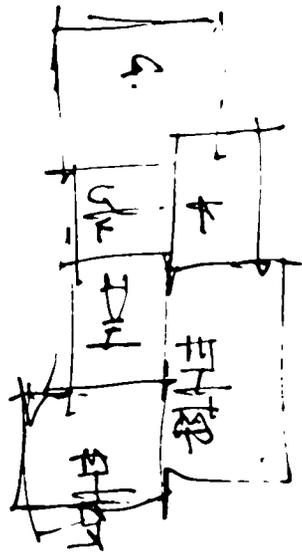
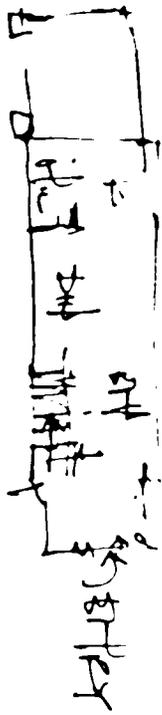


LIVE SPACE
HUG SPACE



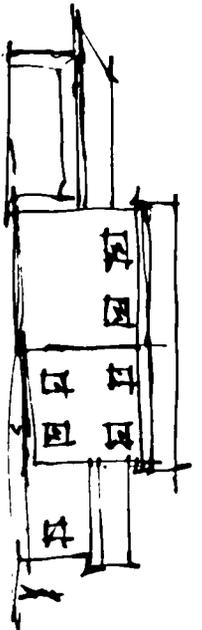


House Prop 3
02793

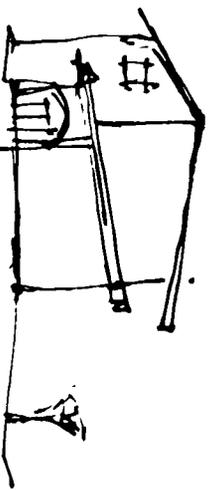


rooms (plan)
bath

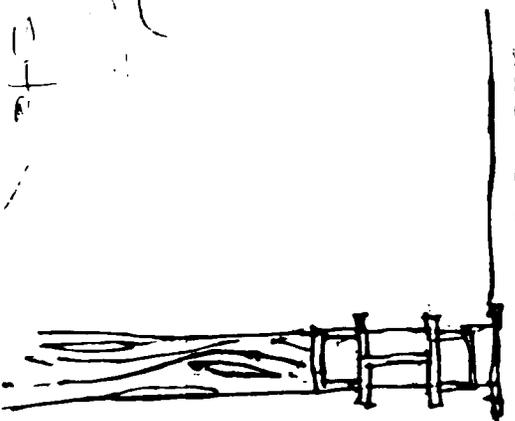
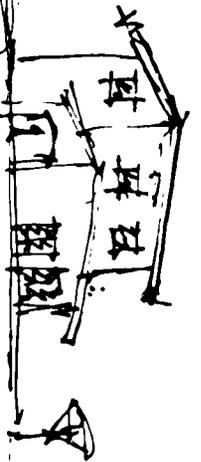
COMMUNAL
AREA W/ NEIGHBORING
RESIDENTS



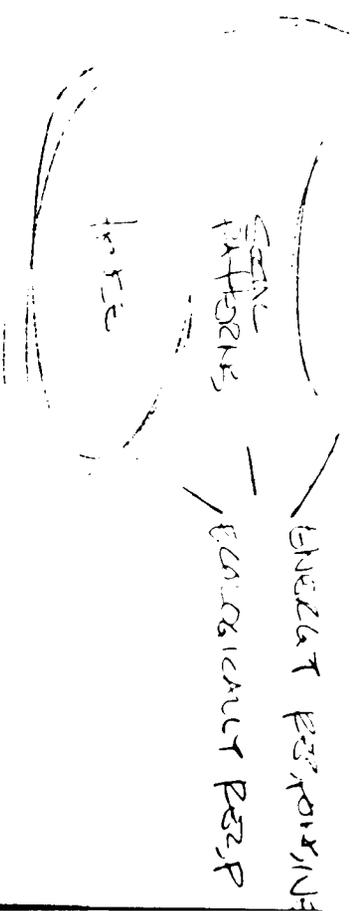
VIEW FRONT
STREET



↑



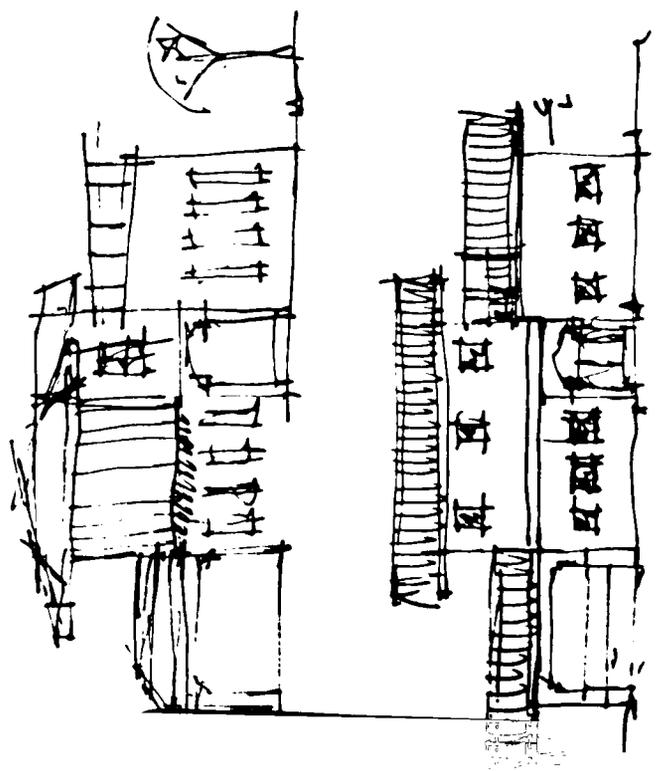
INT. COURT.



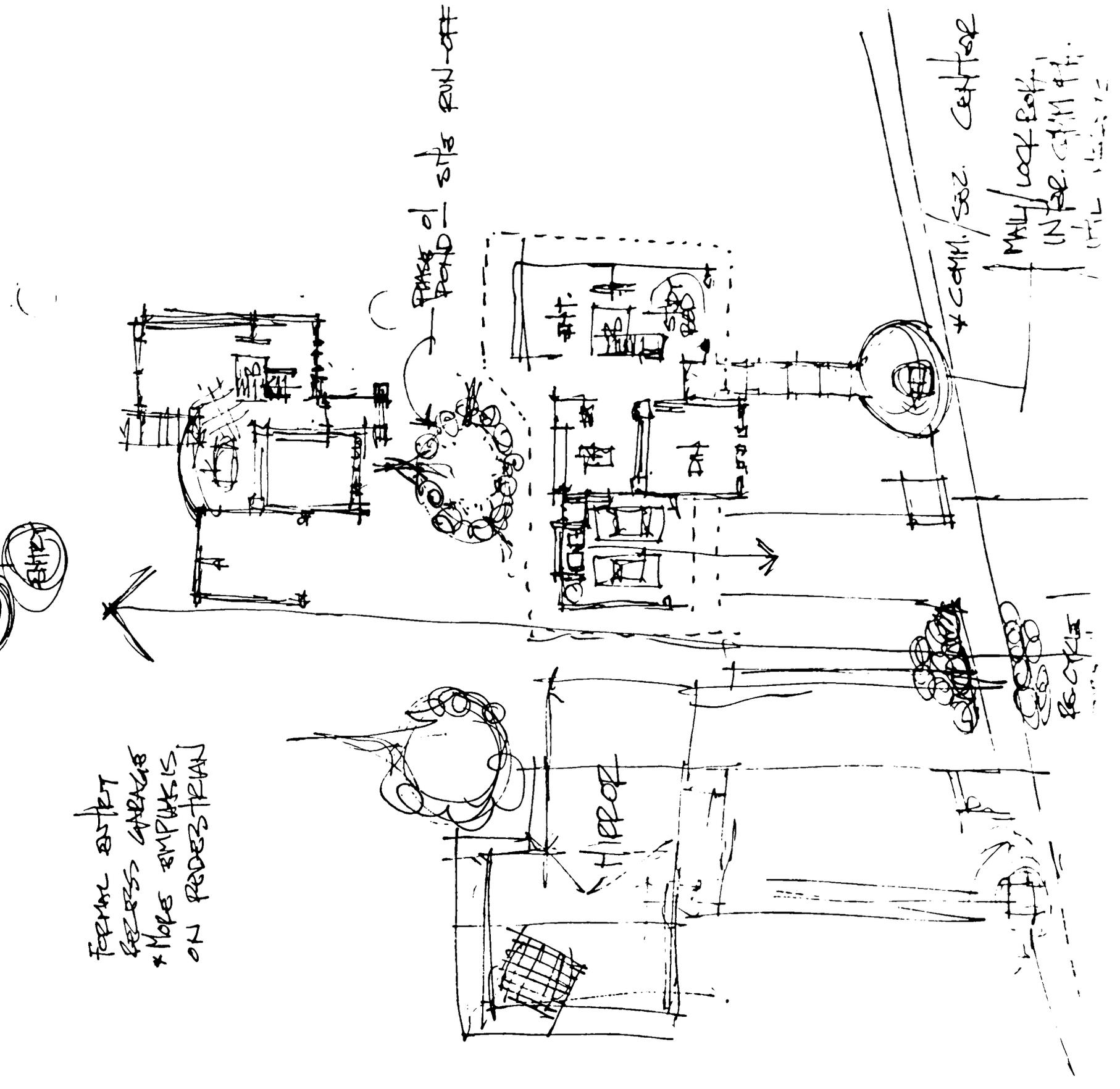
SEMI
PATIO

HOUSE

BRICK PAVING
CONCRETE PAV

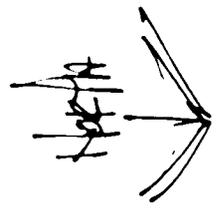
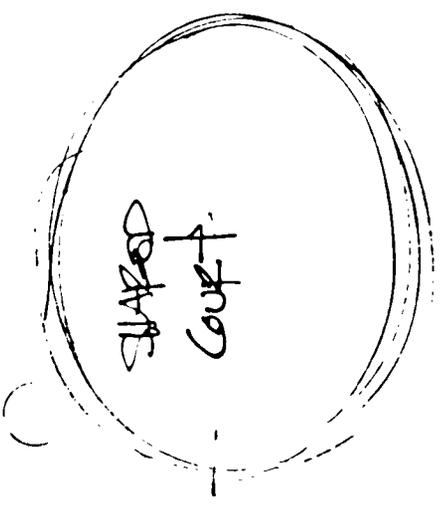
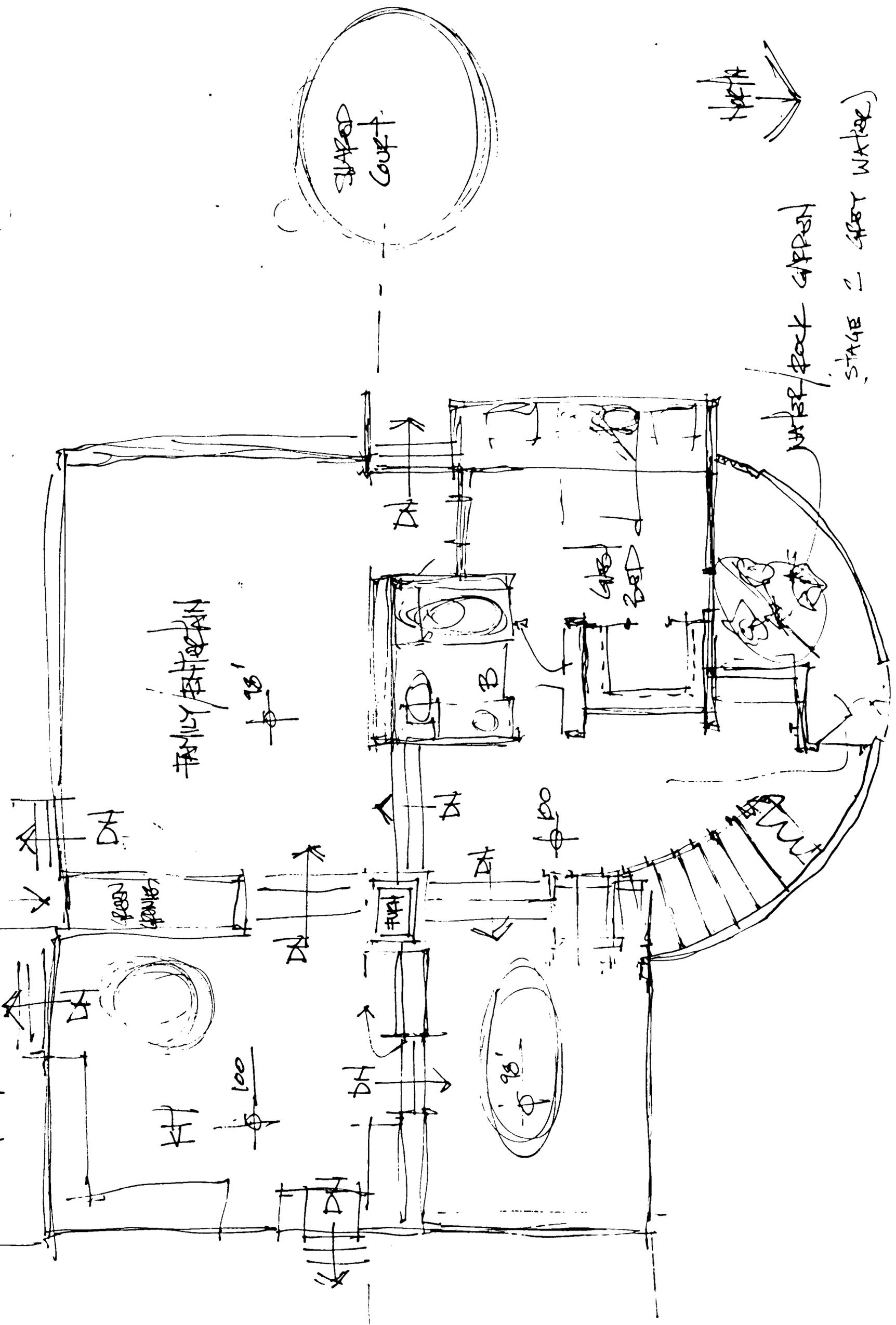


FORMAL ENTRY
 FEELS GARAGE
 * MORE EMPHASIS
 ON PEDESTRIAN



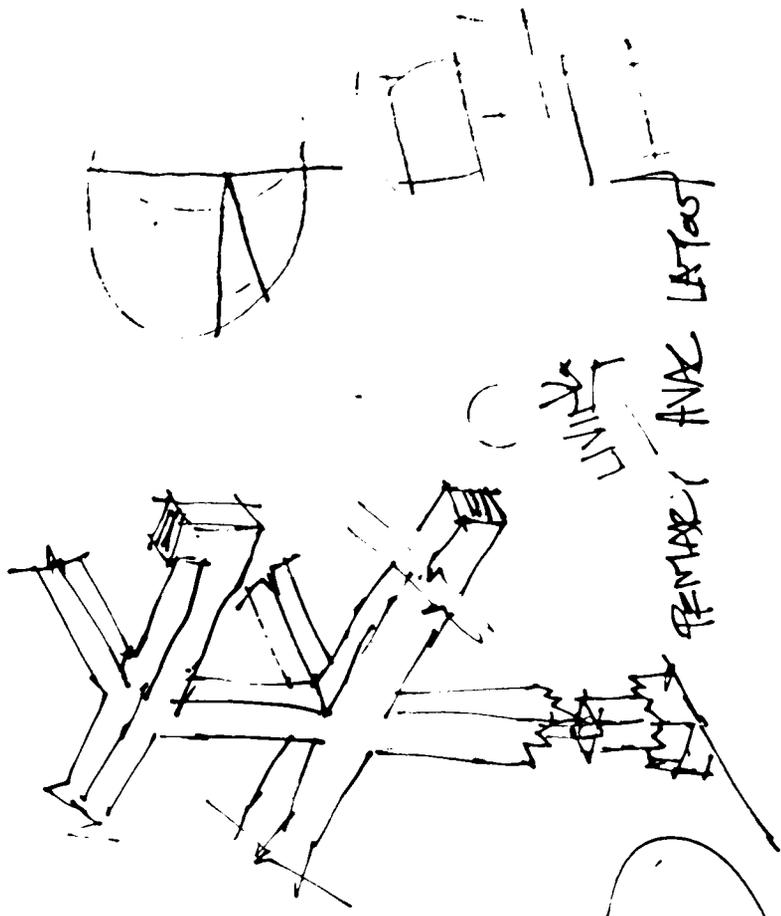
WATER/ROCK

WATER



WATER/ROCK GARDEN

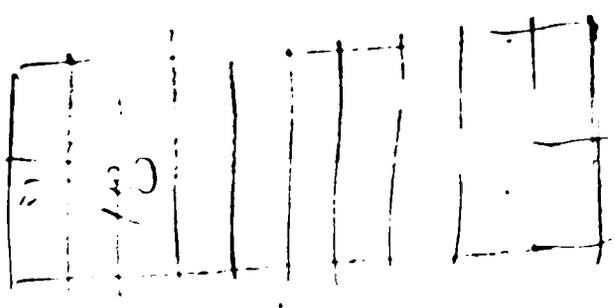
STAGE 2 (ROCK WATER)



