PLANNING AHEAD:
Characteristics of Versatile Buildings

by
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Abstract

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If a building is to maintain its life-long usefulness it must be possible to alter it to accommodate different programmatic demands. This thesis investigates the spatial and material character that facilitates this architectural accommodation of diversity and change. Framed New England houses are compared with contemporary office buildings for their adaptability. A program of office and residential space is presented for a small valley near Brownsville Vermont. A building type is planned for this context and inhabited several ways to test its capabilities.

Thesis Supervisor: Chester L. Sprague
Title: Associate Professor of Architecture

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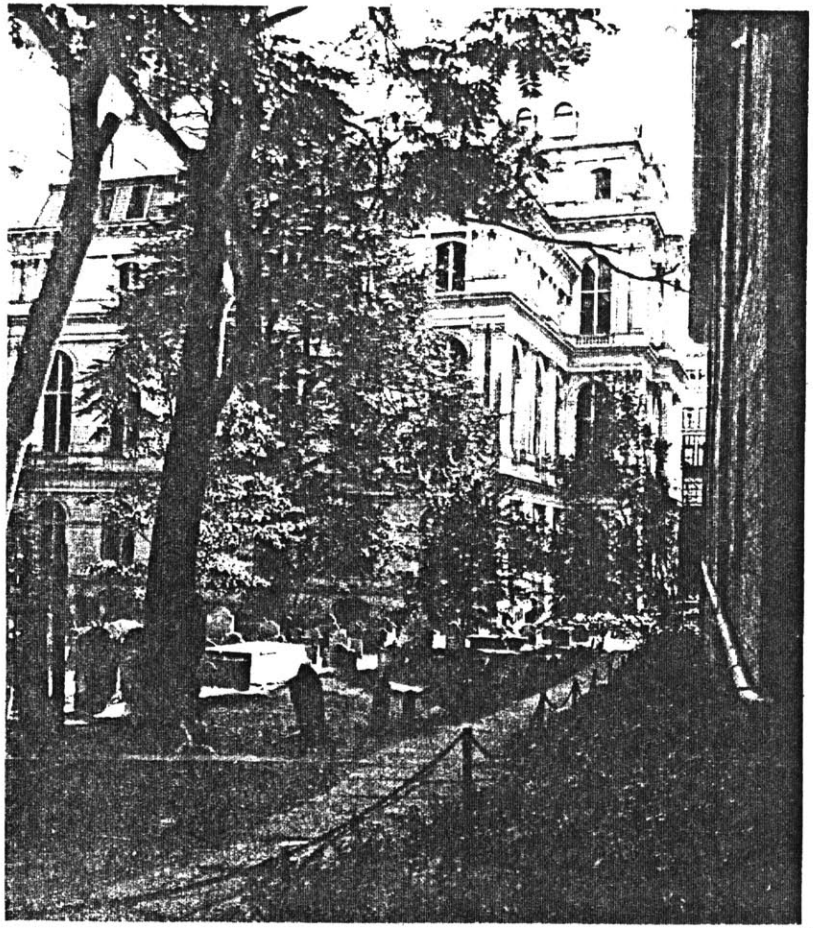


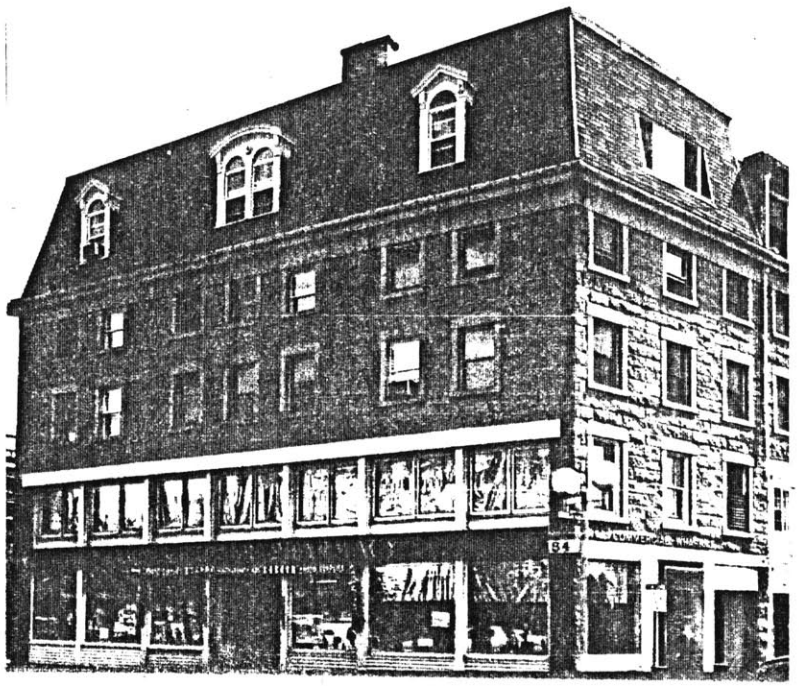
Old Boston City Hall

Completed in 1865. Converted to office shops, and a restaurant in 1972. One wonders whether the New City Hall will be as adaptable as the old when the time comes to retire it from civic duty.

Versatility as an Architectural Ideal

In the course of a building's lifetime, it will probably be called upon to serve many unforeseen purposes. These departures from the original building program may be small or great. Clearly, the building's capacity to be responsive to these changes effects its ability to contribute positively to the lives of its successive inhabitants. If it is versatile and can accommodate their diversity and changing needs without major alteration, a greater human return on the energy spent constructing and maintaining the building can be achieved. In addition, further investment is encouraged and justified.

The multi-faceted role of architecture in enhancing its inhabitants' lives has been a subject of serious investigation for centuries. Buildings mediate between man's fragile body and a sometimes harsh environment, give tangible expression to individual and cultural values and yearnings, function

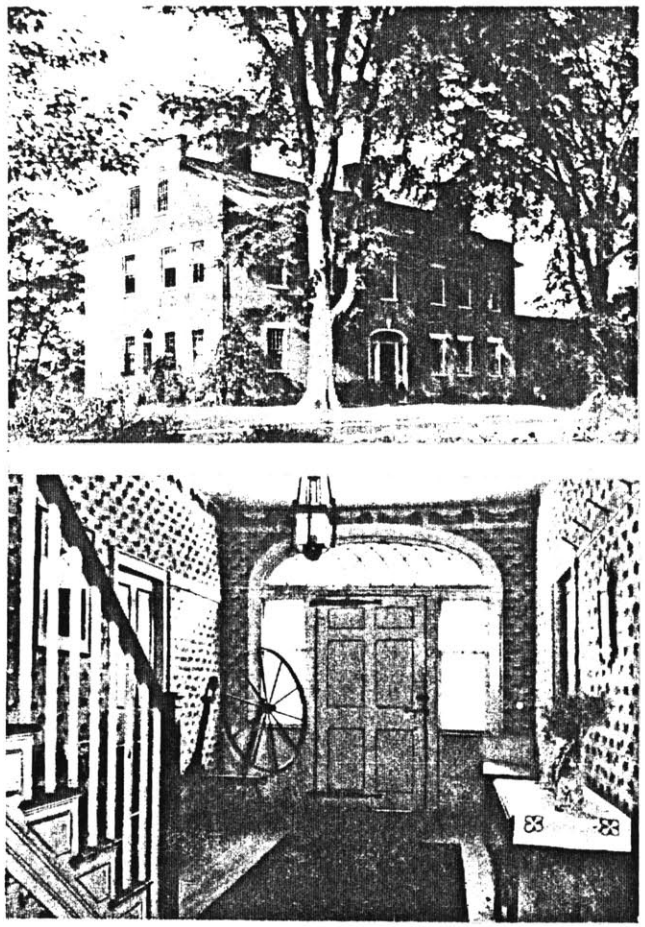


Commercial Wharf Building
Built in 1833. Converted to residential, commercial use in 1971.

as tools in the interest of human industry and enterprise and so on.

It is only more recently that the complex role of inhabitants in the life of their building has been studied carefully. One outcome of this study is the increased understanding of the way that inhabitants try to interpret and alter the shape of the building to fit their unique practical and spiritual needs. A related realization is that a living building is physically dependent on its occupants. If it is to weather time or improve it must be maintained: cleaned, painted, partially refurbished and replaced.

One could assert that the preservation of a building and its continued usefulness go hand in hand; a building which empowers its successive inhabitants to shape it in some significant way and make it a home has an improved chance of surviving and serving to a healthy old age.



Foxe's Tavern, New Hampshire

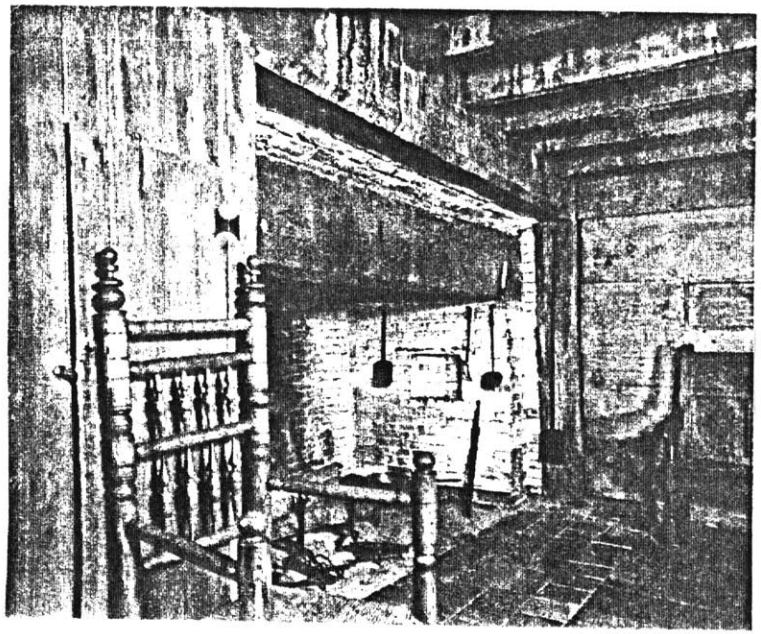
Built later 1700's. Taverns and Inns in the Colonial period were essentially well-sized houses. Many of those preserved are now private residences.

Versatility in a building has particular spatial and physical prerequisites. An example will help illustrate some of them.

Good Yankee Stock - Early Framed Houses in New England

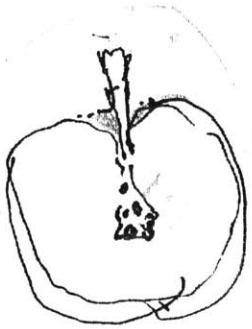
Early New England framed houses as a type succeeded in yielding to adaptation to manifold uses over time. It is significant that a few variations on a single building type served as houses, taverns, stores, offices, and workshops both by initial design and through change.

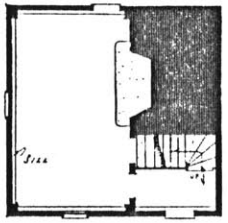
The first framed houses in New England were characterized by an organization which allowed the most flexible and efficient use of the fireplace, the most important physical element within the building. Initially or incrementally the chimney and its fireplaces were surrounded by separate spaces of similar character.

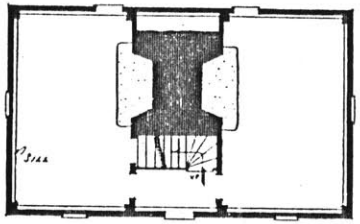


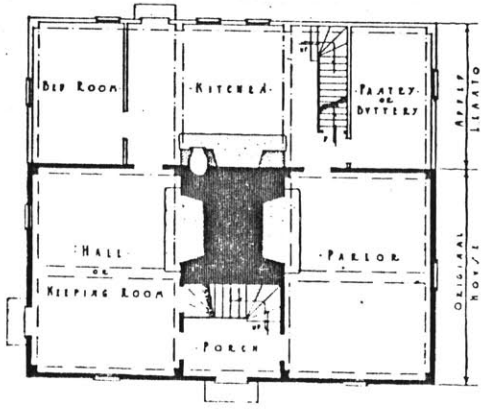
"Hall" Fireplace

The hearth was a real place in the earlier houses; one actually had to inhabit it to cook.