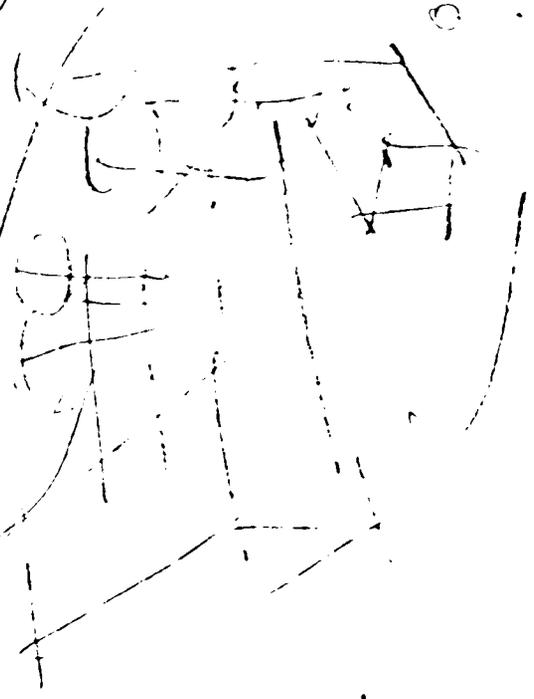
REMARK: ANAC LATEST

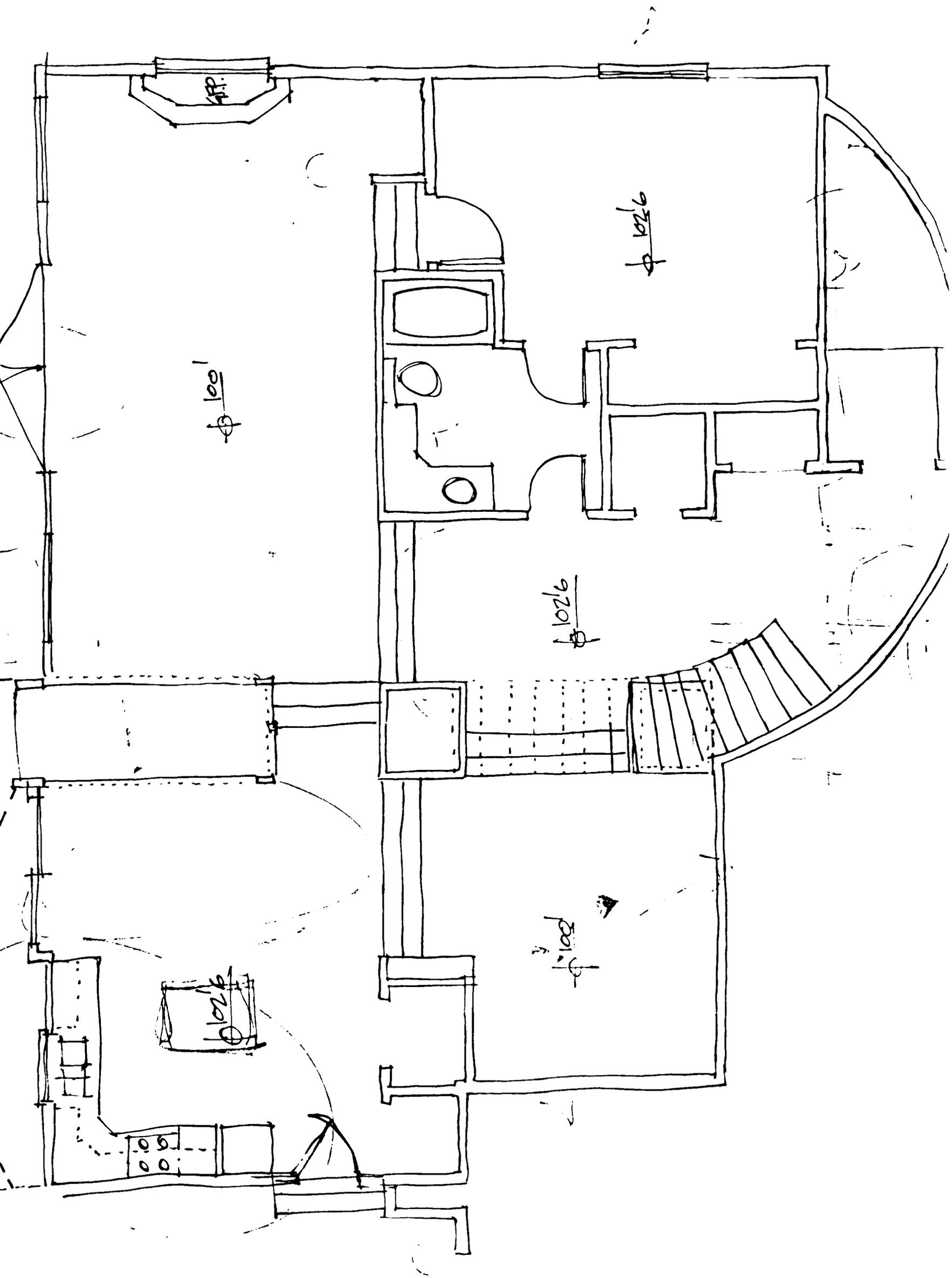
LINING

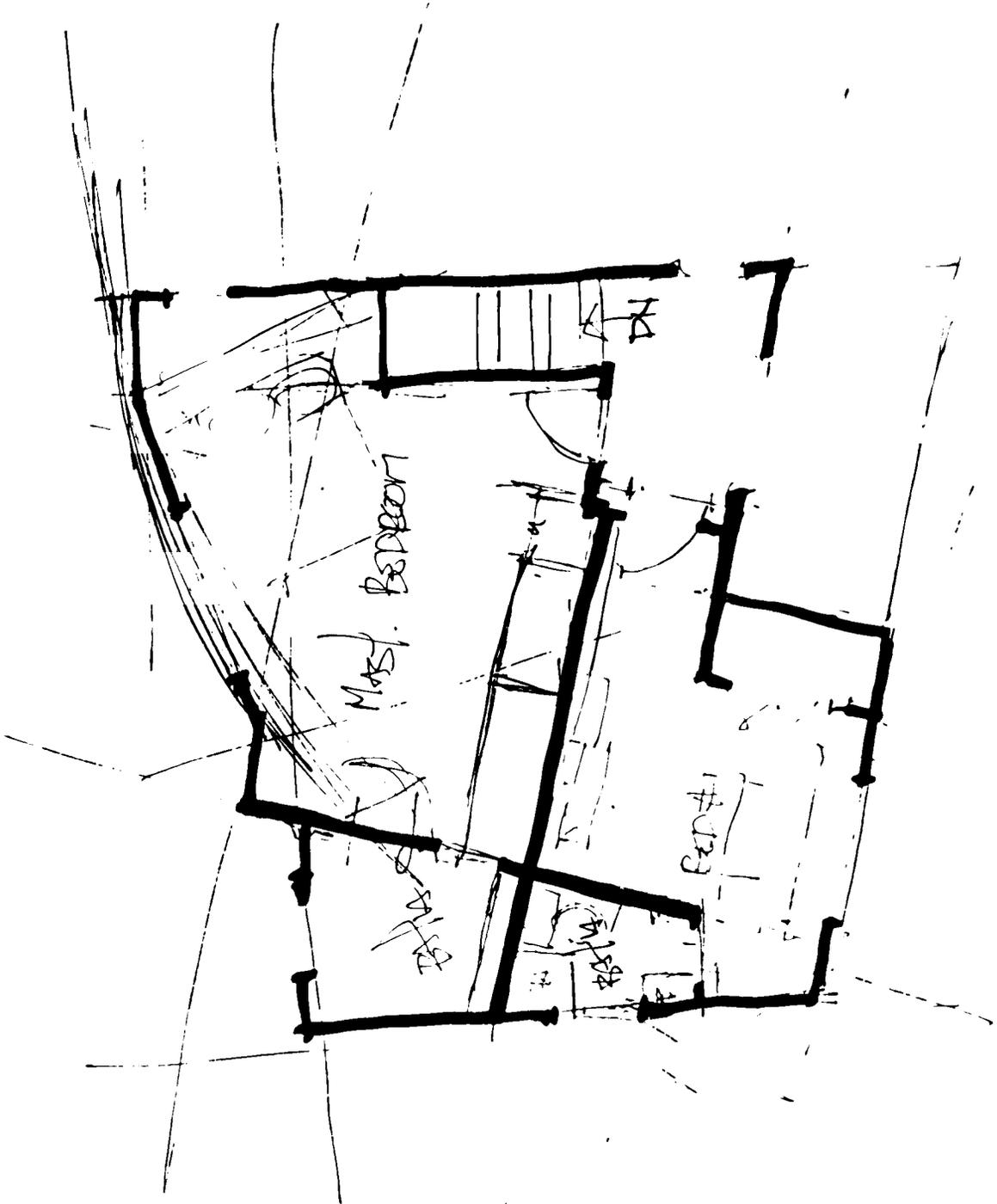
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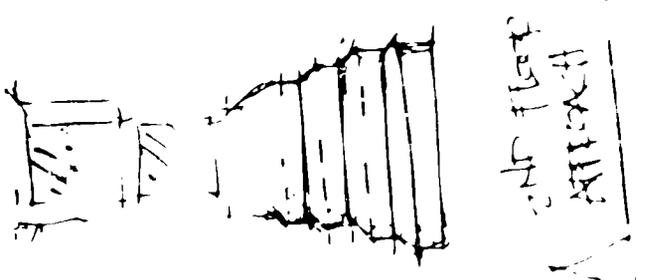
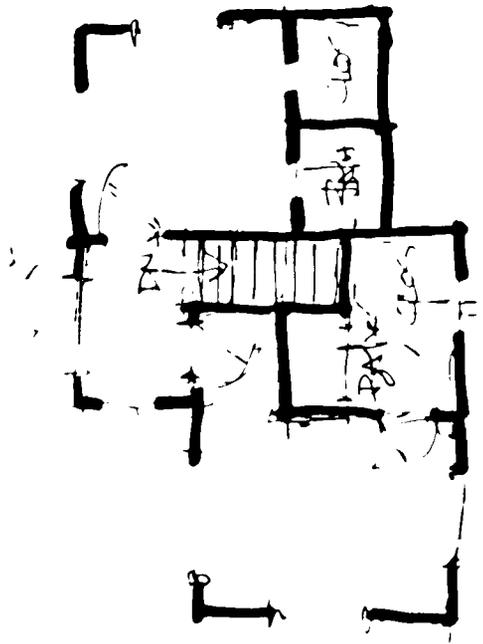
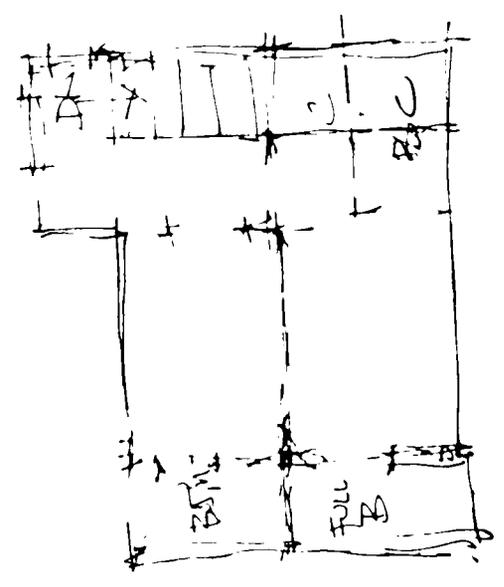
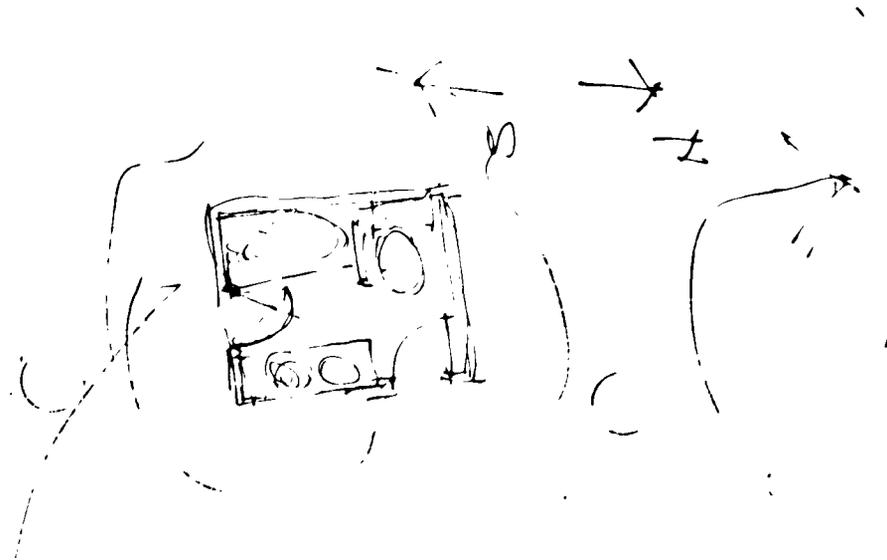
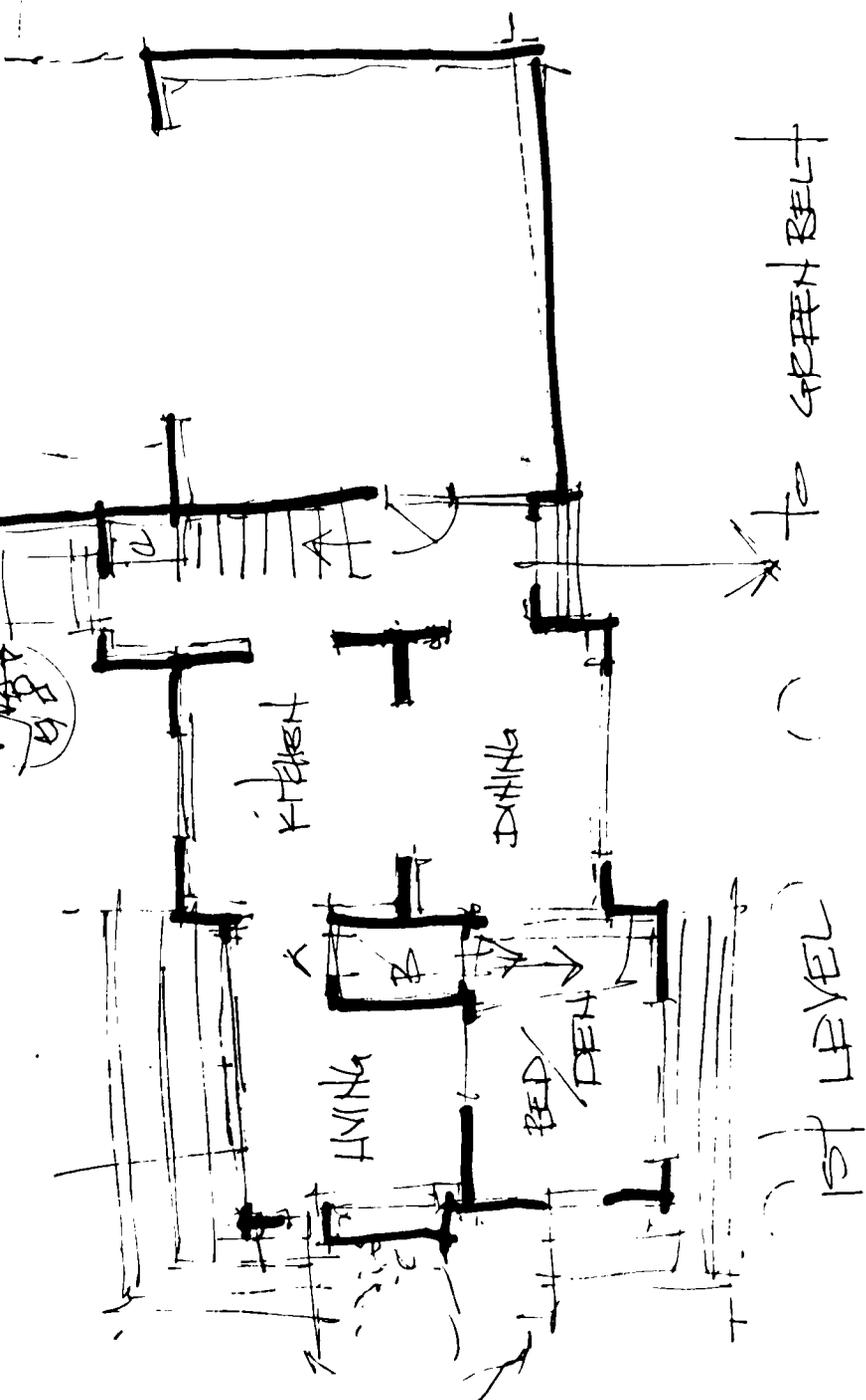
RESTAURANT
L.W. COOLING
MACHINE

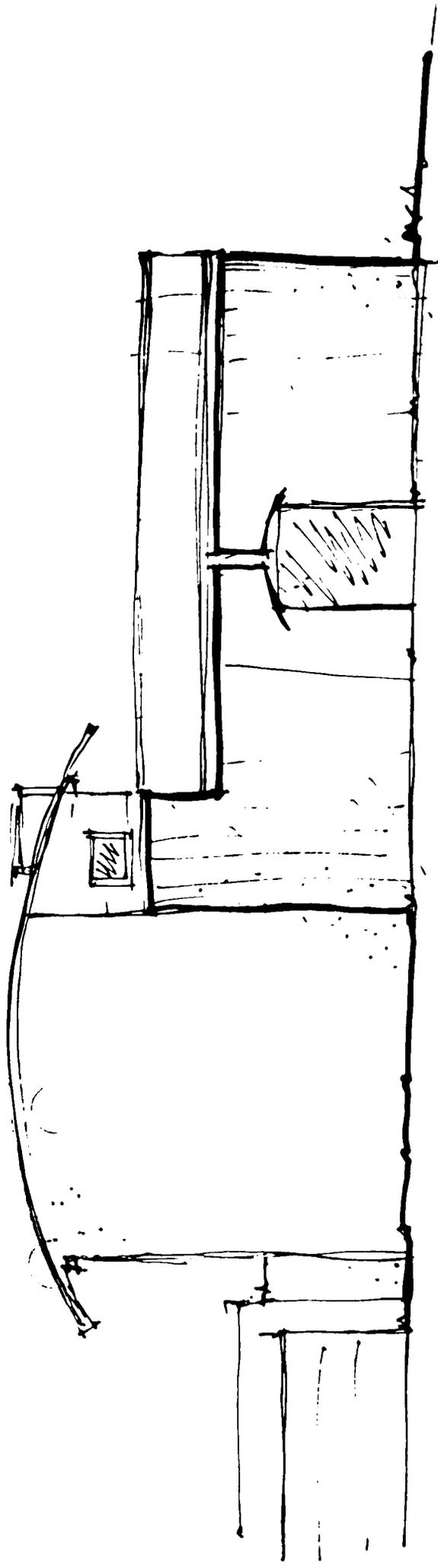






2ND FLOOR



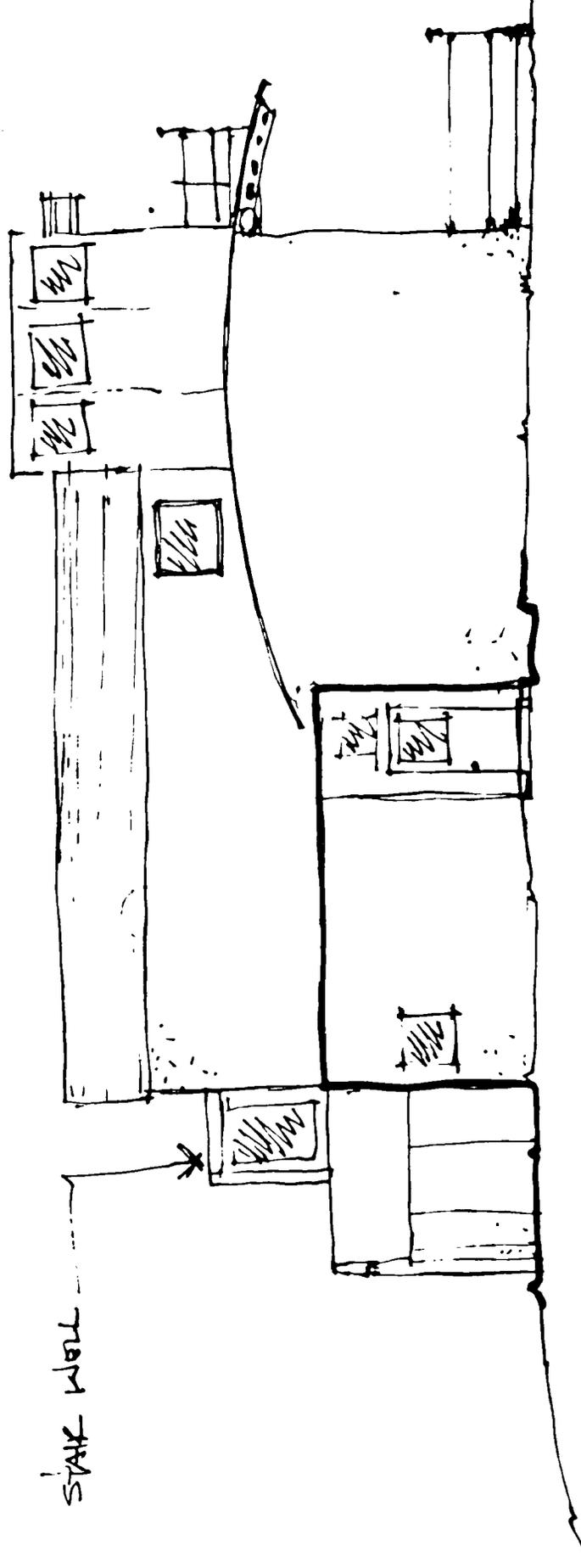


STREET ELEVATION

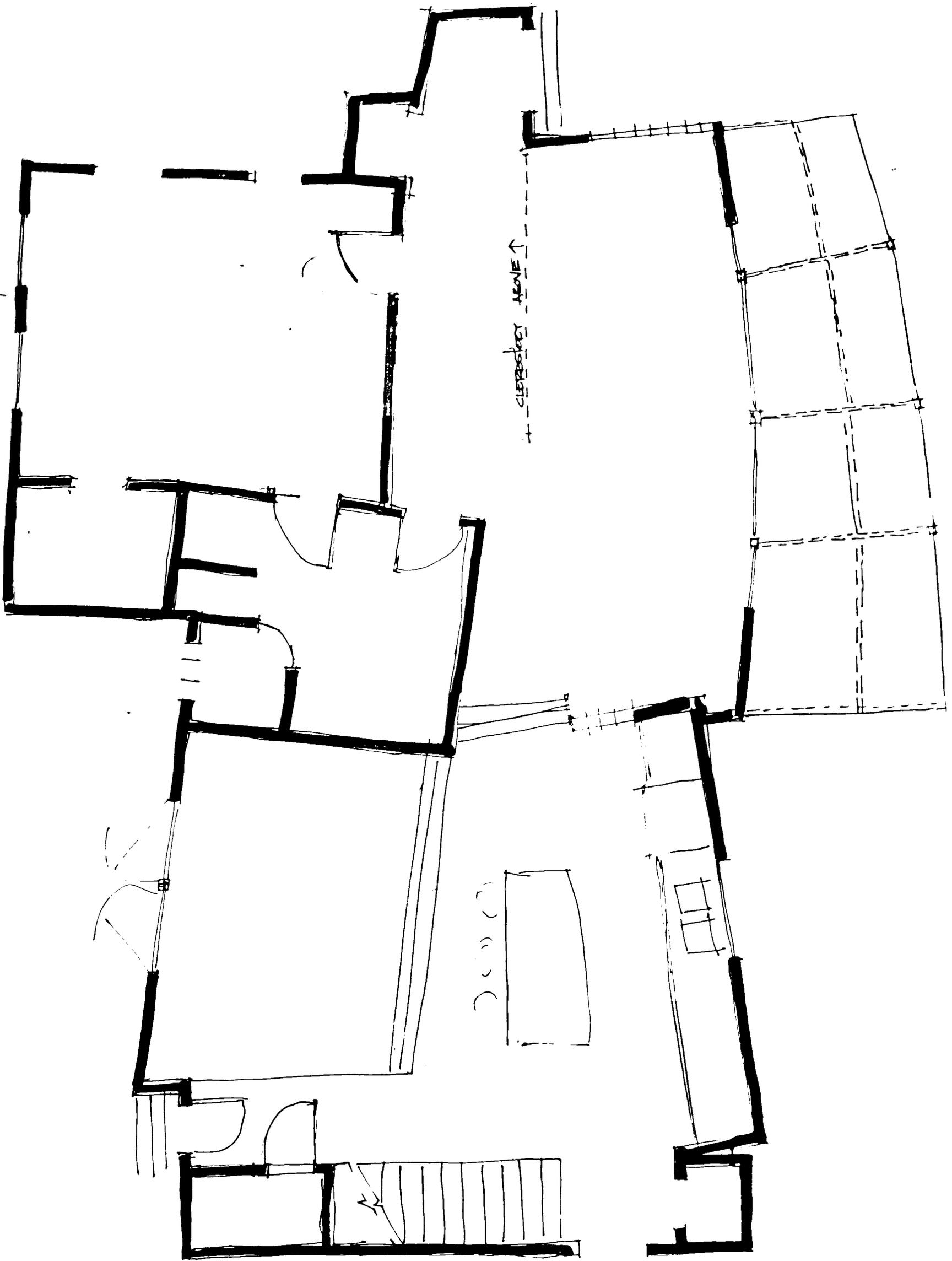
LIGHT WALL, GREENHOUSE

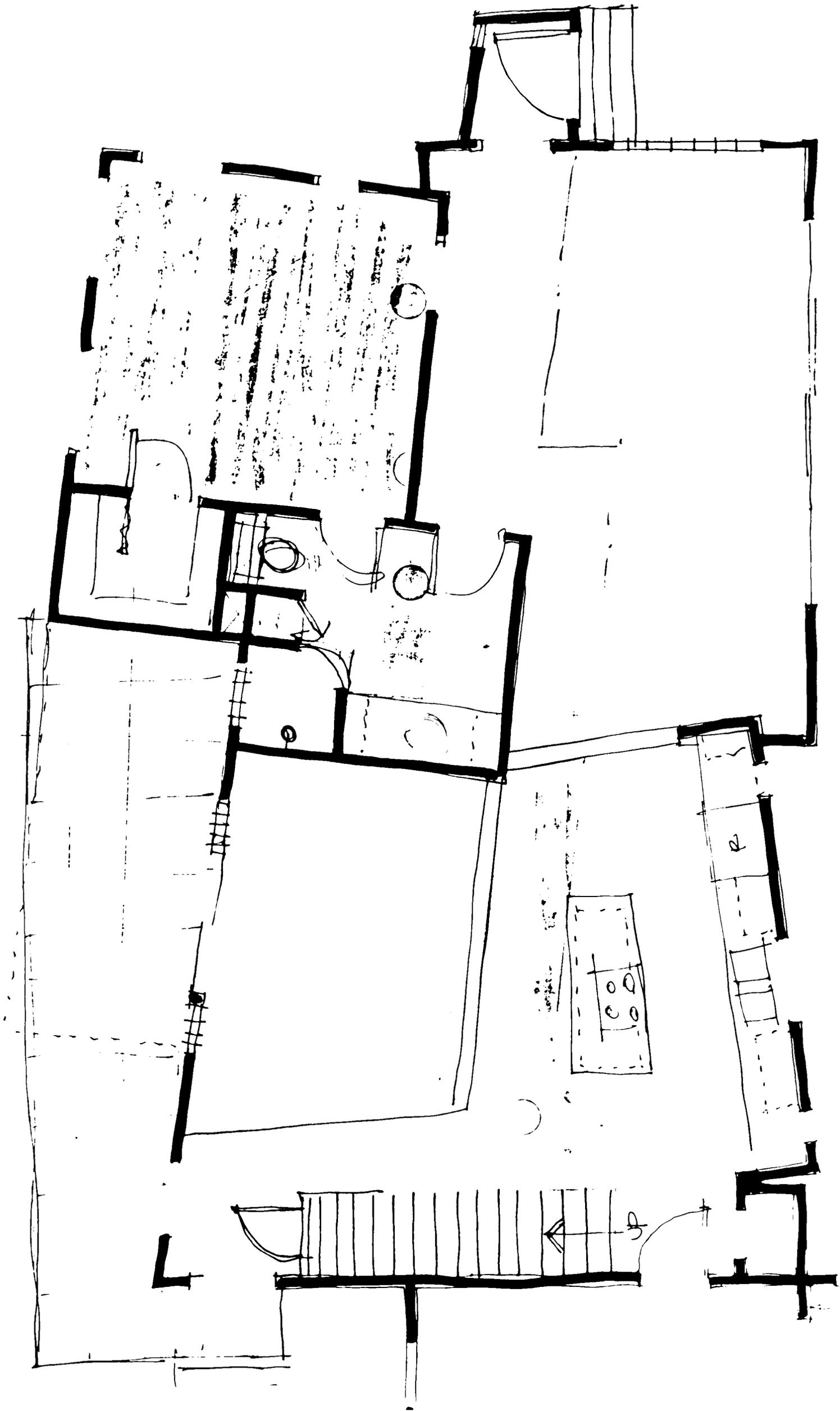


STAIR WALL

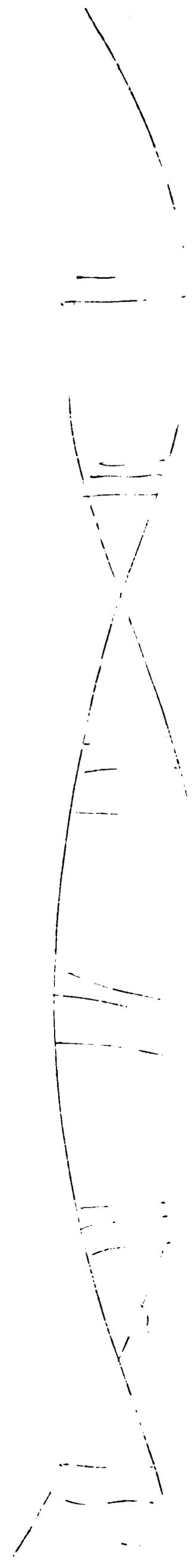
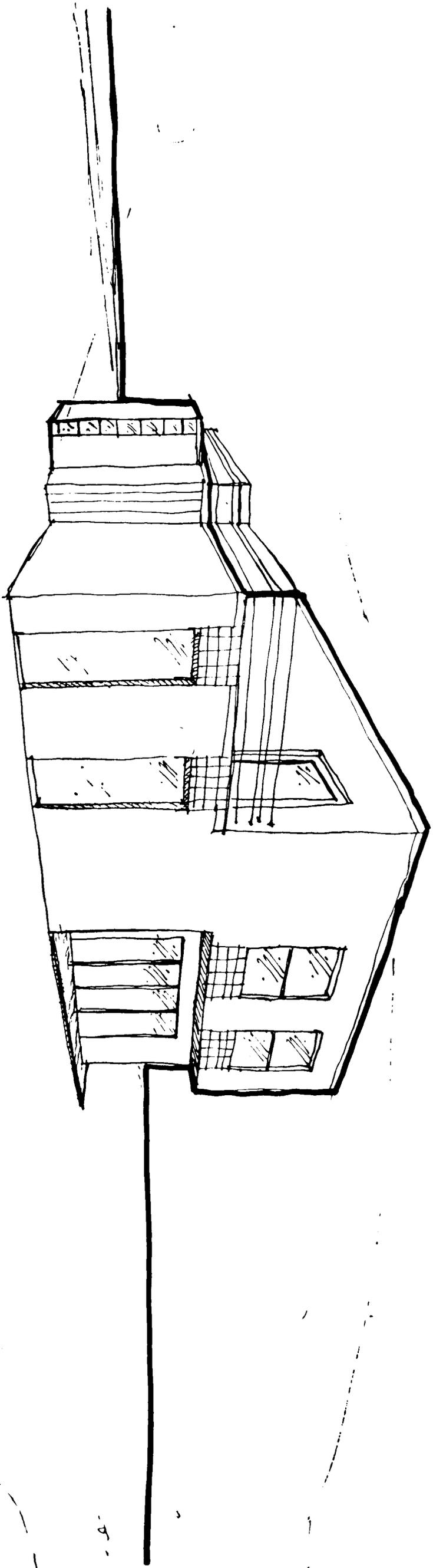