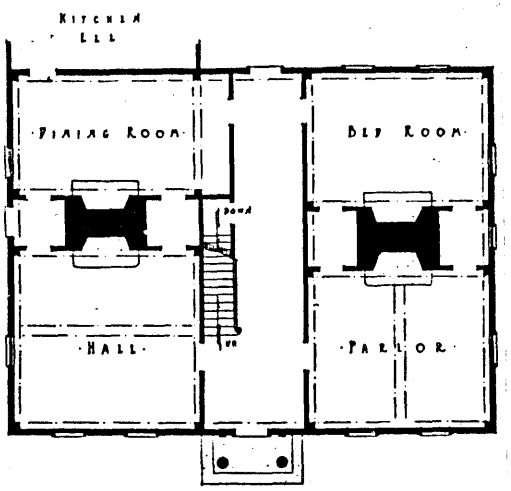






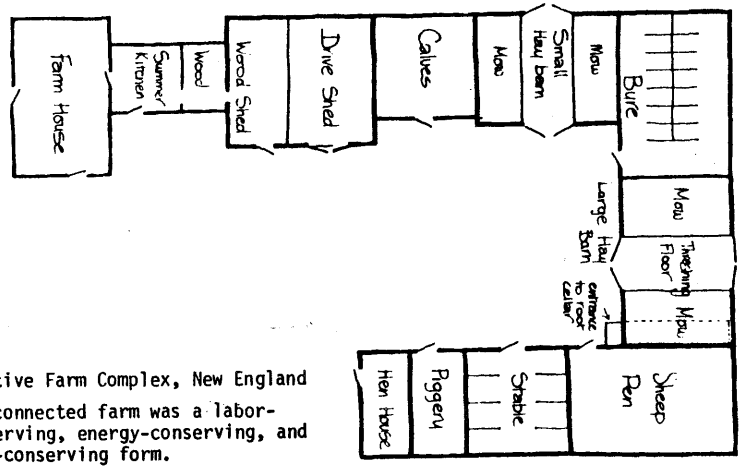
Incremental Growth Around the Chimney Core.

A smoke room was set in the chimney mass, accessible from the front stair, allowing all four sides of the core to be utilized.



Mitosis of the Core

The entry hall later became the most frequently used setting in the house; it became progressively larger and often had a fireplace in the 19th century.



Additive Farm Complex, New England

The connected farm was a labor-conserving, energy-conserving, and land-conserving form.

Another important characteristic of this early type was the location of the main house entry. One could access any of the spaces (with the exception of the rear room) directly from the vestibule.

The flexibility of the nuclear "core-type" house increased, when in cell-like fashion, the building expanded in size and the nucleus split to maintain each spaces' relationship with the hearth. Each room could now be accessed independently from the entry/stair hall, and additions of domestic or utilitarian purpose could be added to the rear of the building.

Early New England buildings, large or small, were built primarily of heavy wood frame construction, with standard building components and joinery. It was easy to replace portions of the structures or add to them because the materials and tools and techniques that shaped them were widely available and widely understood.

The various components of the frame played distinct structural roles in the assemblage; variations in the size and expression of the various parts distinguished those which were essential to the stability of the building from those which were lighter and more easily replaced. All the parts of the structure, small or large, were made from wood. It was easy to manipulate the structure: carve it, cover it, or attach new components to it.

It was the flexibility inherent in the combined spatial and physical organization of the New England house and its material workability that made the type so successful. By subdividing spaces, recombining them or furnishing them differently it was possible to adapt the whole of the building or parts of it to varied uses.

Modern Times

In the dozen or so generations since the first English settlers arrived in the American colonies, the rhythm and shape of existence has changed substantially. Much of this change has been related to the development of industrial technology in the eighteenth and nineteenth centuries and the accompanying rise to prosperity of the republic and the average citizen.

Many environmental - behavioral patterns changed radically during the industrial era, but the increased spatial and structural specialization that characterizes our present-day environment is a trend of special note. Rising prosperity allowed the introduction of spaces dedicated to very specific functions in the domestic environment; rising societal standards encouraged and sometimes demanded this specialization. The interior, sanitary bathroom dates from the nineteenth century, as does that bourgeois fixture, the billiards room.

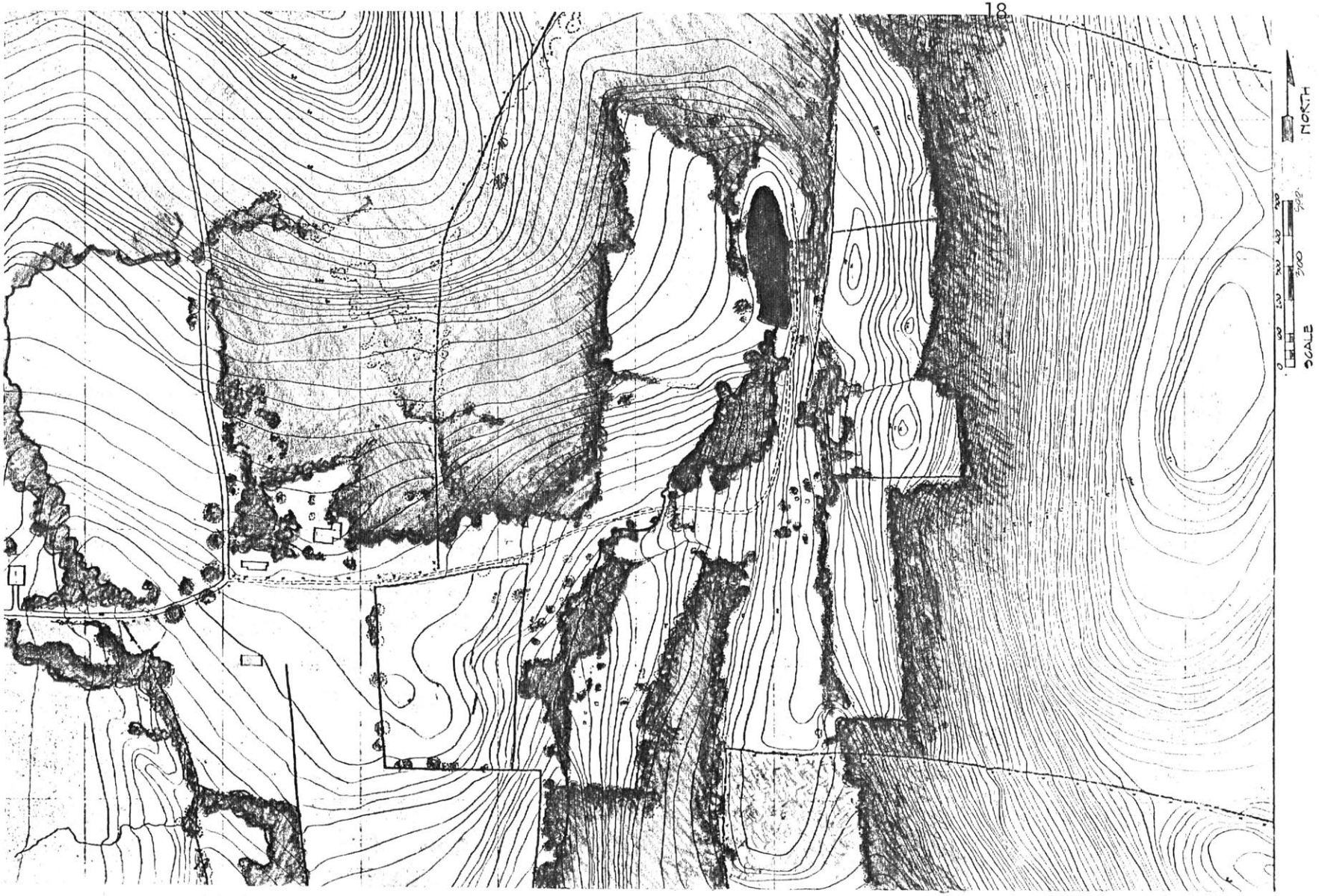
Work places, after moving out of the home into the shop, developed more specific character spatially and structurally, in response to more specialized work tasks and a more scientific approach to their execution. The organization of activities in the work place and elsewhere became more formalized (the first assembly line dates from 1783 and was used in the manufacture of bread). New structural systems and building processes made possible by technological advances supported these developments; cast iron and steel framing systems with long-span capabilities and high-rise potential were developed. The inventions of the elevator, the light bulb, and modern central heating and air conditioning released this potential and freed the planner from the constraints of natural lighting and ventilation and stairs. Buildings could now be taller and broader and more open or more closed in response to specific programmatic requirements of the work process.

A Comparison

While the liberties, economies, and densities that the technology of the industrial age has permitted are valuable, some important attributes that characterized pre-industrial building types (such as early New England's timber frame buildings) have been lost. In those times, even large work places relied on natural ventilation and lighting and therefore had to be kept fairly narrow; their height was limited by the limits of technology and the stamina of the inhabitant. As a rule, buildings were kept close to the street because roads were expensive to pave and keep clear in winter. These severe restrictions decreed that even buildings planned for highly divergent uses were similar in several essential spatial respects. A limited pallet of materials available to the builder: wood, stone, brick, and glass, was conducive to strong constructive similarities between buildings as well.

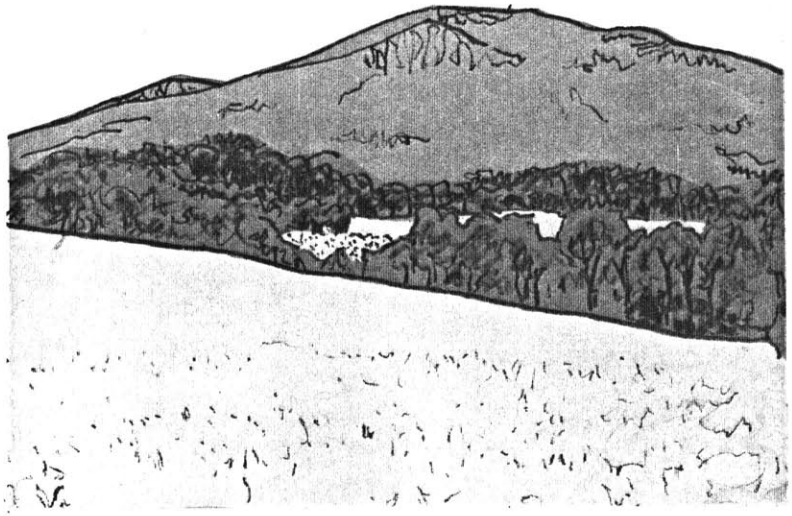
The spatial and physical concordances that exist between older buildings originally constructed for different purposes make them valuable, versatile building stock even today. The popularity of old wharf storage buildings in Boston and barns in rural areas of the country for luxury housing is strong evidence in favor of this assertion.

Seen in the light of this discussion, many of the recent and mighty buildings we see rising around us seem frail and limited. Their extreme dependency on mechanical contrivances for their habitability and their spatial specialization makes them too vulnerable and ill-equiped to cope with the changes they will one day have to face squarely, whether the change is in the form of a day-time blackout, an energy crisis, or an organically evolving building market.



Topographic Map of the Site

The arable land is currently hayed. Many of the wooded areas were pasture, were over-grazed by sheep and are now re-vegetating.



View from the Existing Road
Towards Mount Ascutney

Note:

In order for the scenario to be constructive, it should in some way reflect an existing reality or one that is in the process of becoming. In this regard, one must ask whether a business like the example chosen could or would decide to build an office in a place as isolated as the Brownsville Valley, now or in the future.

The reply is that such a scenario is possible and similar projects have been undertaken elsewhere in the country. The businesses involved are usually in sectors reliant on high-technology communication, and can therefore locate themselves on the basis of what were previously secondary considerations: place quality, proximity to recreational opportunities and other local amenities. The ideal of living in a beautiful natural setting hasn't lost its currency.

Setting Some Stakes ... and How to Cook Them

As a way to find out more about the spatial and material attributes of versatile buildings--buildings that in whole or in part possess the ability to yield to new demands with economy and grace, I have projected a hypothetical scenario (a question and a context) in which to work and develop ideas. The scenario involves a computer-related firm in Boston which has decided to open a branch office for the research and development of new projects in a small valley near Brownsville, Vermont. The valley which possesses great natural beauty, lies at the foot of Mount Ascutney, the tallest free-standing peak in New England.

The firm desires to construct buildings for the office and for housing. Some of the housing will be used by employees and their households and the remainder will be speculative, to take advantage of and help alleviate an existing housing shortage.

View East Towards the Perimeter of the Valley

The space program for the office is fairly specific, but it is fairly certain that it will change in various ways. The initial housing program is less certain. It is unclear which company employees will choose to live in the Valley and which ones will choose to go elsewhere in the region. The constituency of the other in-dwellers is even more uncertain.

This thesis work is spurred by the intuition that the diverse and changing needs of the office and of a dwelling house could be accommodated by a single building type. Furthermore, it is felt that this type could be "rooted" into a context of marked beauty and become an integral and positive feature of it.

For our hypothetical client such an investment in versatile building stock might be a valuable one, both initially and in the future. The reductive aspect of the concept of the versatile building could increase the

The Farmland was Won by
Back-Breaking Work.

economy in the original building process by allowing a degree of repetition and standardization to take place. The malleability of the versatile building allows the client to change it easily and cheaply: to expand it, rearrange spaces within it, embellish it, and so on.

In order to plan such a building type, it will be necessary to come to some specific understanding of the collective patterns present in the rich palette of human possibilities and human needs and the ways that programmatic scenarios transform one into the other.