HOUSE ELEVATION

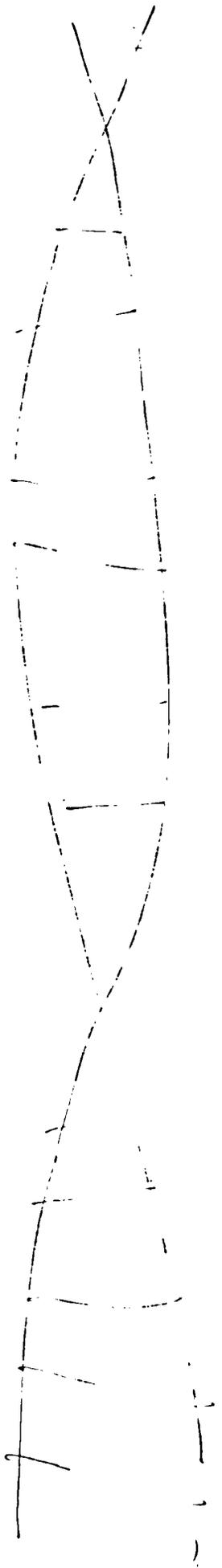
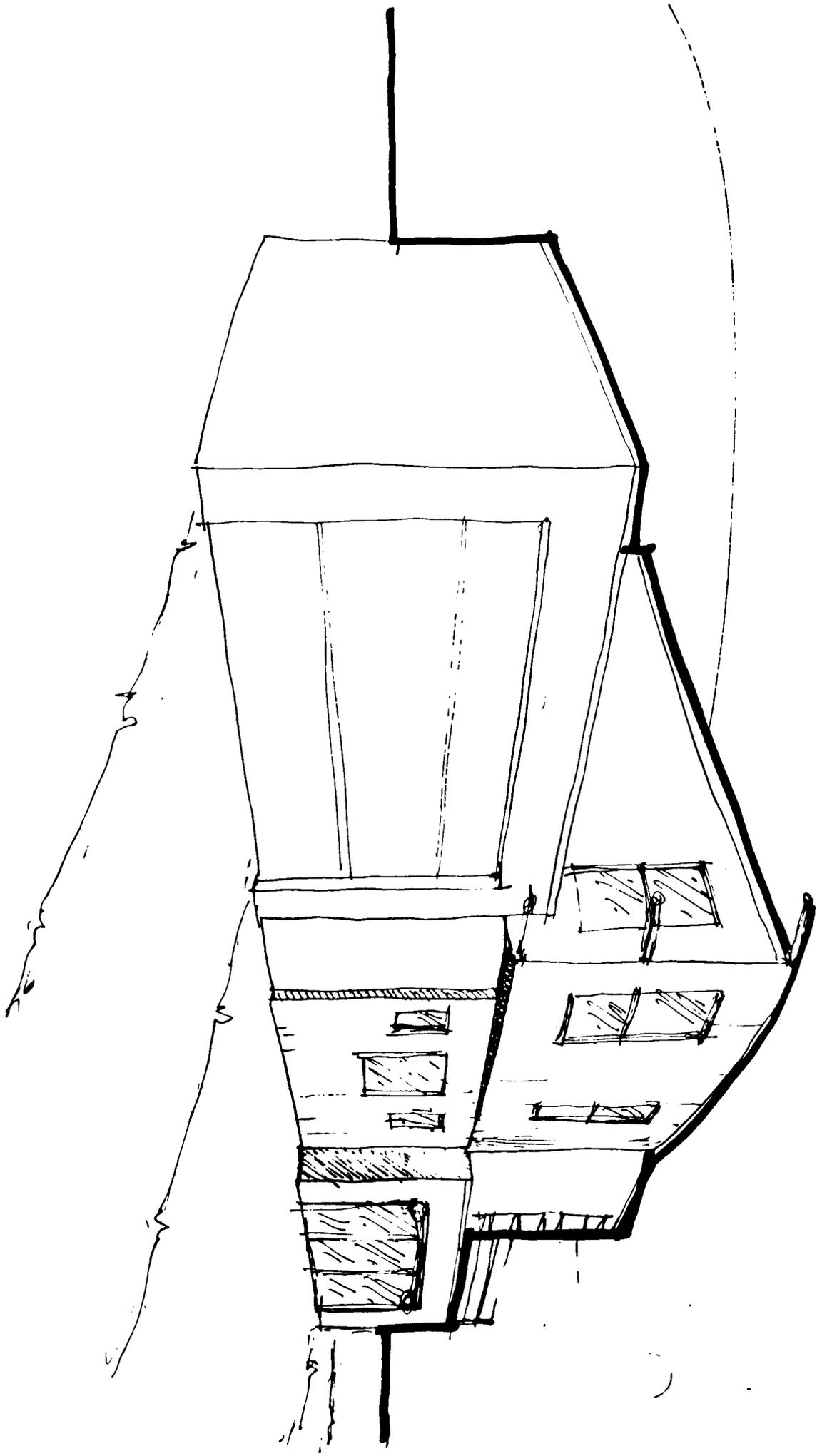




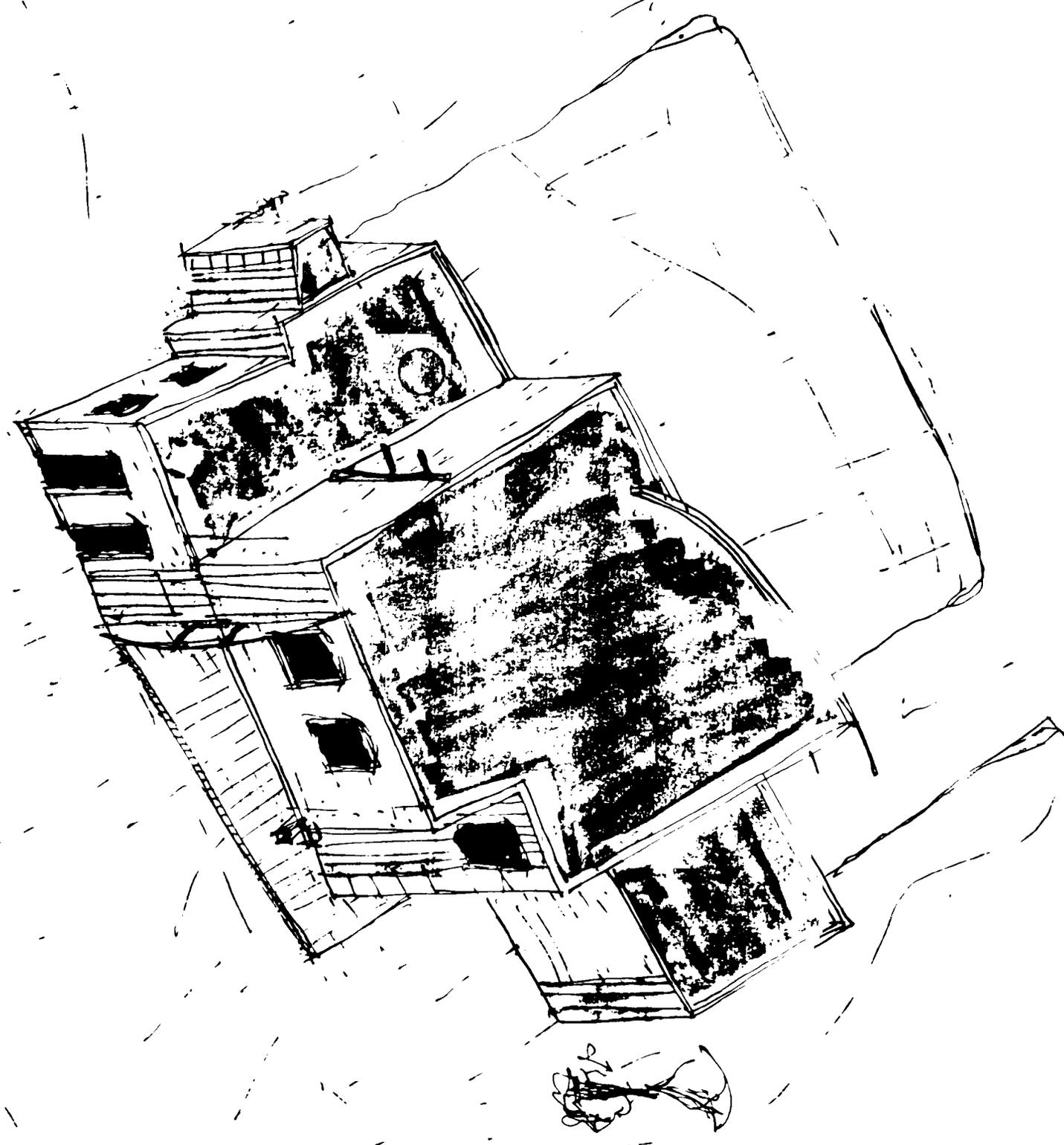
North Perspective
02.12.93

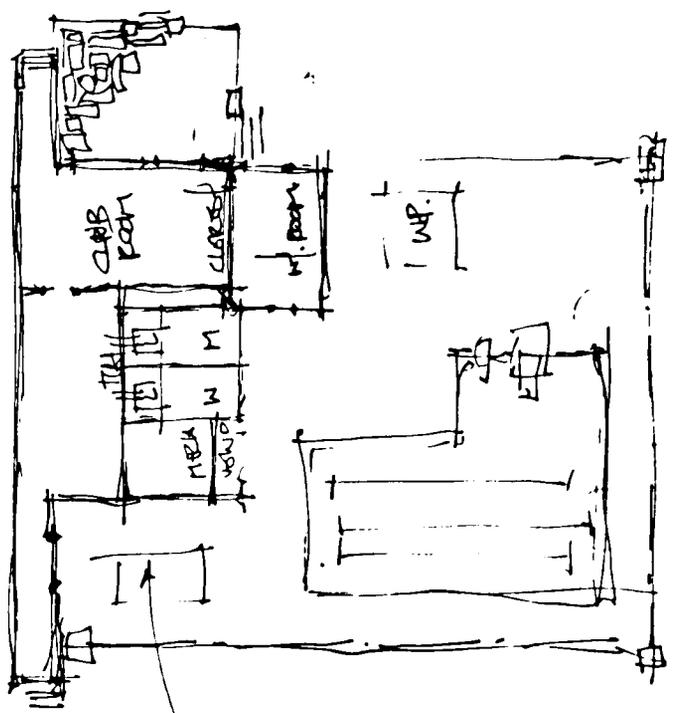
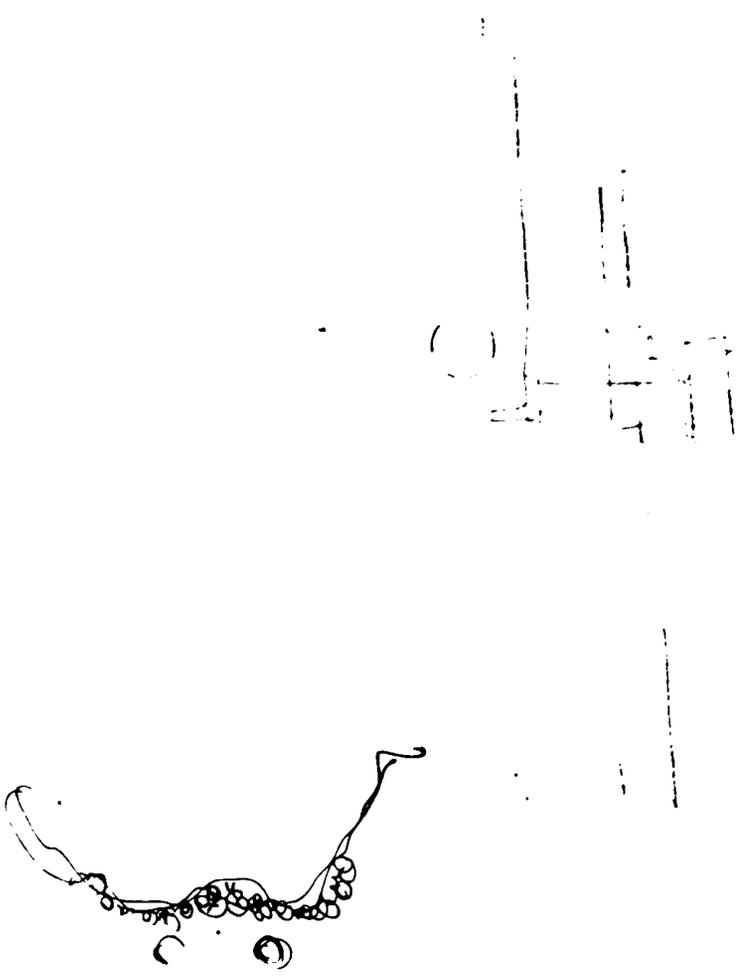


SOUTH PERSPECTIVE
02.11.93

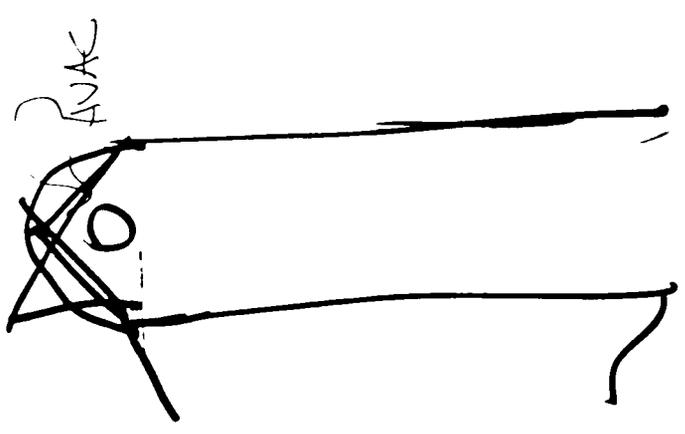


ARCHITECTURE





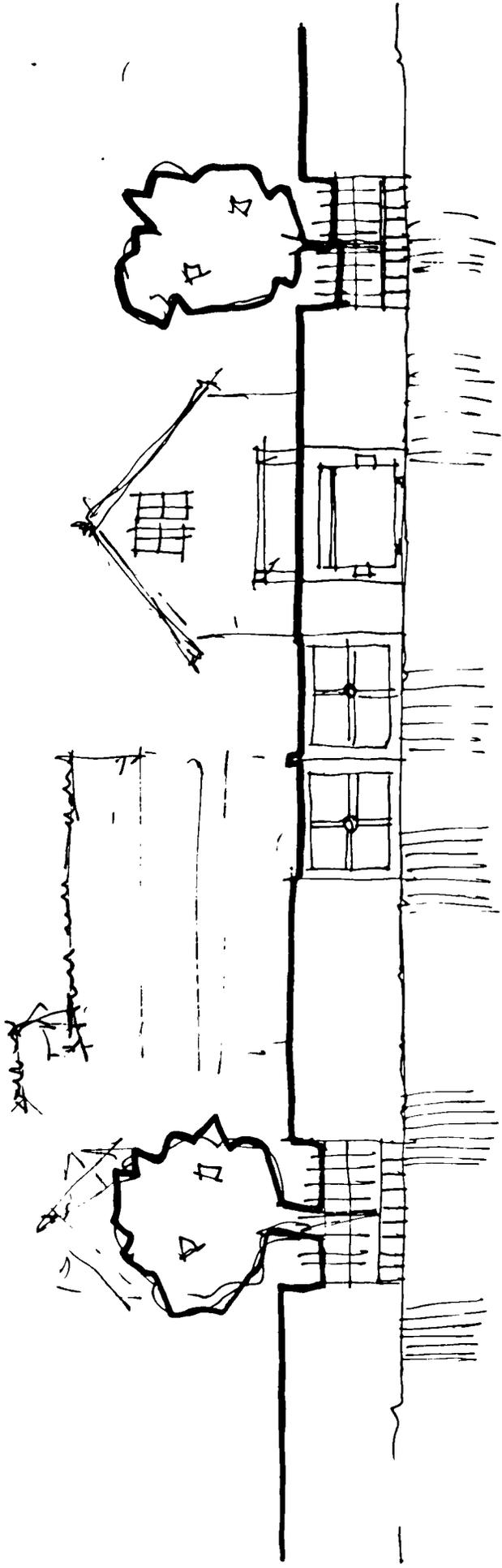
CHILDREN'S POOL



AVAC

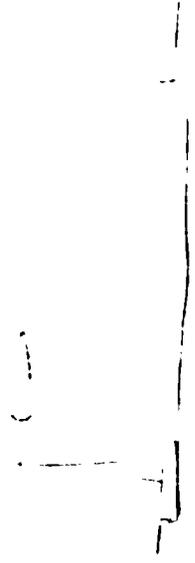
2/12

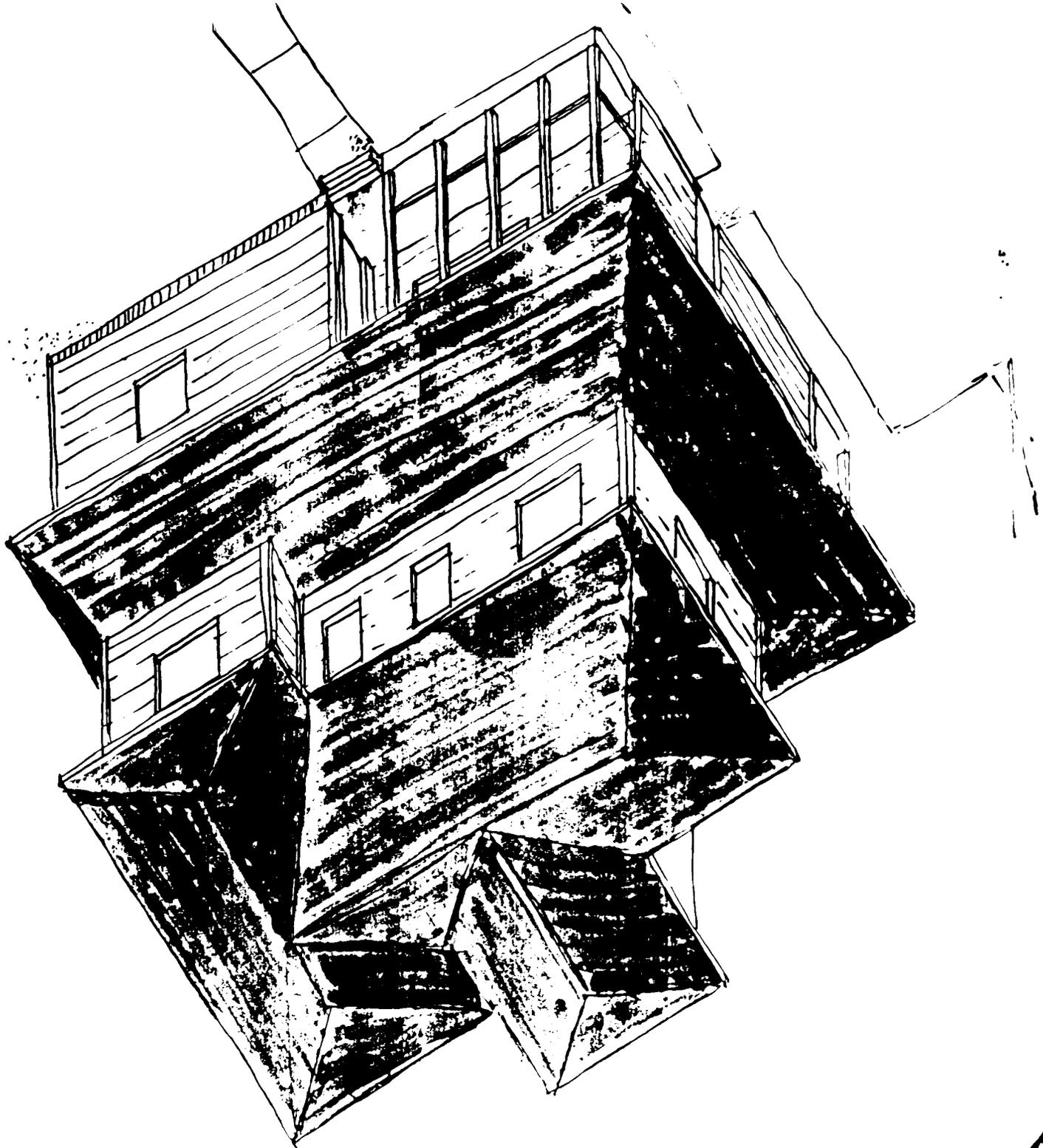
2/12

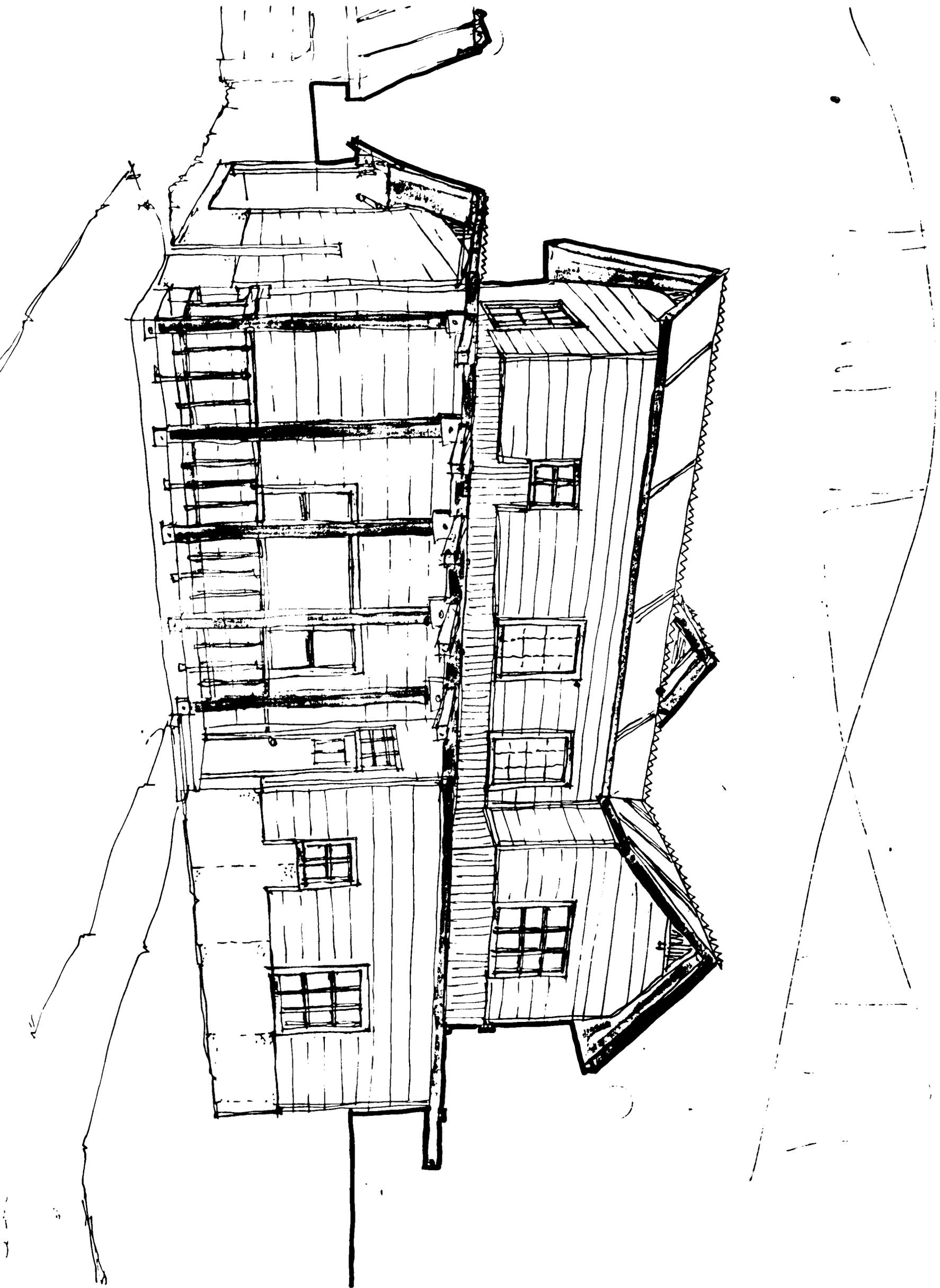


TR. ALLET ELEVATION

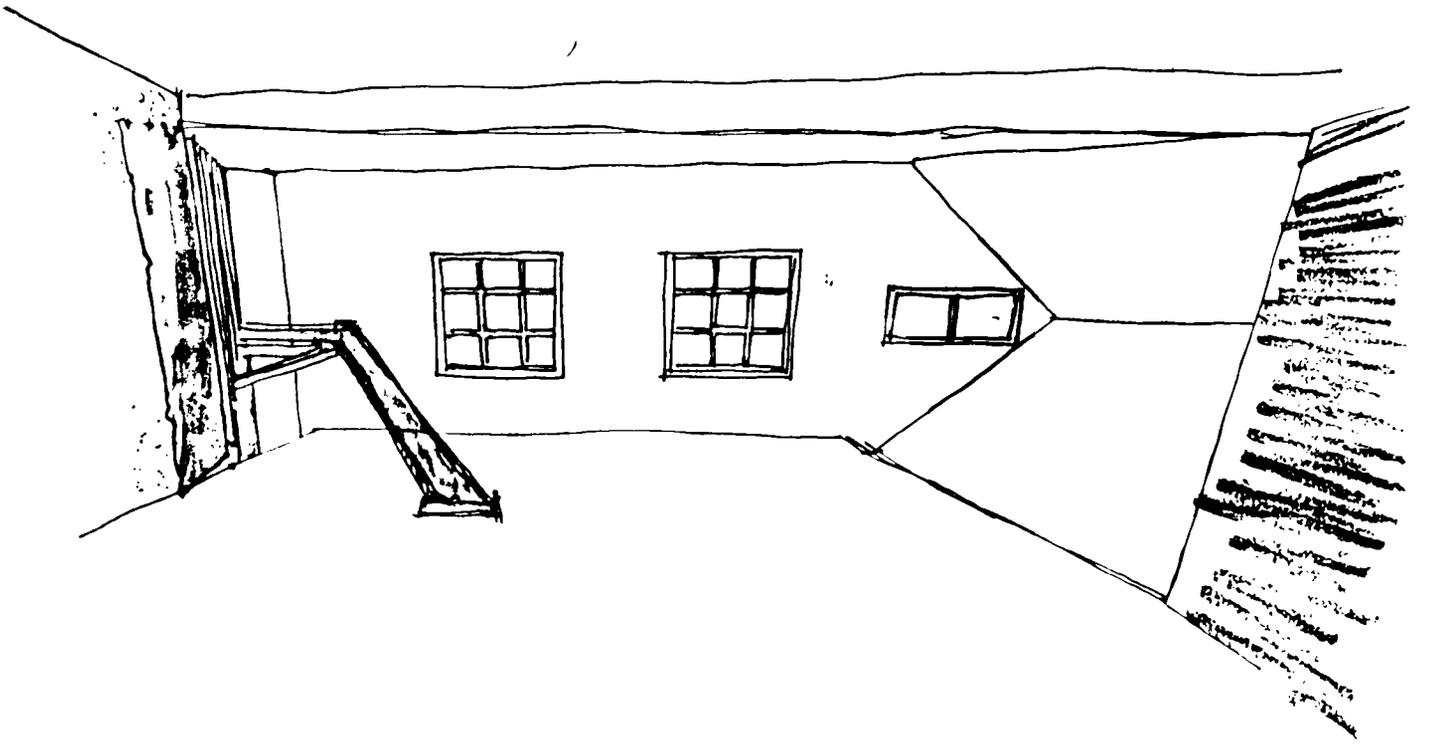
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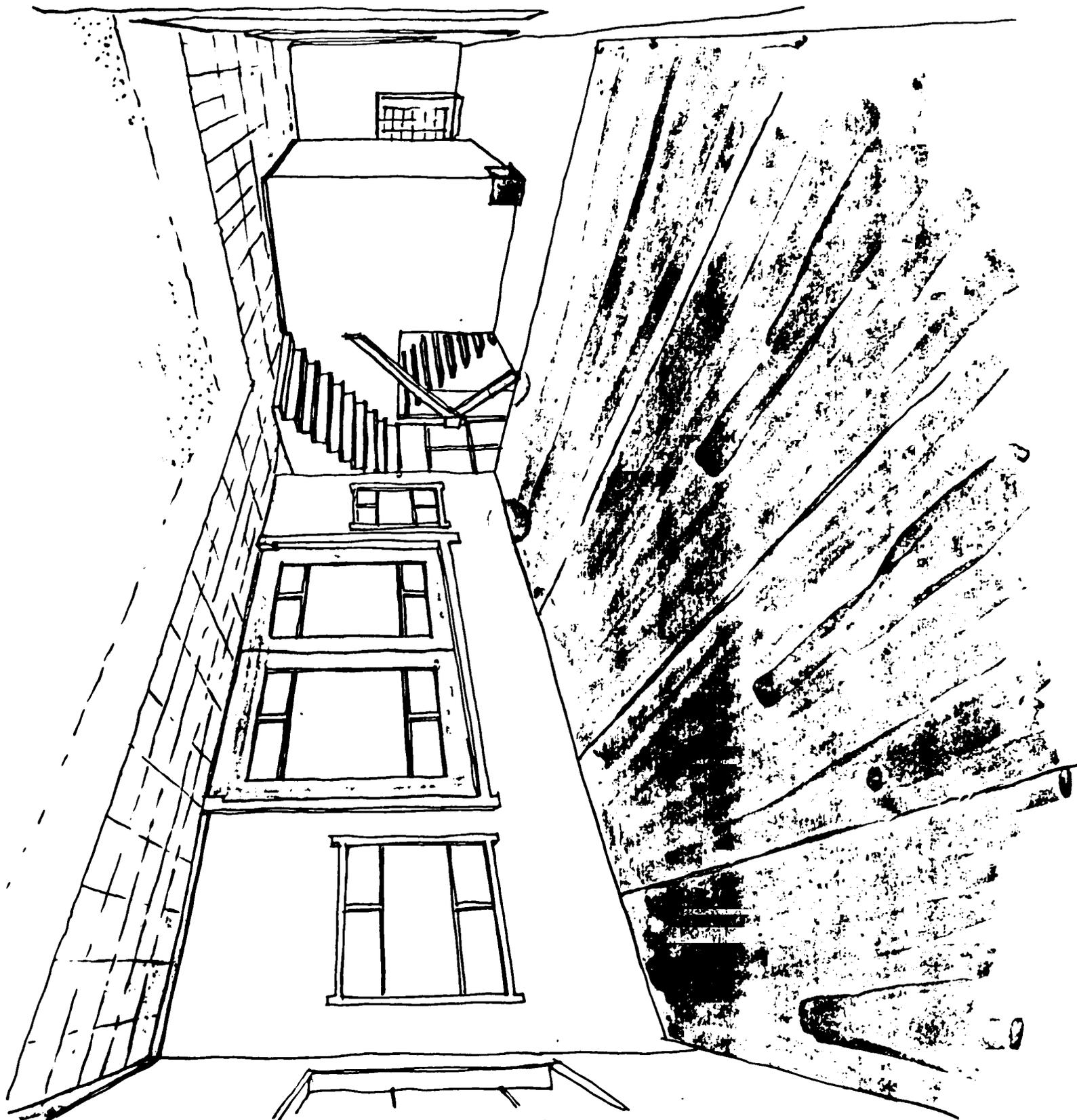