Finding Norms in Diversity and Constants in Flux

The current demography of many regions in the United States and abroad is a virtual crazy quilt of recognizable cultures and sub-cultures. Each has its own common denominators (theology, economic class, ethnicity, age, etc.) and sympathies, which lead to alignments between factions, clashes or indifference. What is important to the architectural designer in this "quilt" is the real multiplicity of life-styles, even among individuals and families of similar socio-economic circumstance.

A set of apartment hunters looking for a "two bedroom" unit may or may not be a married couple with one or two children. It may be two independent working adults who desire some distinctions in the public realm of the unit as well as a high degree of separation of the private worlds. It may be a single adult who intends to use part of the dwelling as a professional office with separate access from the street. These scenarios, which can be projected or drawn from real households, are virtually limitless in variation.

In the work place diversity in employee preferences is matched by shifts in business style and corporate management practice. In the high technology business sector new approaches to work organization have proliferated in response to a wide-open and stiffly competitive market and contemporary attitudes towards the work process, productivity, and worker satisfaction. These new styles meet and mingle with traditional modes of business operation and organization.

In many offices an uneasy state of "inbetweenedness" can be sensed. Workers (man-

agement and the "rank-and-file") are caught between traditional management hierarchies with their associated manager/underling divisions and tensions and a more informal approach that has arisen in recent years. This uneasiness is evidence of corporate and individual uncertainty of purpose, but also indicates that a sorting-out process that strives towards some new and workable balance is in motion. It is important that the work environment conform to this balance as it evolves.

Changing attitudes towards work are important forces in the office, but the primary source of change in the work place is the everyday coming and going and internal movement of personnel. In the computer industry this flux is endemic; employees "burn-out" on a particular project, start spin-off companies, or disembark and job-shop elsewhere. In California's "Silicon Valley" the average term of employment is less than three years.

A young company, after its first success and each subsequent project, may grow at a high rate. They can accommodate this growth in four fashions. They can reorganize in their existing space to accommodate new personnel, expand into convenient existing facilities, add on new construction, or move altogether.

Work places and the kinds of change they experience can be described in purely architectural terms, but it is most beneficial to make such descriptions in terms which relate more directly to the activities that a building supports. This approach was used by Sandra Howell and Gayle Epp in Private Space. By understanding the kinds, quantities and arrangements of equipment and furniture that support an activity, it is possible to know the general dimensional requirements of the architectural setting in which the activity takes place. This concept of the "activity setting" allows a basic kind of approximation of spatial needs to be developed without requiring that other

Howell, Sandra, Private Spaces, Department of Architecture, M.I.T., 1976.

biasing assumptions be expressed (such as the architectural fashion in which the space is defined).

Changes in the various activity settings that exist in buildings can be classified as follows:

1. Expansion or contraction of one or more activity settings.
2. Regrouping and inter-change of activity settings within a given larger territory.
3. Addition or subtraction of settings within a larger territory.
4. Change of scenario at the scale of a group of activity settings.
5. Change of scenario at the scale of the building or larger.

The Enterprise of a Research & Development Office

The primary business of a research and development (R & D) company in the computer field is to bring together a systematic complex of ideas and express those ideas in machinery and instructions for the use of that machinery. An associated task is locating a market for this product of "hardware" and "software" and selling the product.

The process by which the engineers' ideas develop consists of an interaction between the individual engineer and groups of engineers and the ideas. The engineers' work environment must therefore provide places for individual concentration and group "brainstorming" to take place.

A small percentage of the group process in the development of concepts are formal--perhaps in the shape of meetings with visiting consultants or managers from other departments in the firm. Most of the meetings between engineers, however, are informal, and take place in privacies or in "support" settings: by the copying machine, the coffee pot, a secretary's space, or in the wash room.

The actual fabrication of prototypes and finished hardware can take place in larger group settings with partially defined technician's spaces in some association with shared space for testing equipment and the storage of parts. It is not a highly automated process, but rather more like traditional watchmaking; intricate boards are constructed by hand with the aid of small tools. Other production processes, such as the transcribing of data to computer tapes or optical video discs, need to be associated directly with computers.

Marketing and sales personnel, like the engineers in the firm, need options for private concentration and conversations and

group business. Many of their meetings will be of a formal nature, so they need conference space(s) close to their privacies and also to the building's main entrance and reception area (for meetings with clients and consultants).

Initial Work Place Area Program

Entry-Related Functions	690 ft^2	Total
Entry/Waiting Reception	340 ft^2	
Large Conference Room	350 ft^2	
Administrative Functions	500 ft^2	Total
Office Manager	110 ft^2	
2 Secretaries @ 90 ft^2	180 ft^2	
Word Processor	90 ft^2	
Xerox Machine, Storage, etc.	120 ft^2	
Sales	710 ft^2	Total
Conference	200 ft^2	
3 Sales People @ 110 ft^2	330 ft^2	
2 Sales Support @ 90 ft^2	180 ft^2	
Research and Development	2000 ft^2	Total
Conference	200 ft^2	
6 Engineers, 5 Software Engineers @ 110 ft^2	1210 ft^2	
Drafting	100 ft^2	
Hardware Lab	250 ft^2	
4 Technicians @ 60 ft^2	240 ft^2	
Data-Disc Production	725 ft^2	Total
Senior Analyst	110 ft^2	
4 Programmers, Operator @ 60 ft^2	240 ft^2	
Machine Room	375 ft^2	
Systems Production	780 ft^2	Total
Manufacturing Engineer	110 ft^2	
7 Technicians @ 60 ft^2	420 ft^2	
Production Lab	250 ft^2	
Common Spaces	550 ft^2	Total
Lounge, Coffee Prep., etc.	250 ft^2	
2 Bathrooms @ 150 ft^2	300 ft^2	
Other	1950 ft^2	Total
Maintenance Office	150 ft^2	
Circulation/Storage	1600 ft^2	
Receiving	200 ft^2	
Total Building Area	7800 ft^2	
Outdoor Space		
Parking	20 spaces	
Receiving Court	--	
Covered Storage	500 ft^2	

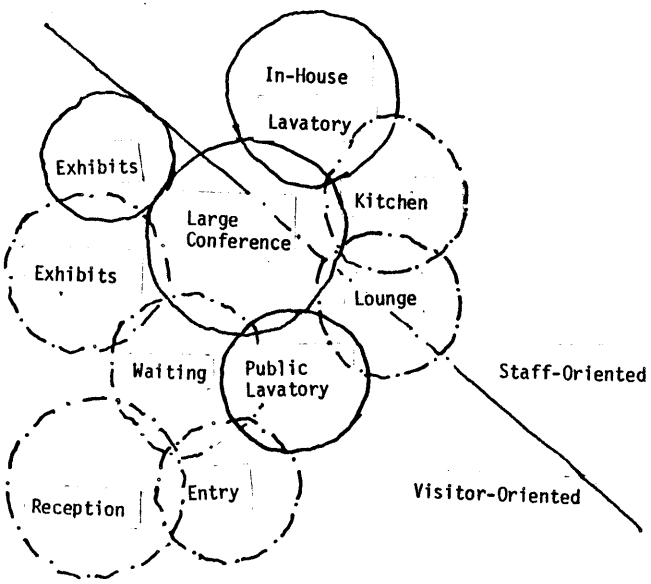
Office Settings: Relationships and Special Needs

The numbers and categorizations that go into an area program like the preceding example are limited in their usefulness. They only help one to prepare a gross estimate of the initial volume of a larger setting (such as this study's R & D office), and they are highly transitory readings. Even in the short time required to design and construct a building, the inscrutable workings of fate can alter such an estimate beyond recognition.

A somewhat more stable understanding of building requirement can be achieved by articulating the processes and qualities of human relationship that must be made possible and enhanced by the building's presence and shape.

One way to do this is by abstracting and diagramming the grosser characteristics of

See Appendix B



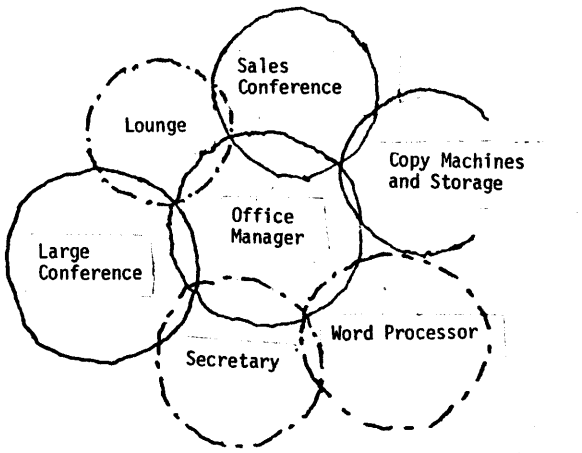
Entry-Related Settings

activity settings and the relationships between them to arrive at a mapping that may hold relatively true despite changes in the size of settings and deletions or additions of them. As an office grows, for example, it may be necessary to relocate its primary entrance, yet the sequence of settings and the relationships between them that make up the entrance might stay the same.

The "bubble" diagrams below show relationships between settings in which associated functions take place. Complete bubbles indicate settings which may need a high degree of visual and/or acoustical privacy. Dotted bubbles indicate settings which are more open.

Entry-Related Settings

It must be easy for a guest to orient him or herself in the complex of visitor-oriented settings; they have to make up an easily understood sequence.



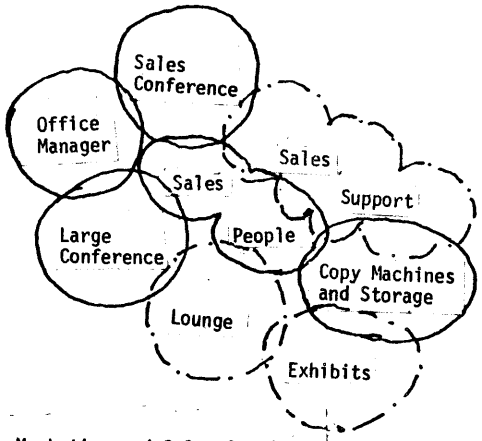
Administrative Settings

The primary "exhibit" may be the computer room; it has an impressive and interesting array of gadgetry. The lounge setting can take place in one or several associated areas; it must be able to accommodate several small groups as well as larger ones.

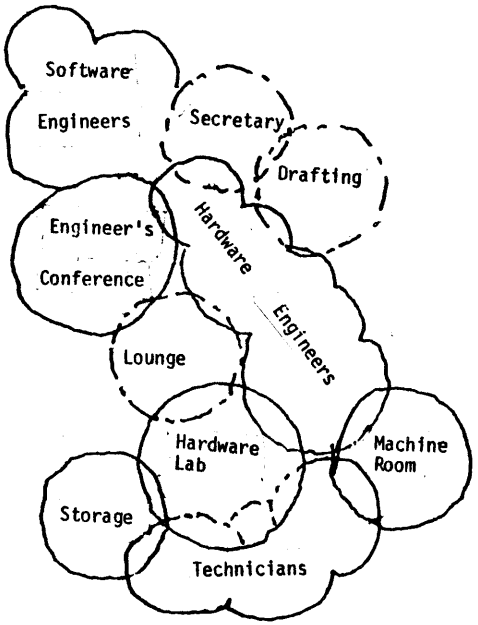
All entry-related functions require natural light and ventilation, with the exception of lavatories and kitchen. These require mechanical ventilation. Waiting and lounge areas should have interesting views of both interior and outside spaces.

Administrative Settings

The office manager must make sure that the office as a whole is operating smoothly. She or he therefore needs contact with many central settings, support personnel and equipment. Copying machines can now be used in open settings because they are quiet. Natural lighting and ventilation is preferred for all administrative settings. It must be



Marketing and Sales Settings



Research and Development Settings

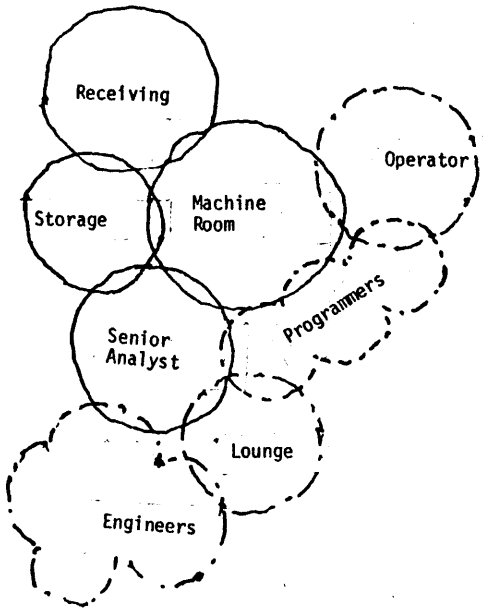
possible, however, to reduce light levels to five foot-candle intensity in the manager's and secretaries' spaces, where CRT screens are occasionally used.

Marketing and Sales Settings

Sales personnel work with outsiders, both over the telephone and in person. The latter activity indicates that some convenient relationship with the visitor-oriented sequence of settings be present.

Research and Development Settings

All of those settings, with the exception of the machine room, need natural lighting and ventilation, particularly the drafting area and the hardware lab. It must be possible to lower light levels in the software engineers' offices, since they frequently use CRT screens. The computers in the machine room operate most effectively in a relatively narrow temperature range. They should be lo-



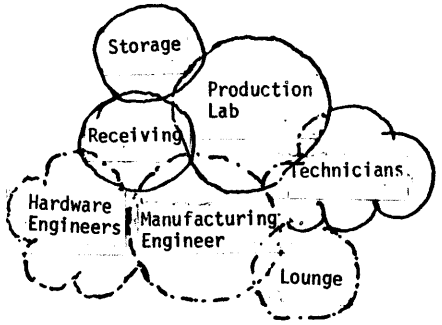
Data-Disc Production

cated away from direct sunlight and in the most thermally stable setting in the building, with excellent ventilation and/or air conditioning. Large, easily accessible raceways in the floors, walls, or ceiling of the machine room must be provided to run electrical connectors between computers and to terminals in other parts of the building. The computers are large, so the machine room must be at ground level, with level or ramped access from a receiving area (five foot minimum width).

Data-Disc Production

The computers, in addition to requiring a highly controlled thermal setting, also must be contained acoustically, since they produce high volumes of noise.

Offices of the senior analyst and programmers should be acoustically and thermally separated from the computers, but with strong visual and electrical connections and



Systems Production

easy access to them. Natural light and ventilation is preferred for the offices.

Systems Production

A large volume of materials and equipment enter and leave the Production Lab; it needs to be at ground level by a receiving area. Natural light and ventilation are preferred for all these settings.

Dwellings - Initial Space Program

3 Studio units @ 600 ft^2	1800 ft^2
8 1-Bedroom units @ 750 ft^2	6000 ft^2
10 2-Bedroom units @ 1100 ft^2	11000 ft^2
9 3-Bedroom units @ 1300 ft^2	11700 ft^2
3 4-Bedroom units @ 1600 ft^2	4800 ft^2
Total - 33 Dwellings	Total - 35300 ft^2

Outdoor Space Requirements

Parking - 2 spaces per unit
Covered storage - 1.2 ft^2 per 10 ft^2 interior space.

Other requirements:

25% of dwellings to be wheelchair accessible. Natural light and ventilation is preferred for all interior settings. If a kitchen or bathroom is isolated from the building edge, it must be mechanically ventilated and have two different options for indirect lighting.

The Domestic Agenda

Once again, the numbers and categories of the area program provide little besides a rough estimate of the total built volume being brought to the farm valley. Some further development of program is necessary.

It could be projected that a portion of the office's employees might decide to live within the site, and that their household needs could be identified and specifically provided for. A good percentage of the dwellings, however, could not be programmed in this way, and their initial sizes, configurations, and degrees of completion would have to be gauged with the aid of some normative model. The area program provides a statistical norm (although these figures themselves might be biased heavily by the restrictions of the existing, larger built stock), but gives no clues as to how a specific dwelling could conform to potential inhabitants' preferred styles of living.

Scenario 1:

INDEPENDENT ADULTS, BOTH WORKING AND SHARING A HOUSEHOLD

Other Scenarios with Approximately the Same Activity Settings:

elderly people (not married) living together
students sharing a place
a couple with a lodger

One can assume that in the course of any given day, independent adults sharing a house or apartment seldom share activity settings, i.e., use them at precisely the same time. Separate sleeping/dressing settings are necessary. Bathing facilities may be shared - given the temporal natural of their use. Since it is more economical to share food preparation, a common setting is needed. It probably should be a size which allows two people to prepare meals at the same time. The lounging/entertaining setting is more problematic; its standard configuration is a shared "living room" where two sets of activities for two individuals and their guests may conflict. An alternative is to provide potential for smaller, individual lounge settings adjacent to, or contiguous with, the individual sleeping/dressing areas. In this way entertaining does not have to be collective. Circulation and entry sequence should be set up to buffer private, individual spaces from each other as well as from the communal space. We give an example of two inhabitants here; there could be more people in a household.

Settings proposed:

1 large area to accommodate food preparation with provision for informal (fp-iD)

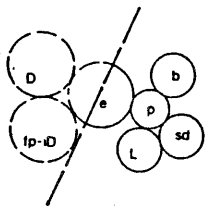
1 bathroom (possibly 2) (b)

1 entry area (e)

2 sleeping/dressing areas (sd)

2 small lounge areas (which may double as individual task or study areas) adjacent to each sleeping area (L)

p = connecting space



To help close this gap, four household scenarios have been selected and reprinted from Tractability in Housing and Neighborhood Form to serve as illustrative guides and test cases for the dwelling designs.

See Appendix A

Scenario 2:

WORKING MARRIED COUPLE, ONE OF THEM WORKING AT HOME

Other Scenarios with Approximately the Same Activity Settings:

cohabiting couple
elderly couple
single person

The amount of space is not as crucial here as layout. The clustering of activities around entry, food preparation, dining and lounging areas with a "public" work area, is the central concern. As Roderic Lawrence's study "Comparative Experiences of Domestic Space" suggests, public and private separation at the entry can be an important issue for the inhabitants. The successful resolution of the separation often depends on a seemingly redundant provision for circulation and services, "public" and "private" passages and, perhaps, a "public" toilet near the entry.

Settings proposed:

1 entry area with access but not intrusion upon food preparation, lounging and perhaps dining areas (e)

1 food preparation area with informal dining for 2 (fp)

1 formal dining area (optional, may combine with lounge) (D)

1 lounging/entertainment area (L)

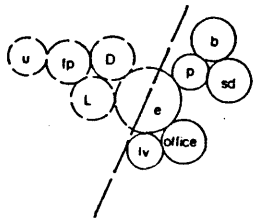
1 bath (b)

1 utility area (u)

2 sleeping/dressing areas (1 large, 1 small for guests which may be incorporated by another setting) (sd)

1 office/work area near the entry (office)

1 toilet near the entry in the "public" part of it (lv)



Scenario 3:

FAMILY WITH 3 CHILDREN (ages 7, 4 and 1)

Other Scenarios with Approximately the Same Activity Settings:

one-parent household

Characteristically, the family is composed of a married couple, one or both of whom work outside the home. The children, in various stages of development, attend school for part of the day. Many settings are shared, but individual privacy is at times a critical developmental or social need for each inhabitant. Provision for individual activities away from shared spaces should be provided and should be most likely related to sleeping/dressing settings. Play settings for small children near adult work areas place additional demand on the organization of household spaces. Here again, entry and circulation perform mitigating functions, between "public" and private areas and between private realms for adults and children (Chermayeff and Alexander, 1965, Chapter 13).

Settings Proposed:

1 entry area (e)

2 large area for food preparation and informal dining (fp)

1 lounging area (or more for varying activity) (L)

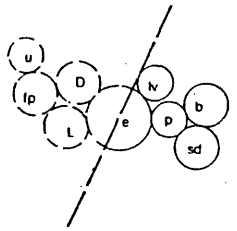
1 laundry area/utility area (u)

1 or two bathing areas (b) (lv)

3 (at least) sleeping/dressing areas, each to accommodate 2 people (2 children may share a room, but provision for separate rooms in the future should be anticipated) (sd)

OR

1 double and 3 single sleeping/dressing areas (all sleeping/dressing areas have provision for private, unrelated activity for each person; if not, such places are elsewhere in the unit.



Scenario 4:

EXTENDED FAMILY. COUPLE WITH THREE TEENAGERS (ages 17, 14 and 11), ELDERLY WOMAN

Other Scenarios with Approximately the Same Activity Settings:

couple with son, daughter-in-law and baby living in

family with lodger(s)

two families in communal arrangement

The term "extended family" evokes an image of a rich and interactive mix of people. The extinction of three-generation households is often the result of the lack of room for older inhabitants to live with the younger. Then too, changing lifestyles make the managing of such households difficult, given the layout of most new housing in the United States. Even if a place is big enough to accommodate an older relative, the house may not be organized so that all parties can come together and yet maintain privacy. Privacies are generally not respected where places are designed for families. Private realms can be sifted out most expediently in layers of sequenced options, a vestibule, stair hall, passages between rooms.

Settings proposed:

1 entry area (e)

2 large area for food preparation and informal dining (D)

1 lounging area (or more for varying activity) (L)

1 laundry/utility area (u)

1 or 2 bathing areas (b)

1 double and 3 single sleeping/dressing areas (all sleeping/dressing areas have provision for private, unrelated activity for each person; if not, such places are elsewhere in the unit) (sd)

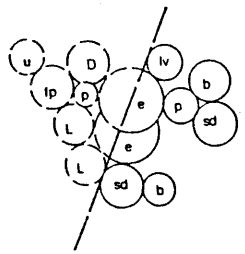
1 separate entry or entry from the household vestibule (e)

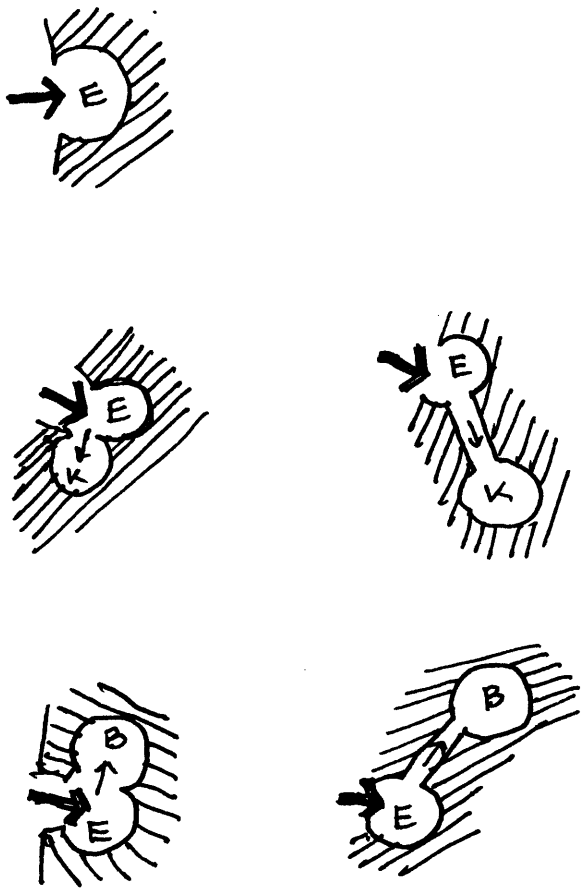
1 sleeping/dressing area (possibly with adjunct lounge) (sd)

1 bath (b)

interior connection to the rest of the household so that shared activities and services can be easily accessed

allow adequate space for a small food preparation area to be added to the sub-unit

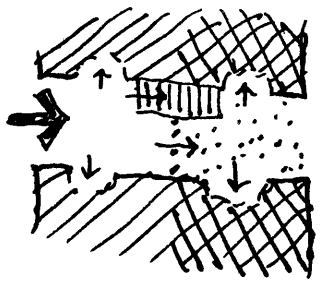


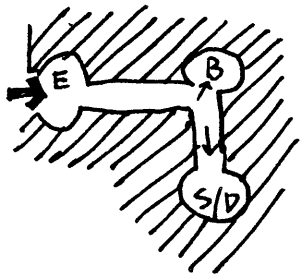


The Entry Settings and Realms of Privacy in the Household

The scenarios indicate the critical role of the entry sequence in the household. As one leaves the public way, ventures to a private or semi-private entrance and then inside and through a dwelling, a gradual unfolding of increasingly private and protected realms is perceived. It is important that inhabitants be able to control the way that their inner world is revealed and the extent of that exposure in a given situation. The interior vestibule might be the only setting presented to a stranger (perhaps a solicitor or a deliveryman). A neighbor might be allowed to come into the kitchen to borrow a cup of sugar, and the neighbor's child might need to use a bathroom.