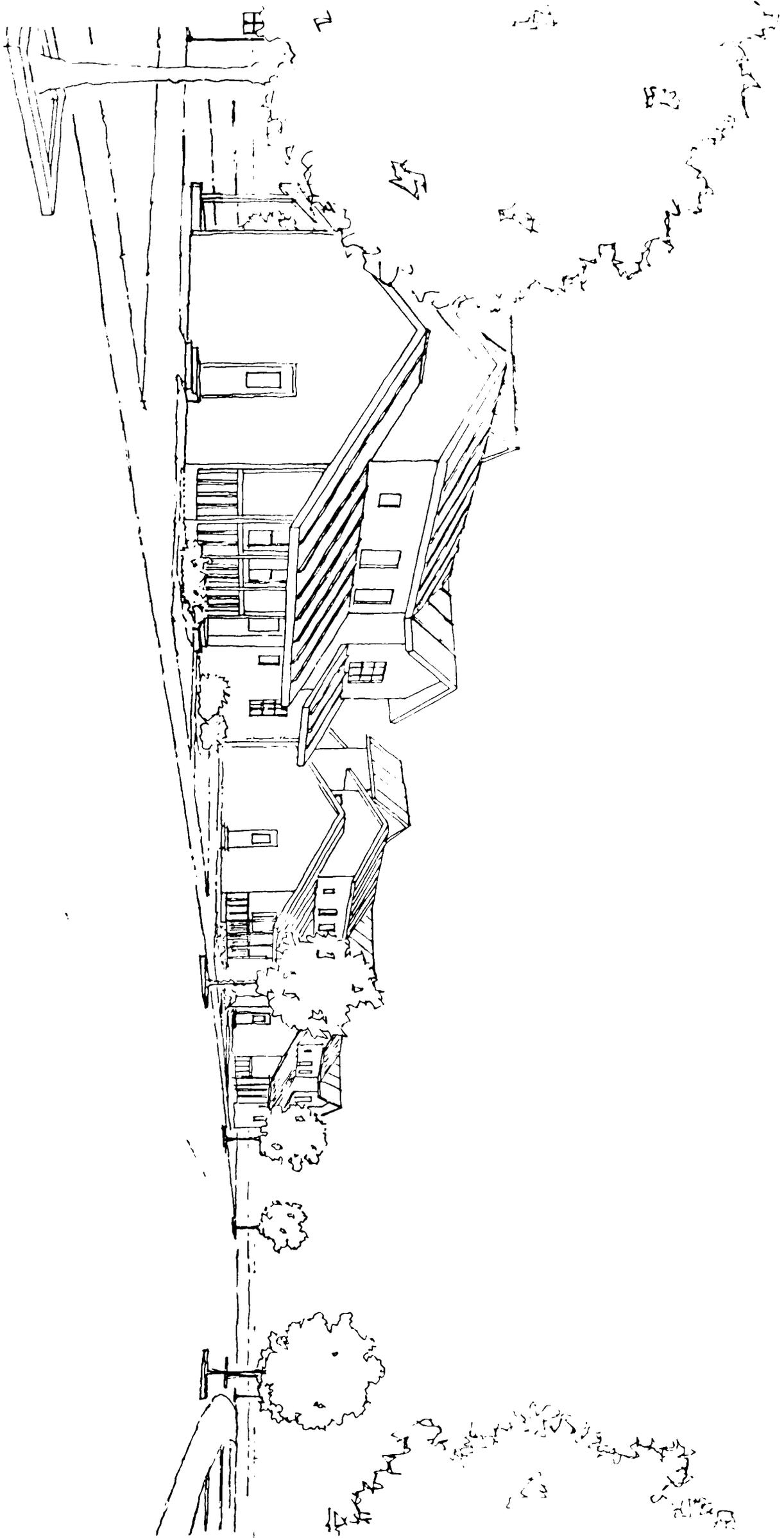


SECOND FLOOR SKIN TOWER
02.24.93

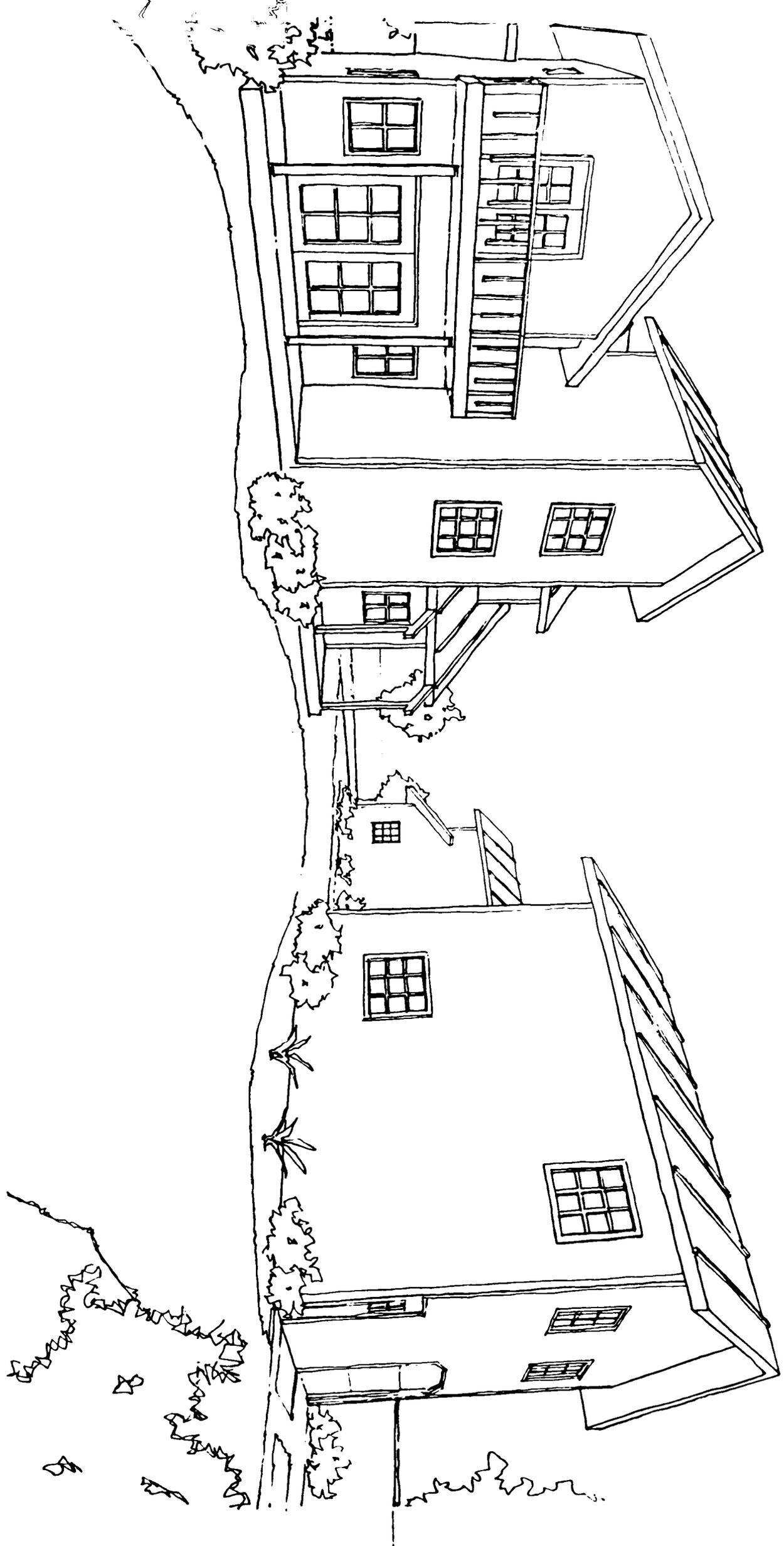


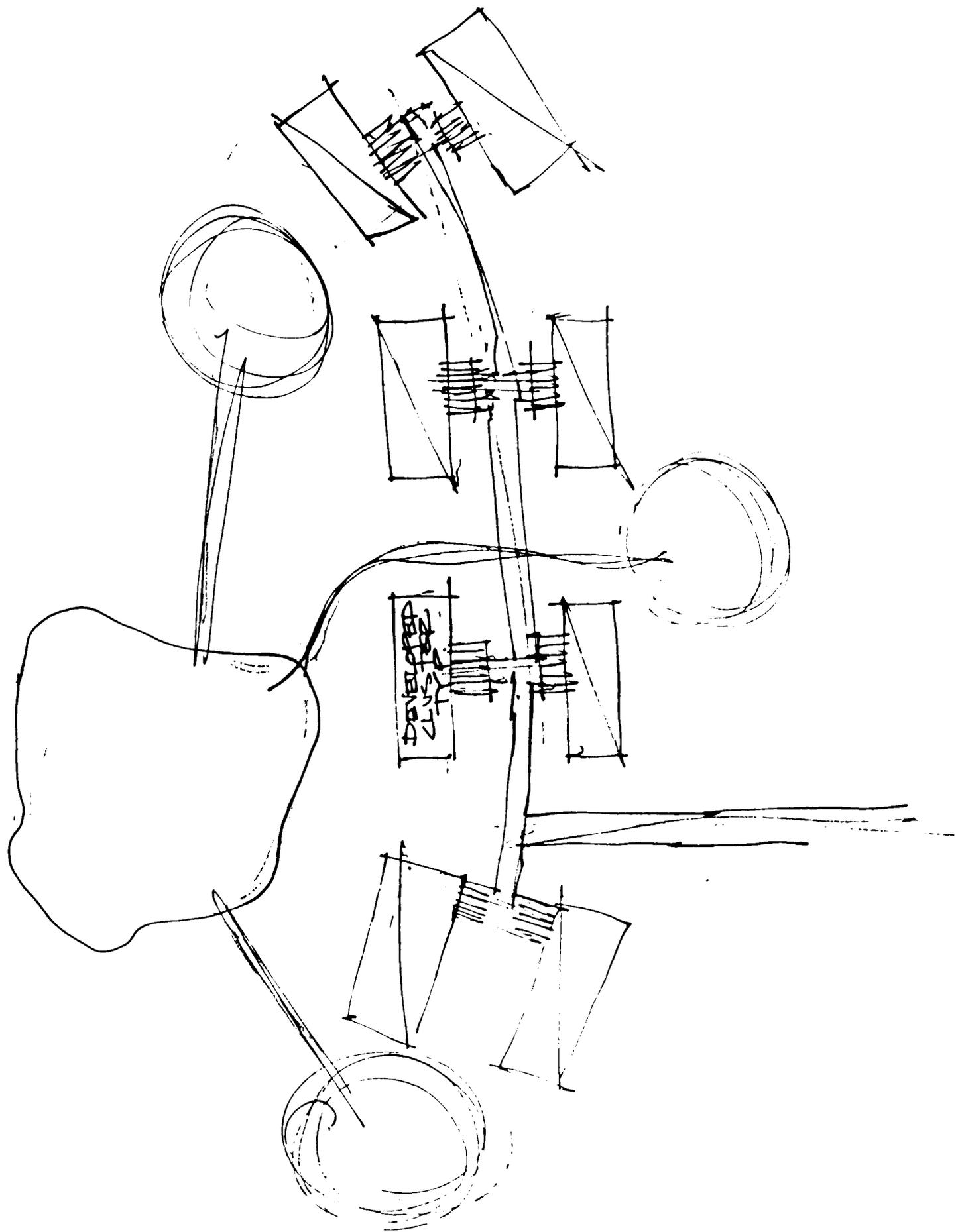
great room
022593

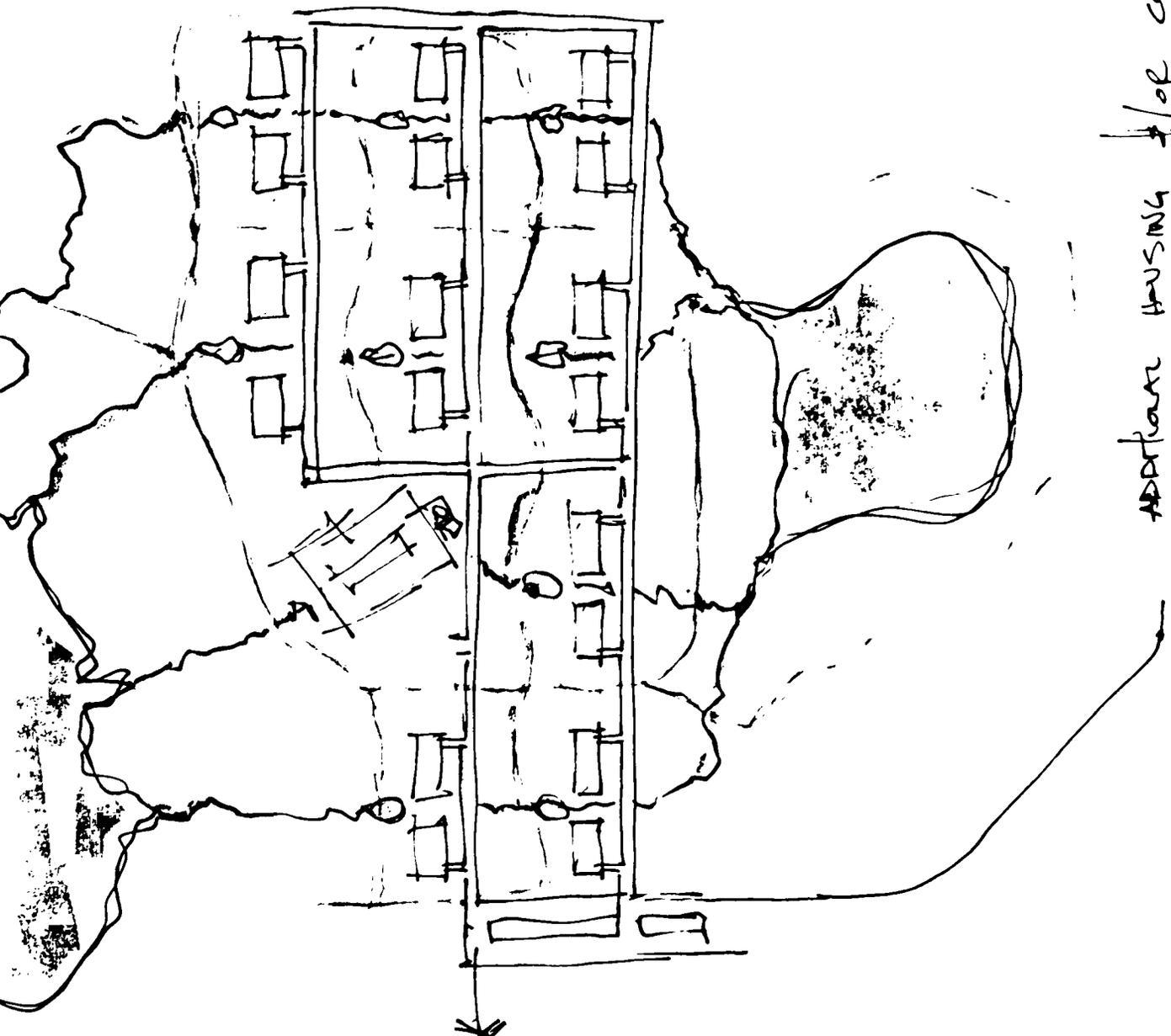




住宅

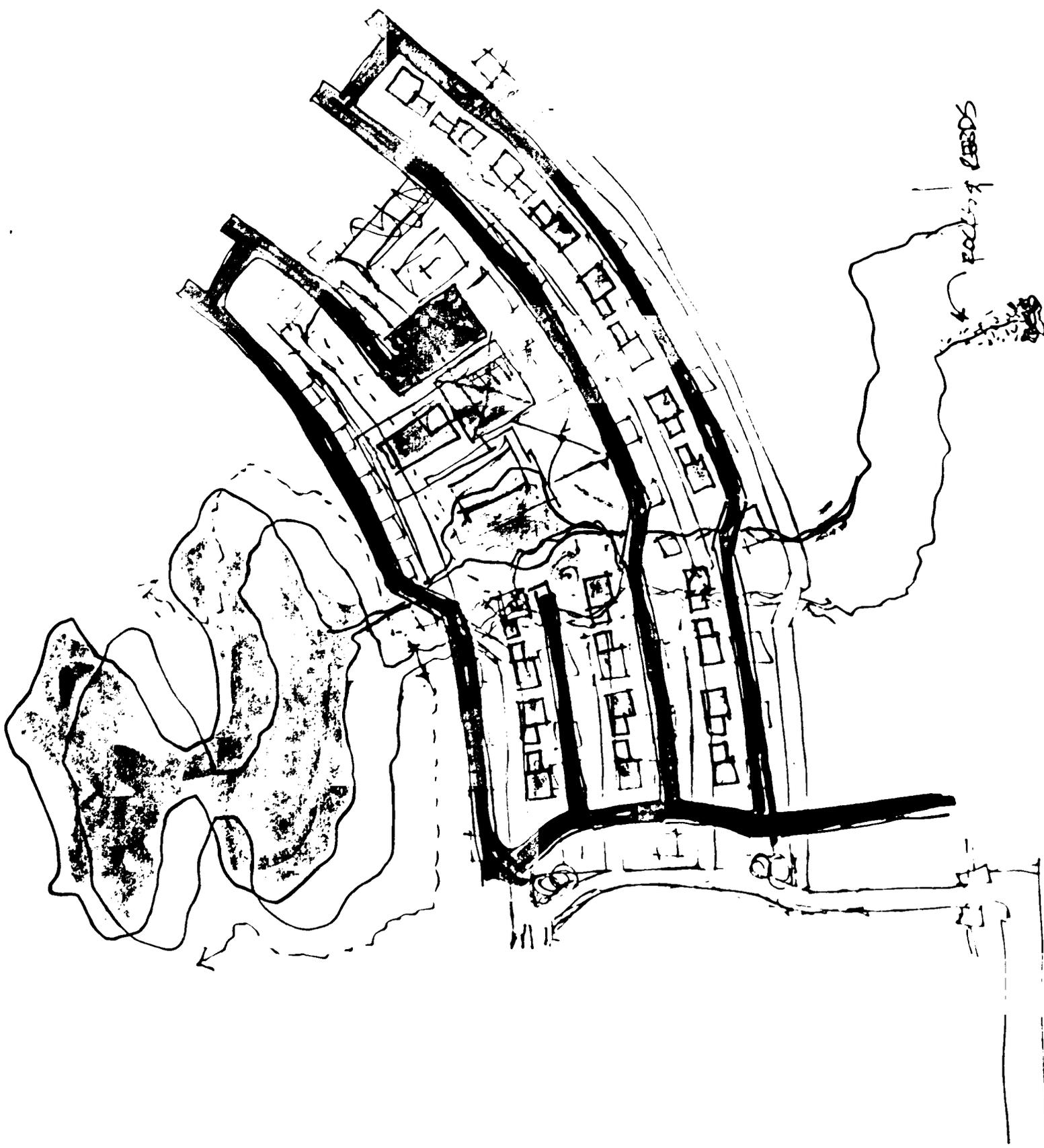






ADDITIONAL HOUSING #/OR COMM. USE ↓

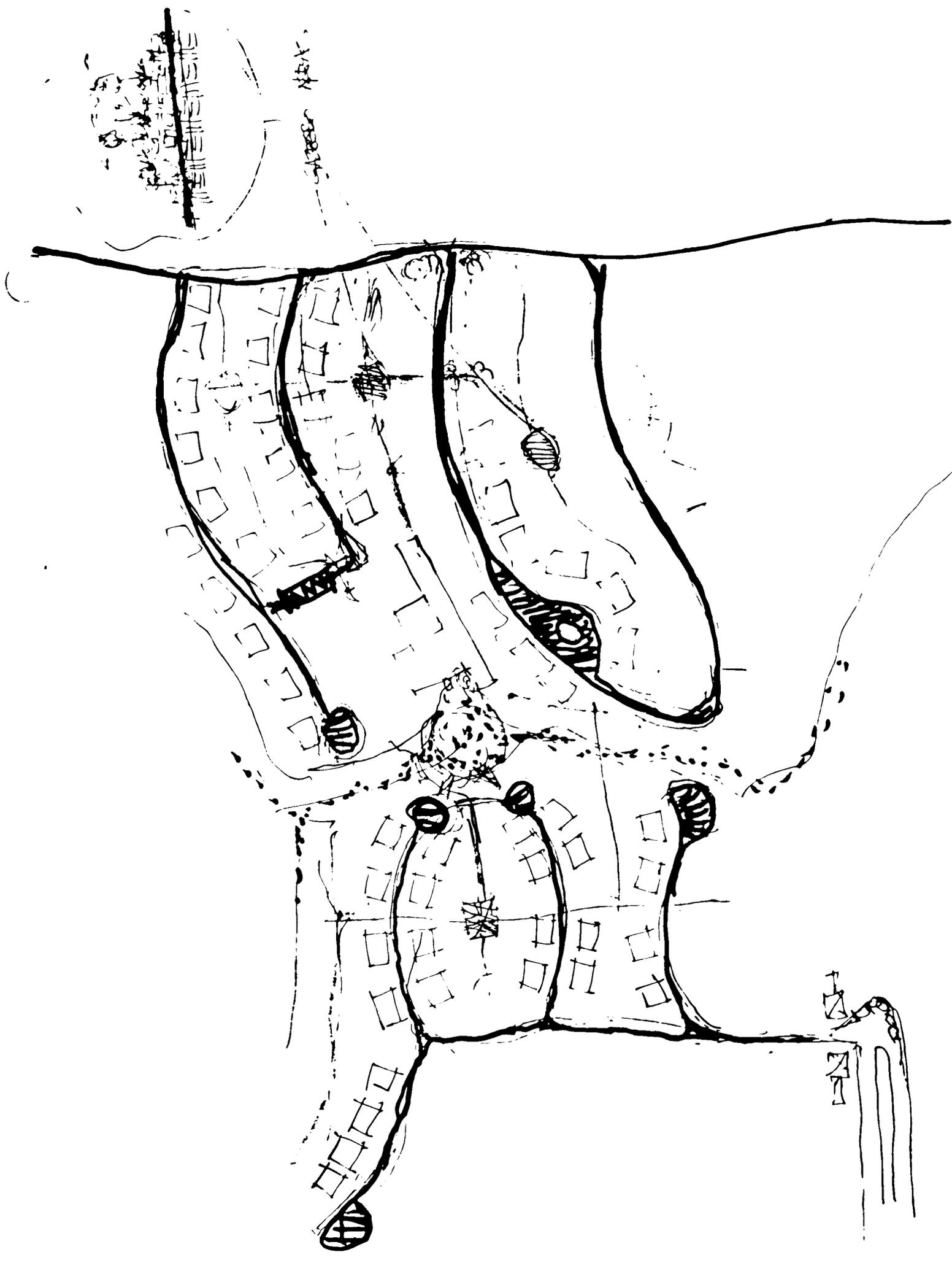
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27.05
1/1/1

POOLING BEEDS