These diagrams suggest that the entry take the form of a generous node with options available for accessing several different activity settings. If the diagram is articulated correctly, it is possible to give discrete access to an office, a bathroom, an



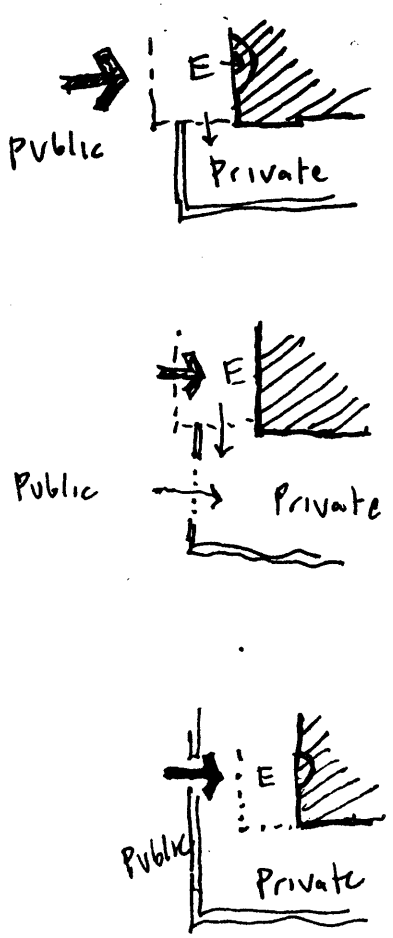


Mediating the Entry and the Most Private Realms

entertaining space or an internal apartment.

In the earlier New England house type this node was minimal in size but allowed one to access either sides room or the stair independently. The enlargement of this node into a hall that extended through the building provided optional access to even more settings, with some gradation of privacy corresponding to the proximity of rooms' entrances to the front door.

A further degree of control can be given the in-dweller by allowing the separation of the circulation of the most private realms from that of the most public. Usually the most private zone includes a sleeping/dressing setting, a bathroom and possibly a lounge or other additional settings. In a smaller dwelling with one bathroom, this diagram implies that the bathroom occupies a place along the interior path of movement between the sleeping/dressing settings and the unit entry.

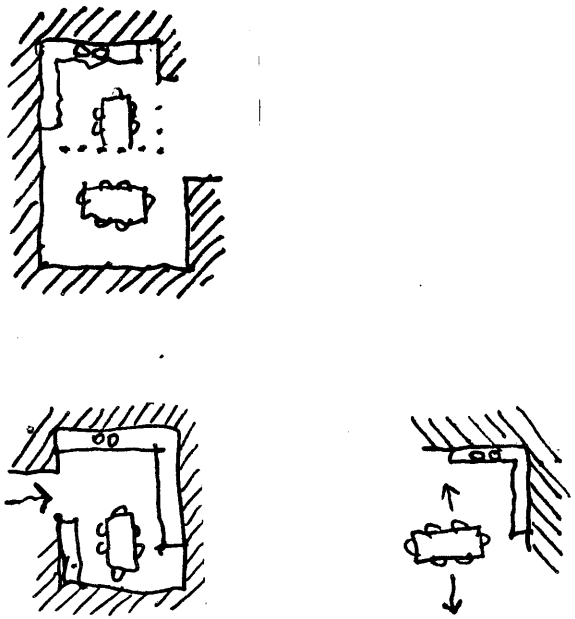


Relationships of the Outer Entry Setting and Private Outdoor Space

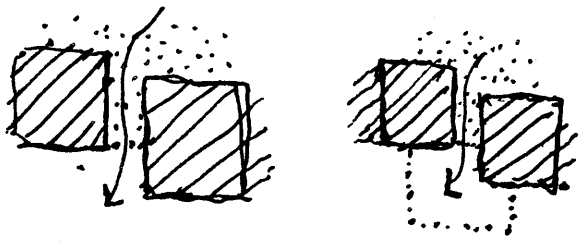
The outdoor portion of the entry setting can serve as a threshold between the public way and the private outdoor realm of the dwelling. This diagram also allows the possibility of a direct connection between a private yard and the public path. A small extension of the private yard allows it to be interposed between the house entry and the public zone.

The other important common feature of the four excerpted household scenarios is the preference for a single kitchen in the dwelling. Significantly, the kitchen is used differently in each scenario. This means that if it is not possible to easily relocate the kitchen in a given dwelling, at least two different dining options should be available. It should be possible to dine in close connection with the kitchen or in a more formal manner.

In a generously sized kitchen informal dining can be incorporated into the kitchen; in



Options in Cooking and Dining



Discrete Access to Outdoor Space and Additions

a tighter setting, the built-in kitchen definition must be incomplete and compact to allow dining to take place in between the cooking area and other living settings.

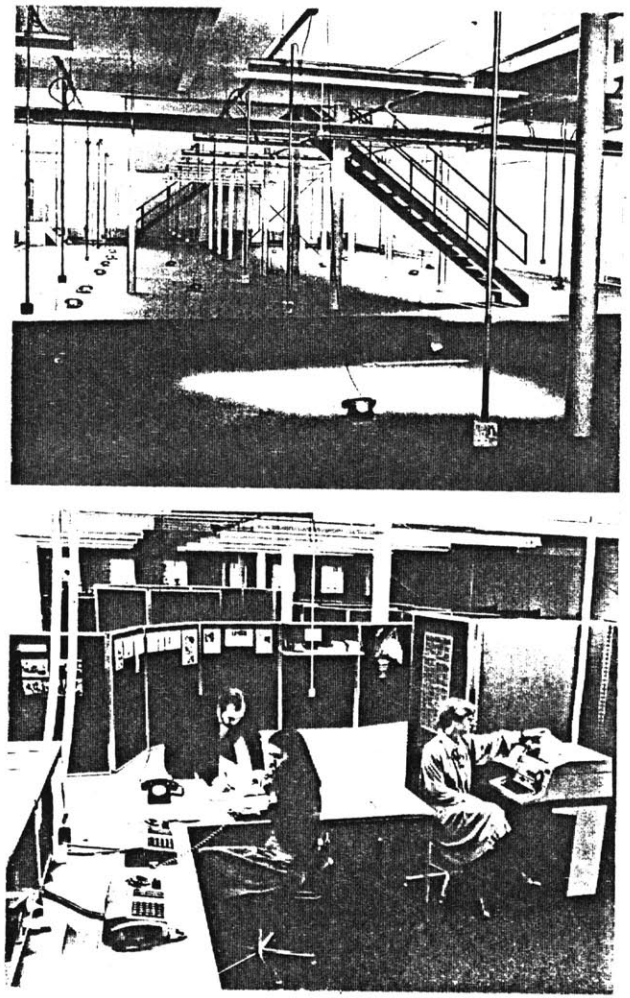
The same multiplicity of options can be present with respect to the use of private outdoor spaces, whether in the form of yards or balconies. In rural areas, since outdoor space will usually have important practical as well as aesthetic values, this is particularly important. Relationships of outdoor spaces to indoor settings and their dimensions should be determined so that it is possible to access an outdoor space without violating the boundaries of any stable activity setting. This independence of access and setting gives the inhabitant greater freedom in choosing the layout of the settings, their function, and that of the exterior space. This independence also allows the enclosure of the outdoor space to occur (perhaps in the form of a sunspace) while preserving the value of the existing settings.

Office and Dwellings: Finding an Intermediary

Typically, the major difficulty in converting a dwelling house to an office place is in trying to aggregate enough individual work settings together to constitute a functioning whole. The predominance of bearing walls and service structures (plumbing and heating ductwork in walls, etc.) in many dwellings compounds this problem, particularly if the original building accommodates many smaller apartments.

Conversely, a typical office building, because its bearing structure, service network, building access, and interior space configuration are so highly consolidated, will require substantial physical additions to achieve the density and distributions of definition, services and access required in a dwelling scenario.

The material and spatial polarities implied by different use-scenarios must find mediation at some level in the structure of a building which is to accommodate these different uses; the higher the level of ordering at which this mediation can take place, the more economical the transition from one use to another will be. For example, if an office building is to become a dwelling place without extraordinary investment, the essential physical and spatial attributes (expressible in diagram) that make dwellings habitable must lie latent in that office: in its overall dimensions, in its capacity for spaces and access places to be divided among smaller, independent dwelling units, and in the ability of its service structures to be differentiated and elaborated. Along the same lines, the spaces and physical structures in a dwelling house must allow themselves to be consolidated into larger unities, if it is to make the transition to larger use-scenarios.

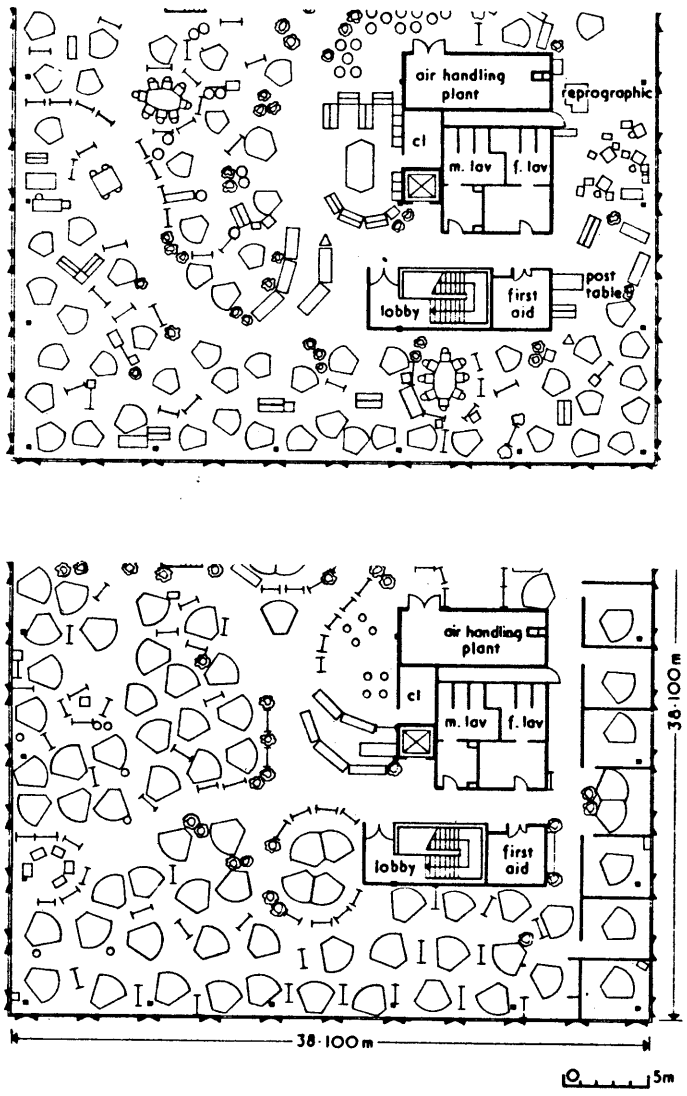


Office Support with Minimal Secondary Conditions

The secondary structure provides light, air and...phones for an open setting.

Within the sphere of the speculative office type, the way that spatial and physical structures are organized hierarchically to allow periodic adaptation has always been an important issue, since these buildings are constructed without a clear idea of who will inhabit them, for what purpose or for how long.

The speculative office typically has three levels of physical organization and flexibility. The bearing structure of the building and the essential service network constitute the first level of the hierarchy (the "shell," "framework," or "support"), which does not change much over time. The second level of the hierarchy is made up of non-bearing walls and ceilings and smaller extensions of the service network. These structures may be altered partially or completely by successive tenants to meet their particular environmental preferences. Within the combined context of the primary and secondary organizations, the smaller changes

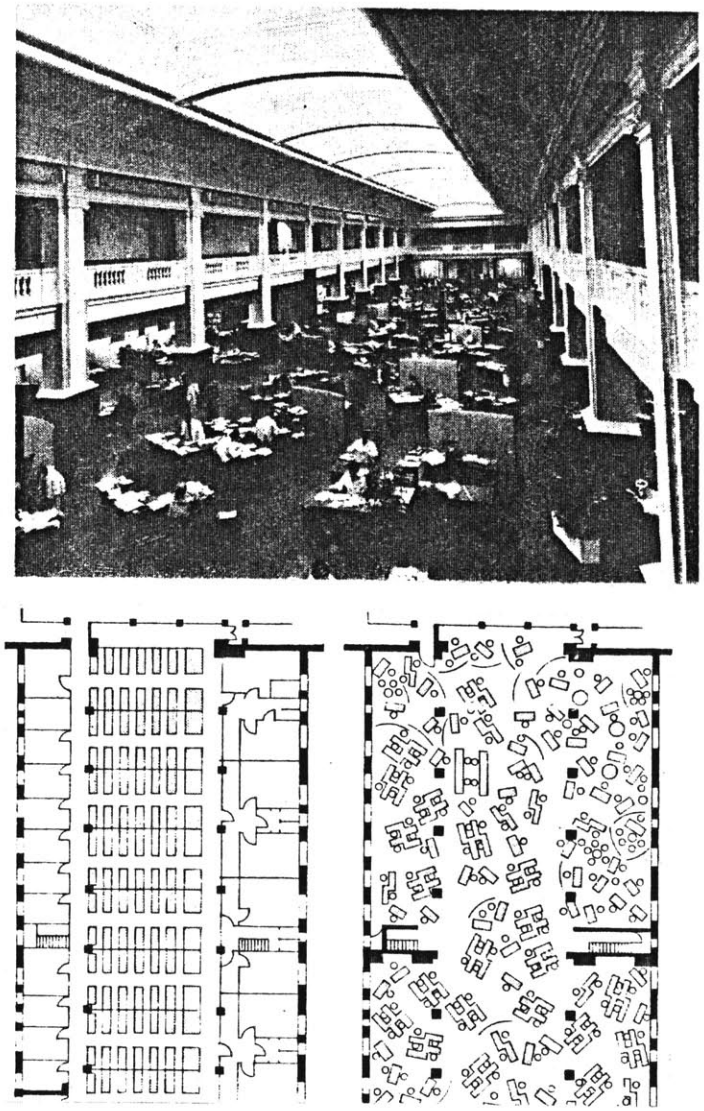


Choice in an Office "Landscape"

that allow individual personnel to accommodate spaces to themselves are achieved by movable partitions, furniture, and equipment.

It is the structuring of the primary "framework" that determines the larger range of use and flexibility of a building. For example, a "deep" office environment, one that is dimensioned so that settings exist which are farther than thirty feet from natural light, will accommodate a seemingly infinite variety of "open" office arrangements. It cannot, however, be converted into a "closed" office environment without great loss of environmental quality. By the same token, a primary structure built for closed office conditions may allow a range of office sizes and immediate relationships between individual offices, but not permit connections to be made among larger groups of workers.

Some custom-designed office buildings accommodate in-house differences of working style

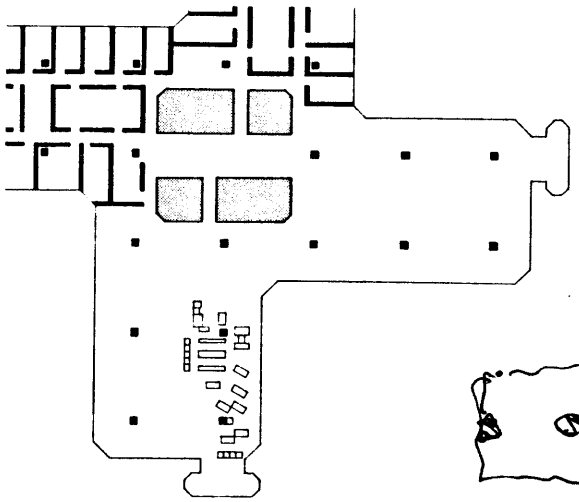


"Open" and "Closed" Office Settings
within the Atrium-type Building

with a "deep" structure through the use of interior, light-bearing volumes of space. This configuration creates a distinction between areas suitable for open plan settings and those allowing closed settings.

An approach used in speculative office situations which strives towards a greater degree of tenant choice is one which limits the maximum depth of buildings to less than sixty feet and intersperses solid "core" spaces: lavatories, lifts, fire stairs, etc. with open spaces which can be used freely. This organization allows peripheral settings to be closed, with conference spaces and storage and equipment rooms at the center of the building, or for the entirety of the peripheral and interstitial spaces to be left open in plan.

Diagrammatically, the hybrid kind of office organization can be recognized as a kind of composite of the mass-void and access-room characteristics of the two early New England



The "Hybrid" Office Type

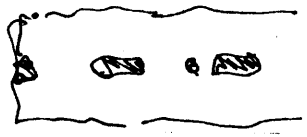
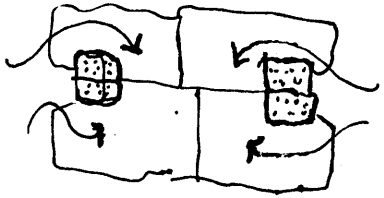
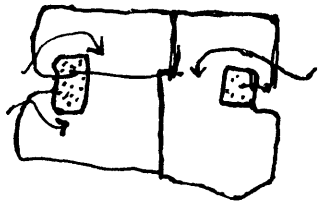
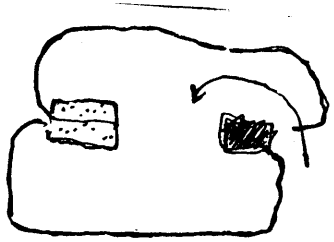


Diagram of the "Hybrid" Type



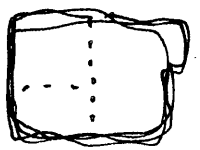


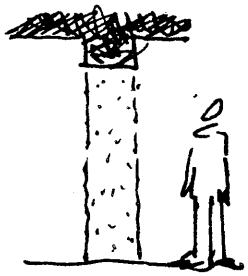


Divisions of the Hybrid Diagram
Core, Access Locations

house types. It potentially combines the accessibility of the physical core inherent in the first type with the more flexible access to individual settings of the second.

The diagrams shown previously for the entrance sequence in offices and dwellings show the importance of the relationship between the entry and "wet" spaces (bathrooms, washrooms and kitchens). Using the composite diagram to give order to the intermediate scale of a building, possibilities for entry locations and division of consolidated spaces and service structures are as shown. We could imagine this diagram being developed in to space accommodating up to four small apartments, with maximum use and extension of service structures to provide a small kitchen and bath for each unit. In an office scenario, only one of the four entry possibilities might need to be utilized, in which case the others would be turned over to other purposes (suggesting that entry areas and movement spaces be



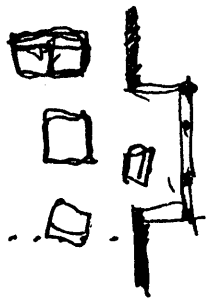


capable of consolidation into other spaces, or sized to allow at least a small privacy to occur in them), and some of the service potential be left dormant.

The consolidation of spaces, services, entry conditions and bearing structures is the first condition for the formation of larger functional unities within a building; expressing these larger forms as aggregates of smaller entities facilitates the establishment of more intimate territories.

In a building of simple, expressed construction (wooden post and beam, or concrete frame, for example) the relationship between the smaller settings in the building and the intermediate scale can be mediated in the following ways.

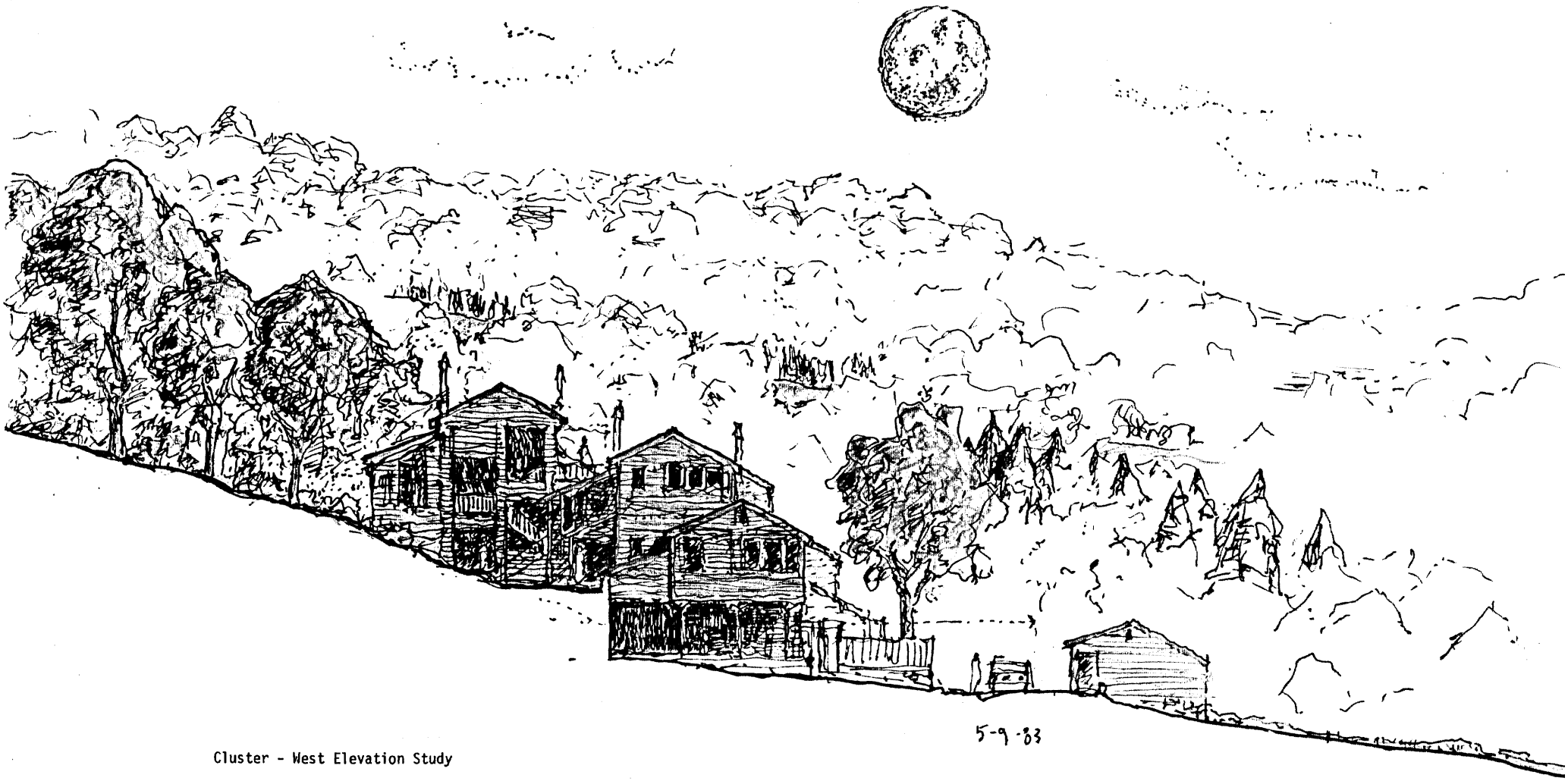
1. Dimensioning spaces additively so that functional subdivisions can occur - each space is an aggregate of smaller, useful spaces.
2. Locating and dimensioning bearing structure to partially define smaller settings.



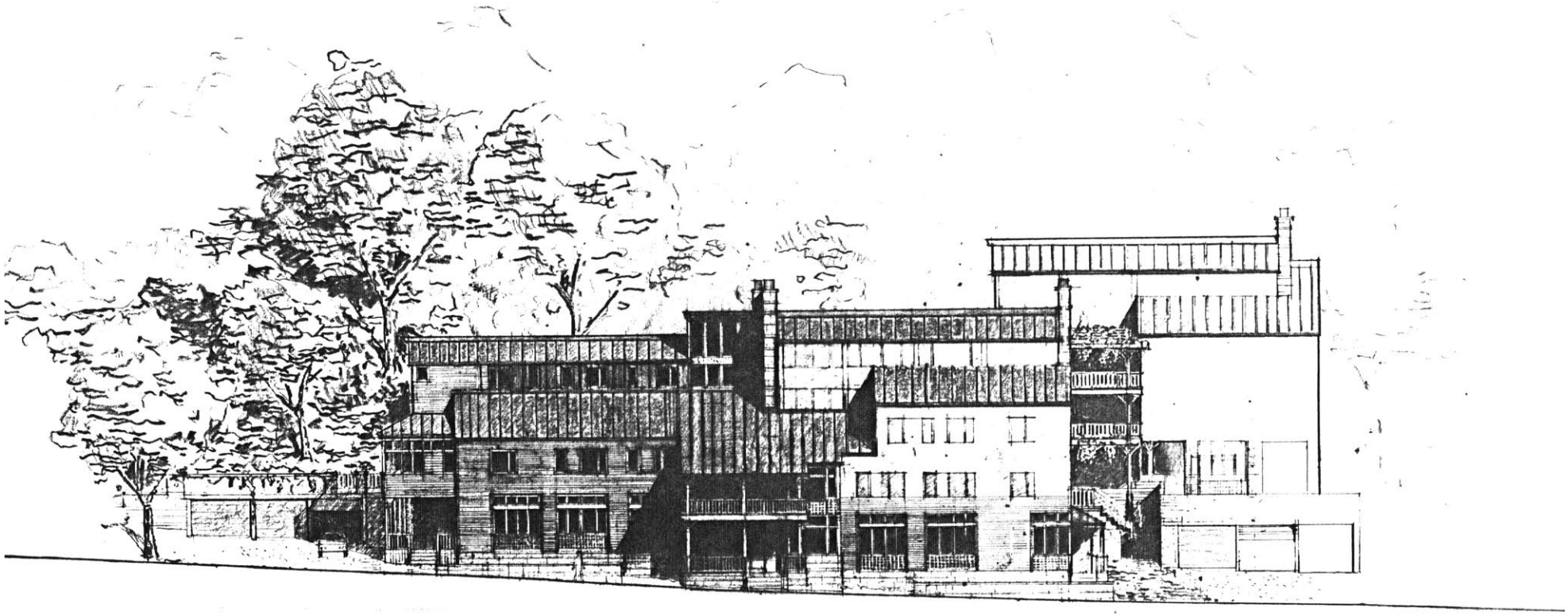
3. Articulating outer building edges to partially define peripheral settings.