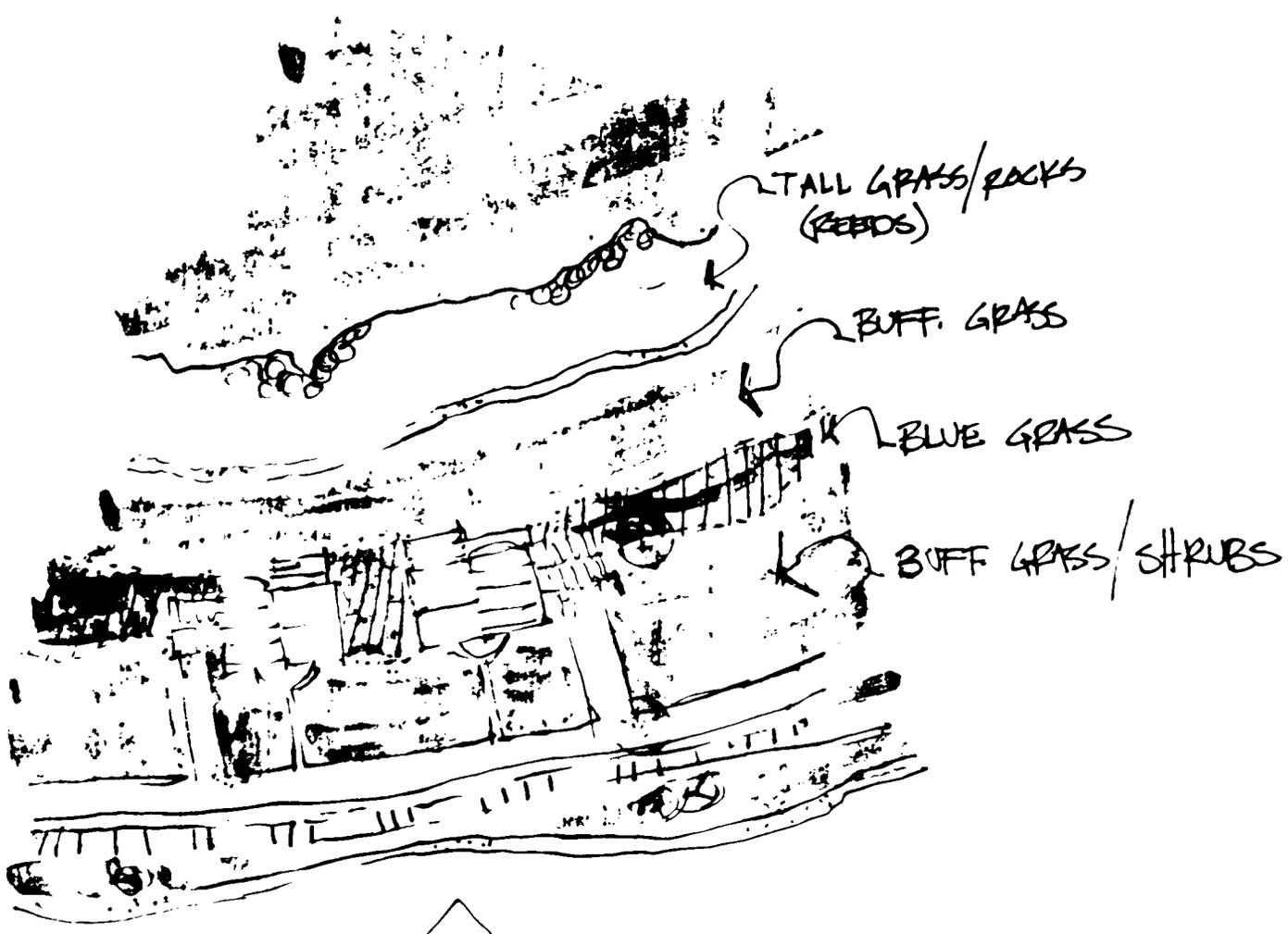




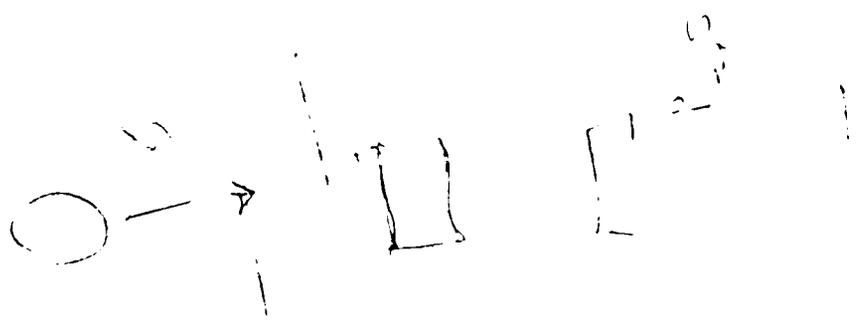
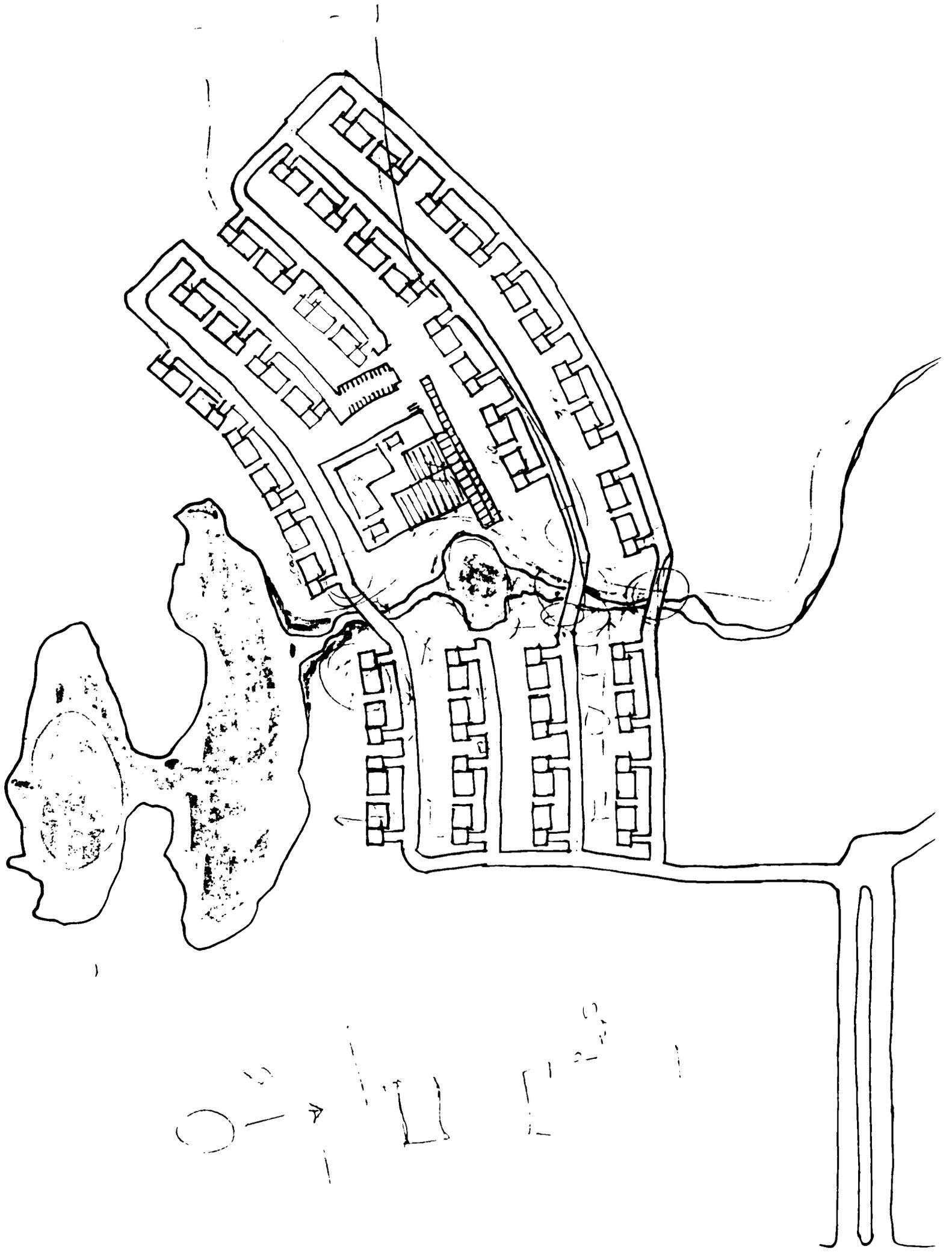
NEW
CORPORATE

2.15.15

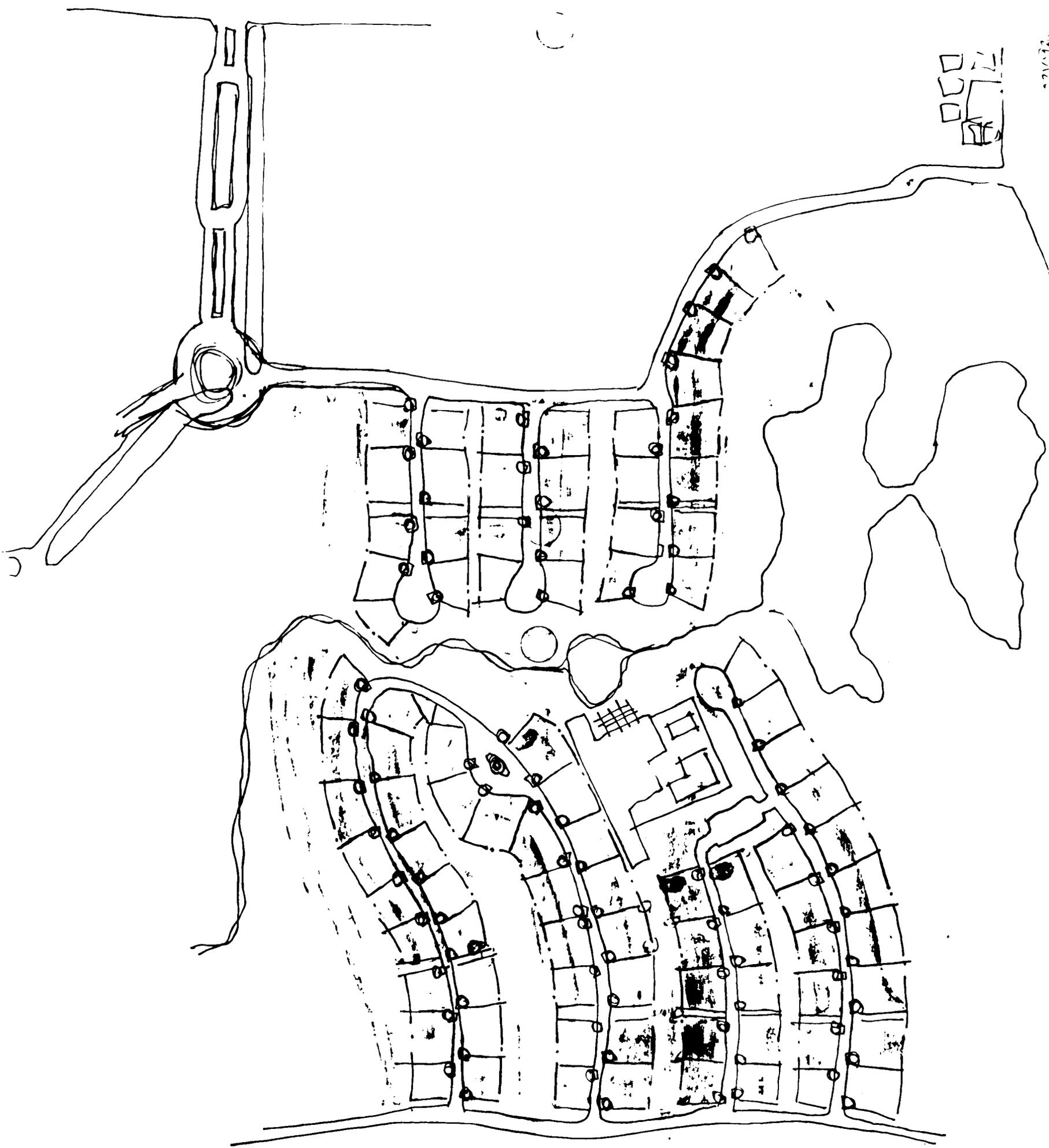
A NEW FIVE-LEVEL SCHEME



SIDE - TL
ANDREW SP
DUONT
PWA - LTRRG
~~SEE~~
DRAW SPACE DIA. TOP:
AUTO
RED
UTL
VIEWS
1.635 M - CLAR



Handwritten notes and symbols on the left margin, including a vertical line of dashes and a small square symbol.