Figures 1 - 4 show an uninhabited framework of two buildings in which the principles of consolidation and articulation have been used to organize the intermediate scale of the buildings. The buildings are shell-like in character--the enclosure is highly continuous and containing, in response to the harsh Vermont climate.

In the North-east building, the diagram of the intermediary has been expressed once, in three levels of space. In the West building it is seen two times, with an interior connection between the intermediaries that maintains the spatial continuity of the building as a whole. The inner connection within the West building and the outer connection within the cluster provide continuous vertical access to all levels of the buildings.



Cluster - West Elevation Study



Cluster - South Elevation Study

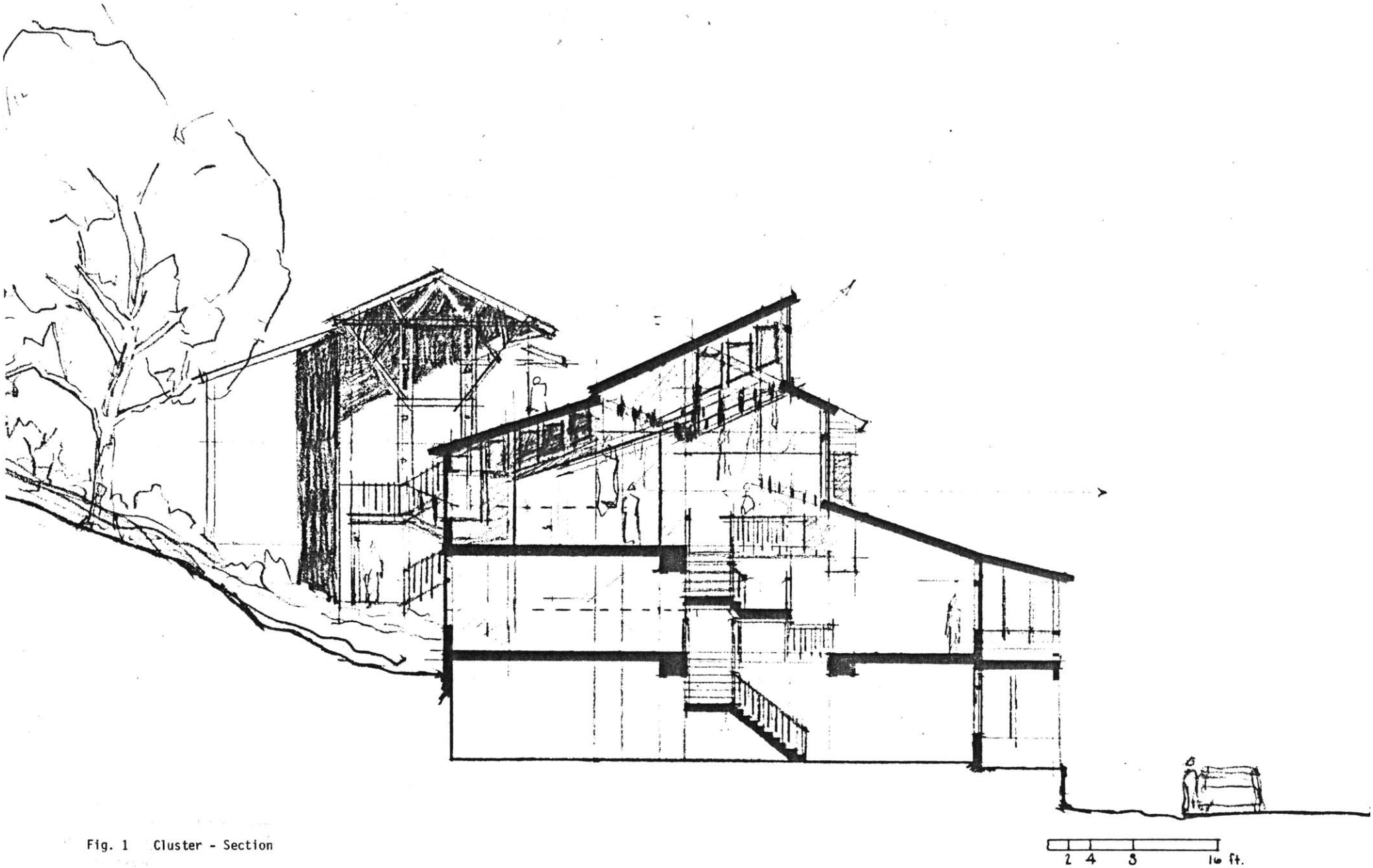


Fig. 1 Cluster - Section

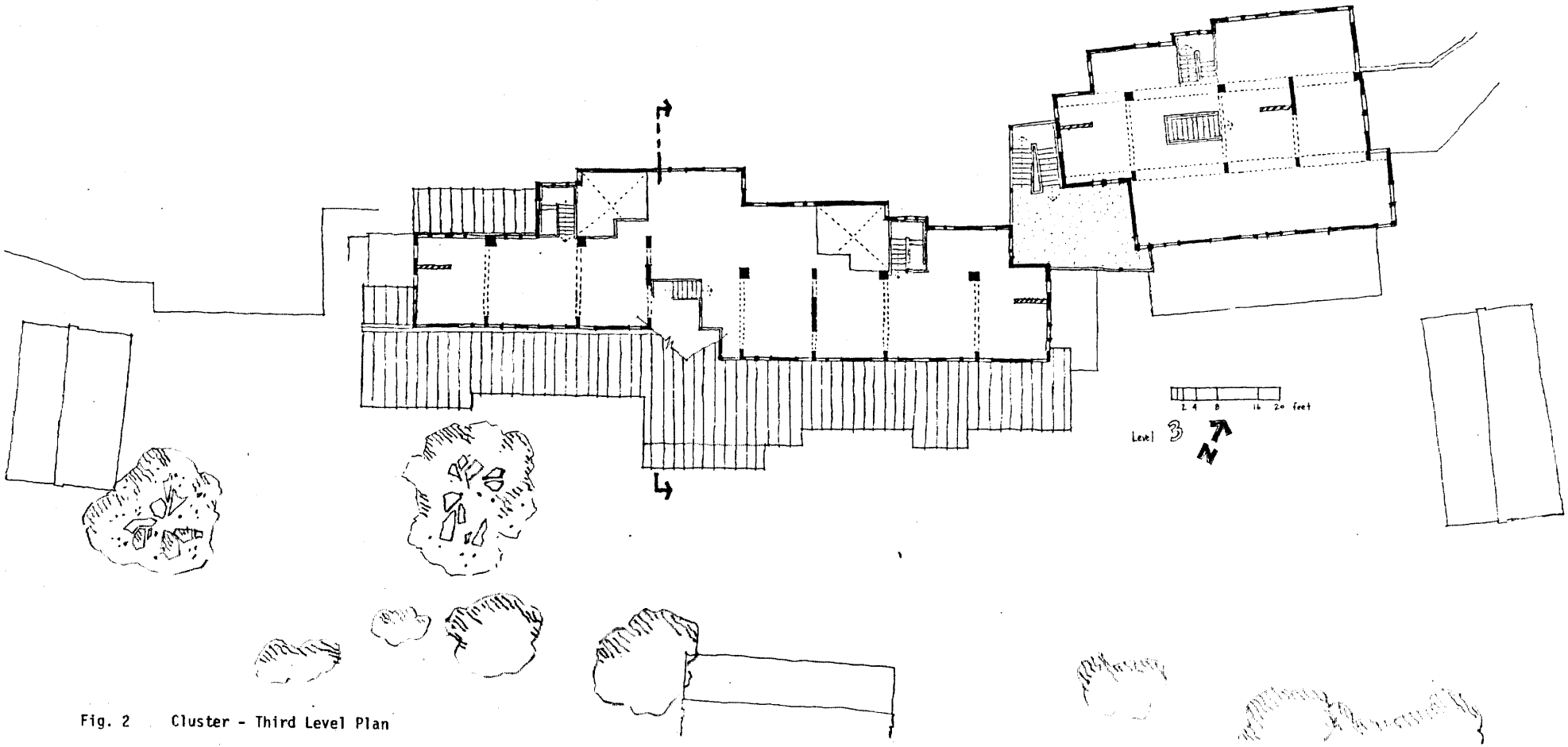


Fig. 2 Cluster - Third Level Plan

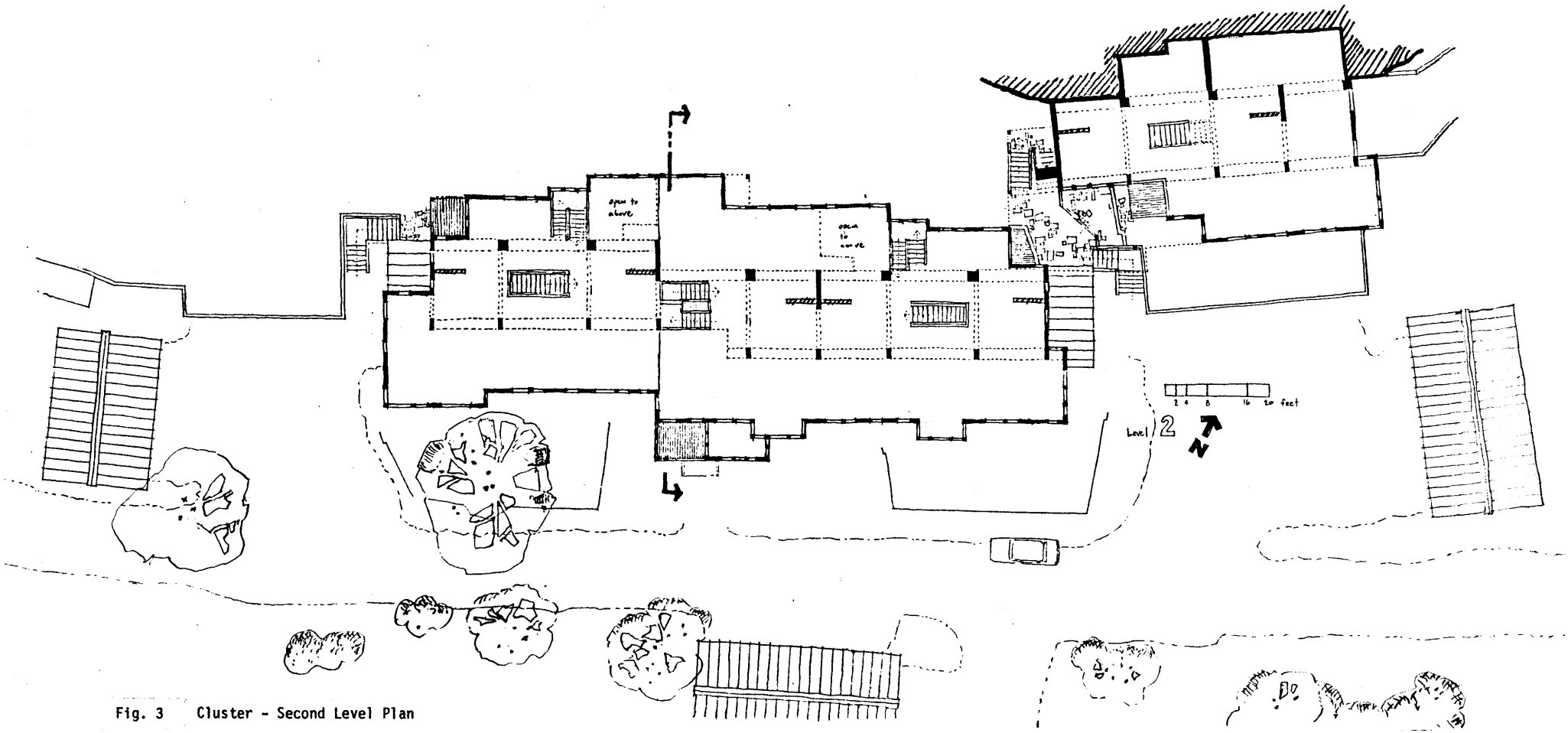


Fig. 3 Cluster - Second Level Plan

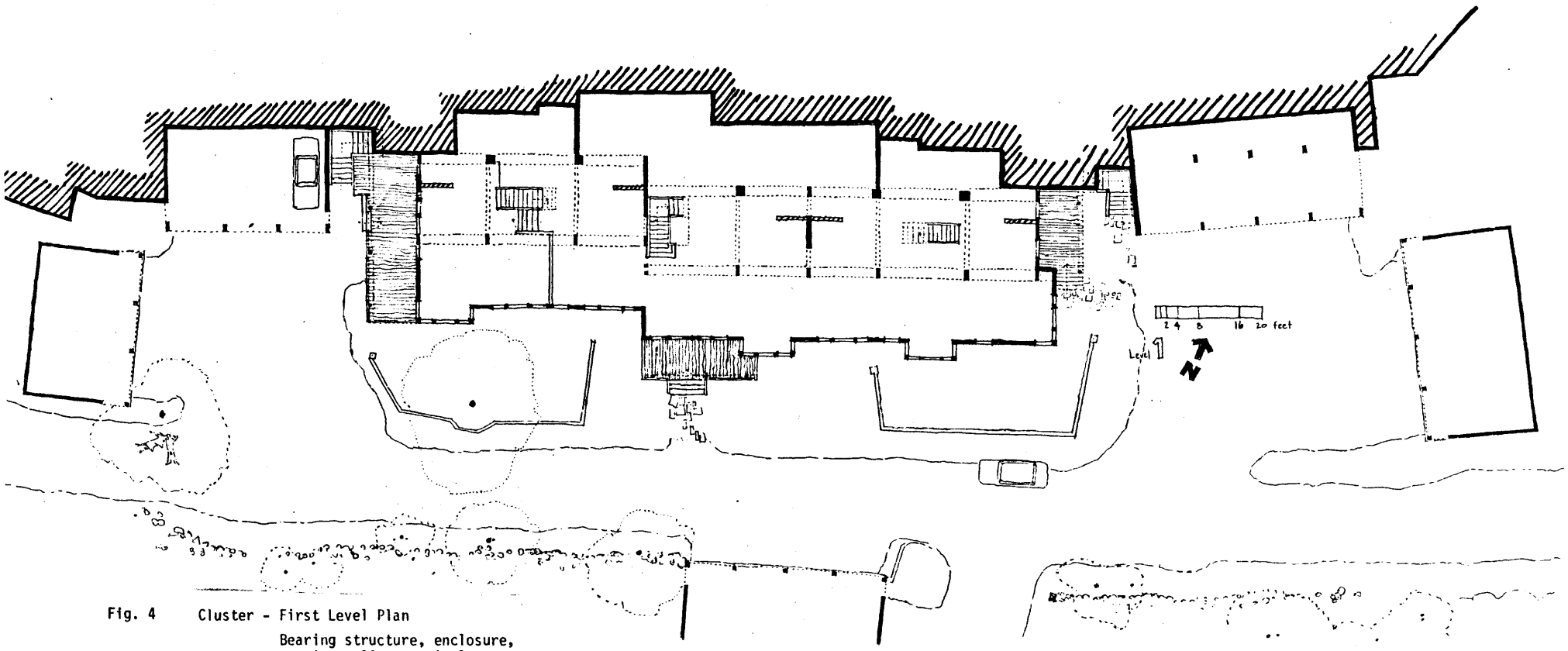
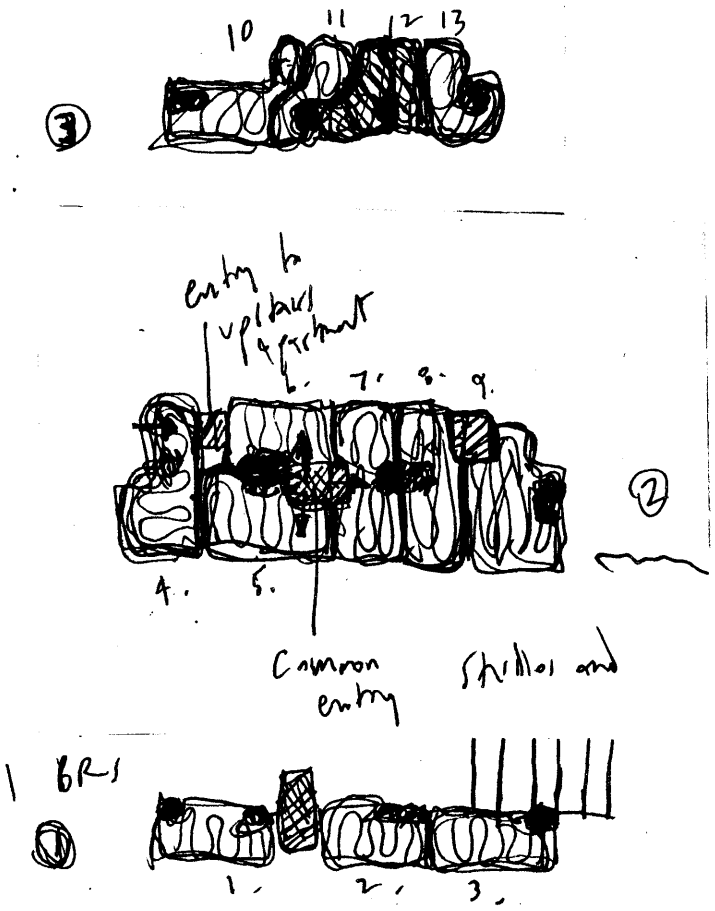


Fig. 4 Cluster - First Level Plan

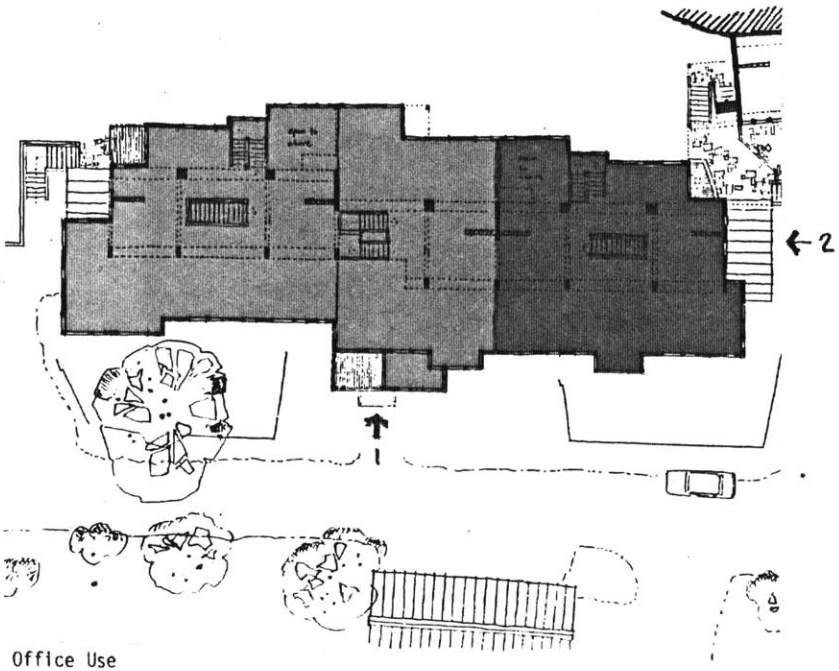