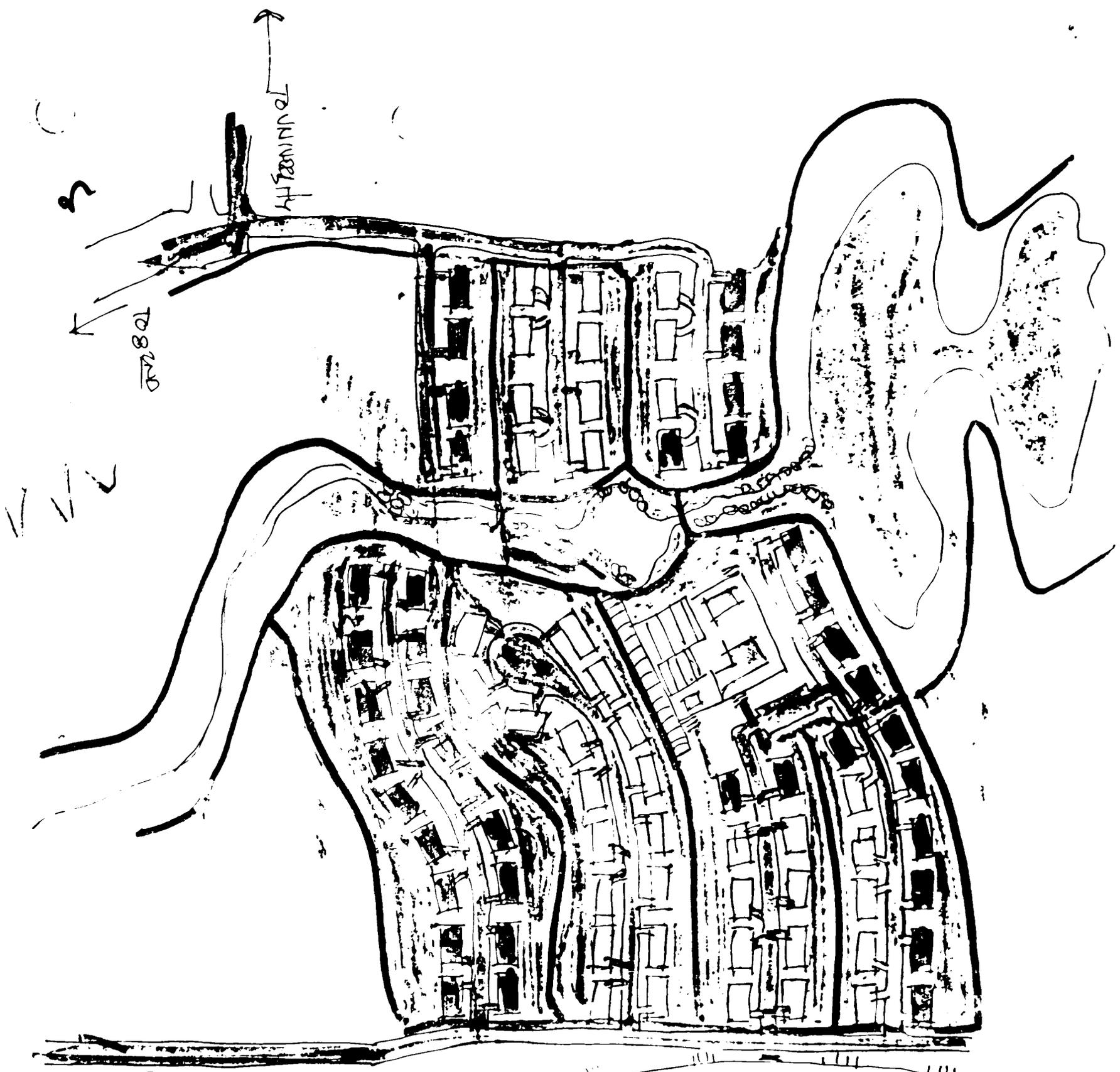
26/12/03

65-75

66

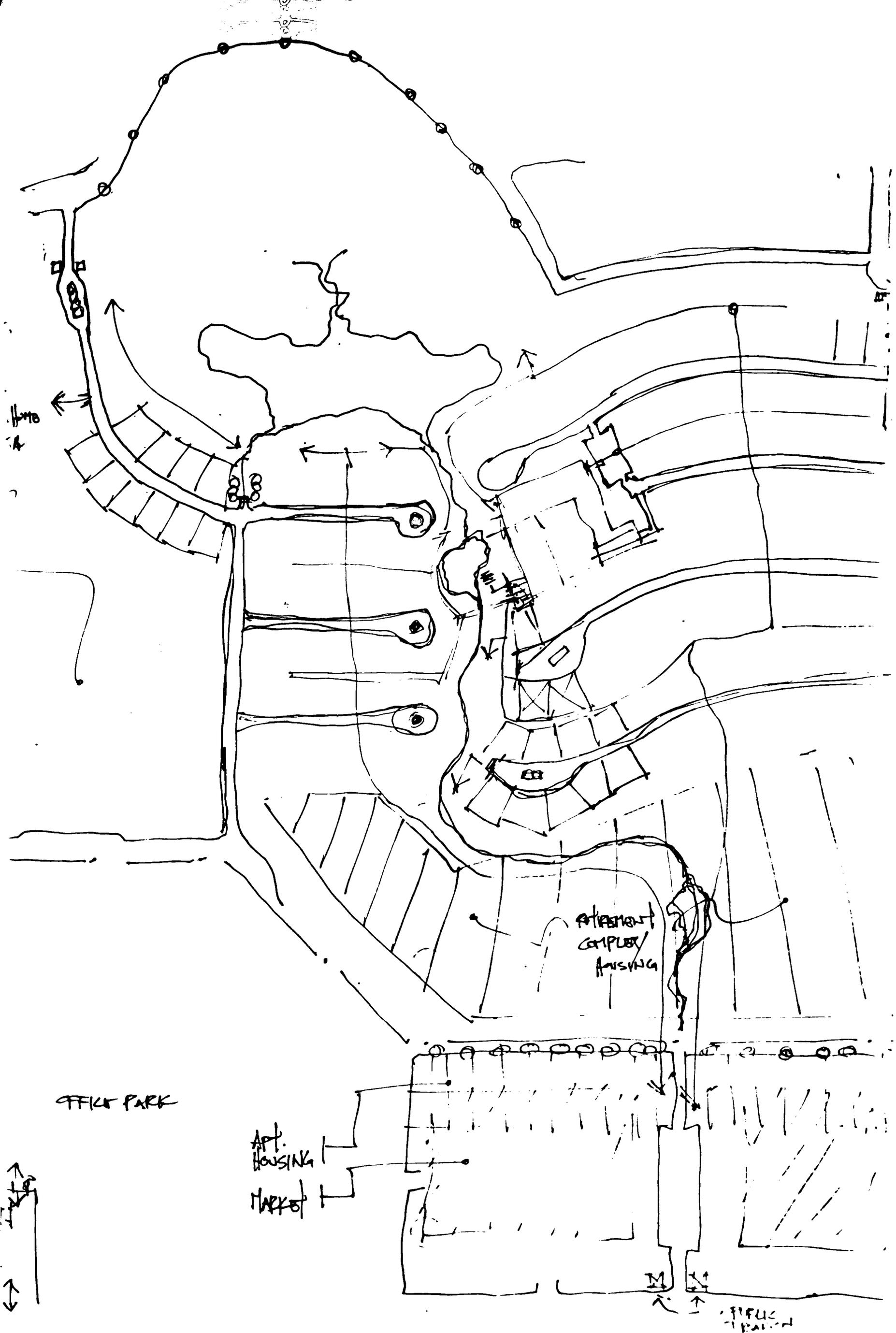
7

1111



TO 82ND

FED
ACCESS to
A PIN
LOCAL
BUSINESS
EG. AREA

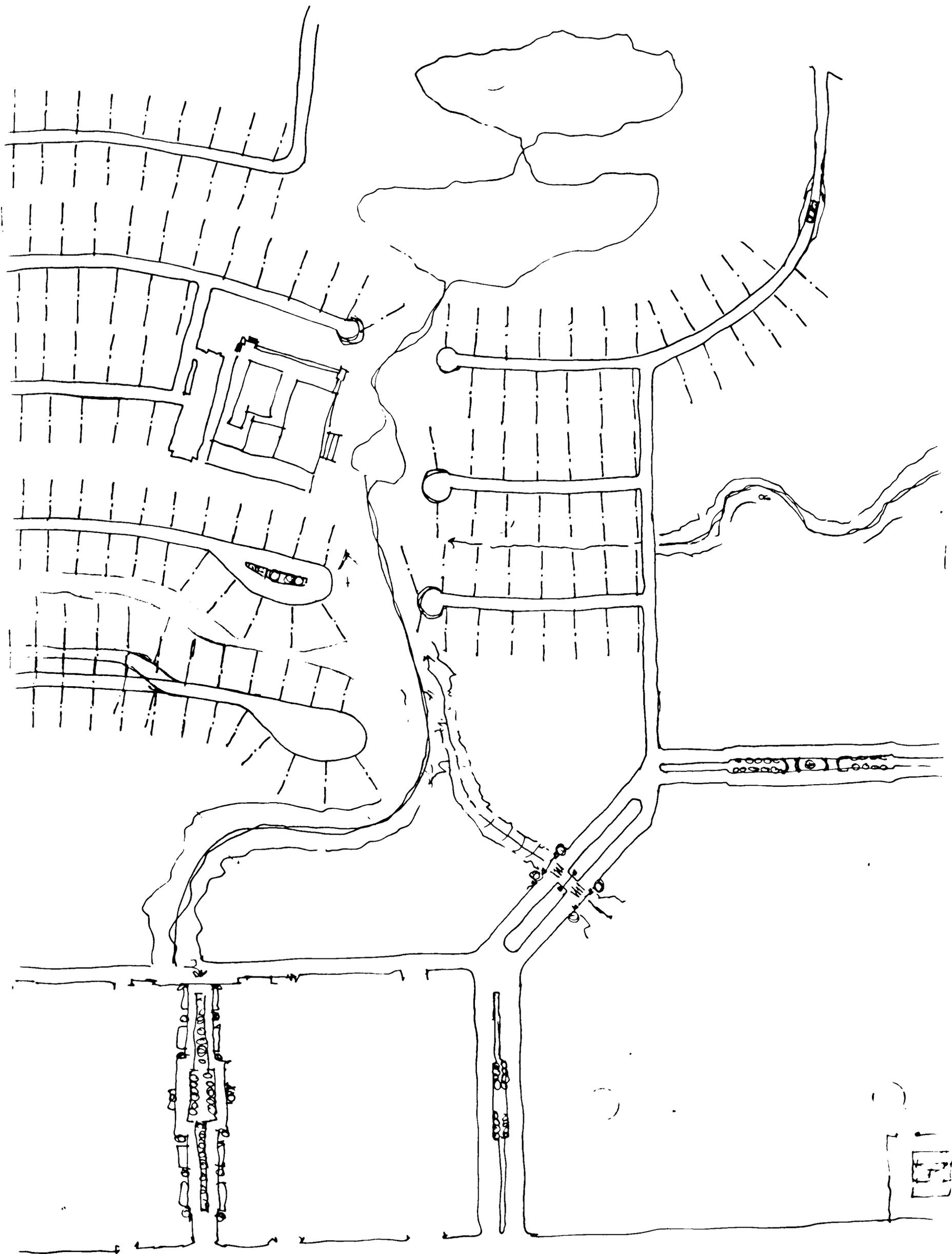


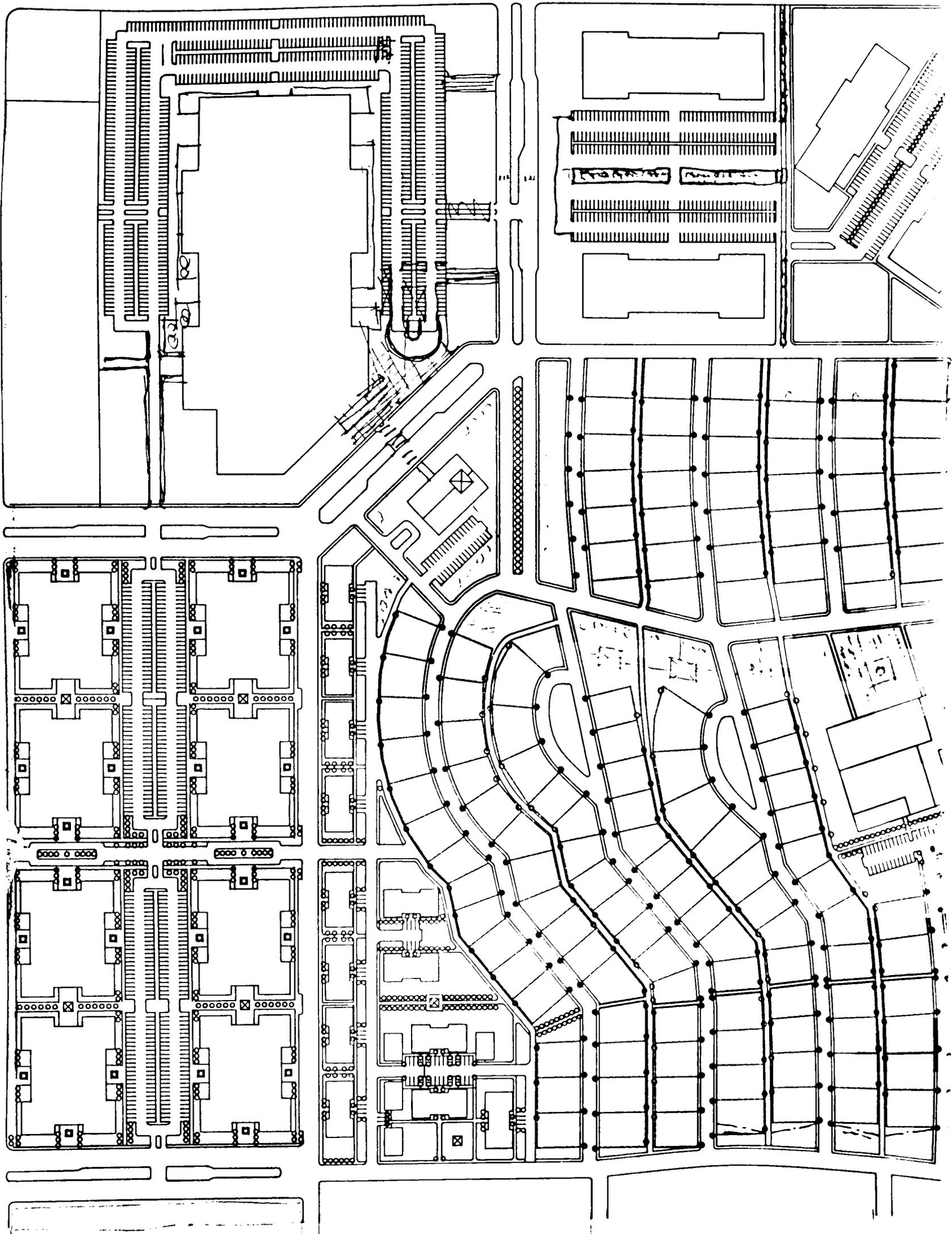
OFFICE PARK

APT.
HOUSING
MARKET

ATTACHED
COMPLEX
HOUSING

OFFICE
TRAIL





2 BRITISH