Bearing structure, enclosure, service walls, vertical connections, outdoor storage and parking.



Division of Building into Studio Units

By manipulating the secondary non-bearing structure of the building, it is possible to define "open" or "closed" settings within the same primary formal condition. The framework shown previously can be divided into a large number of studio-sized apartments of 500 - 800 ft^2 if the stairway in the central interstitial zone is used as a common accessway. If the building has fewer, but larger apartment units, the same stairway can be incorporated into a single unit.

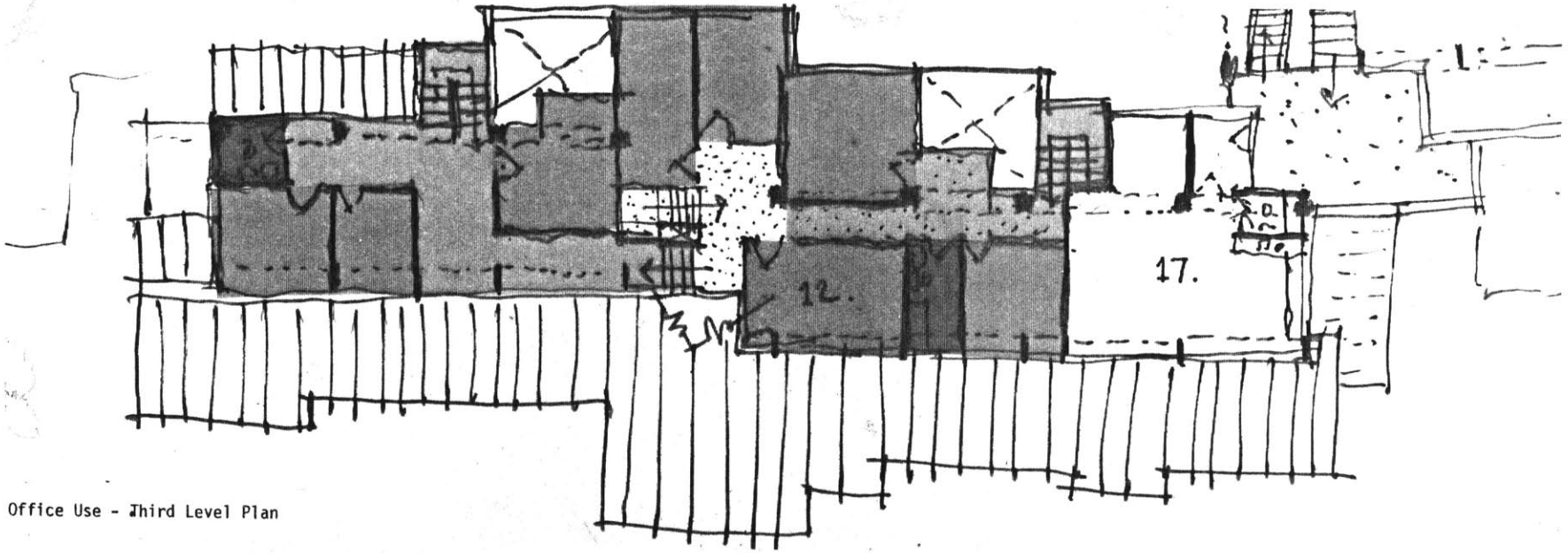
A degree of redundancy is required in the path networks (horizontally and vertically) in a building which is to flexibly accommodate a larger scenario such as the office program shown earlier. The net of relations (diagrammed previously) between departments and activity settings within the firm indicate the need for multiple choices for interaction between different departments and settings. In addition, as the office grows or shrinks and/or the nature of the



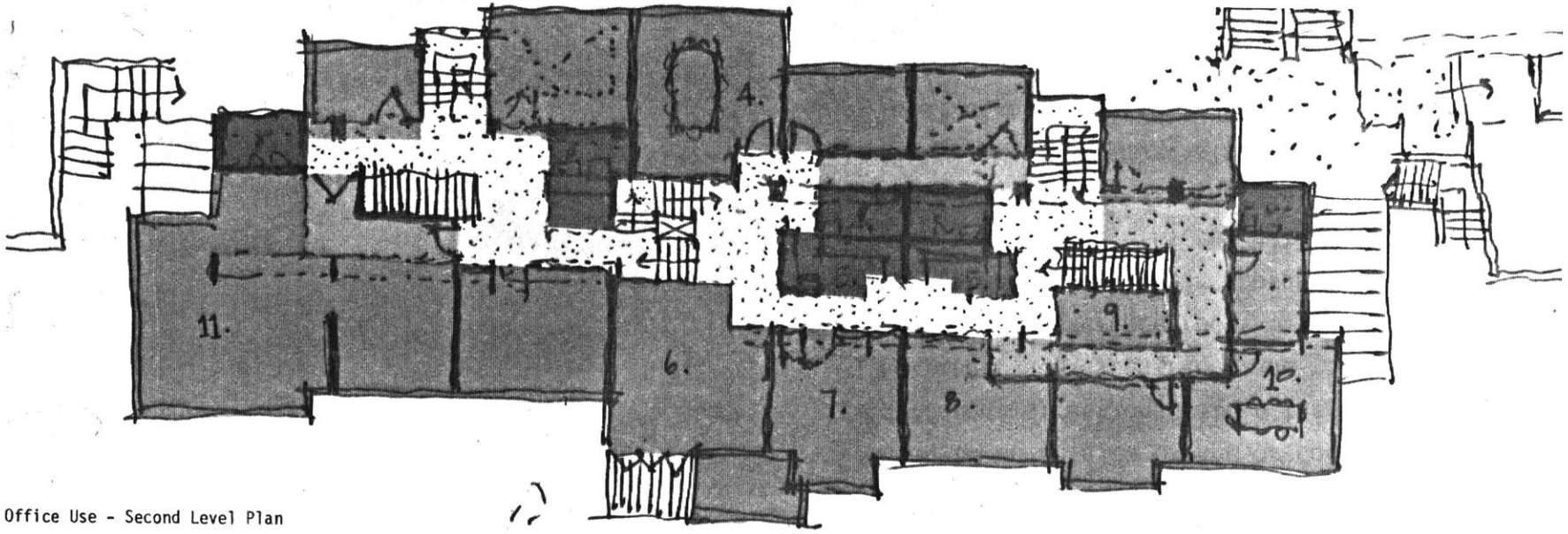
Office Use

Inhabitation with two independent offices.

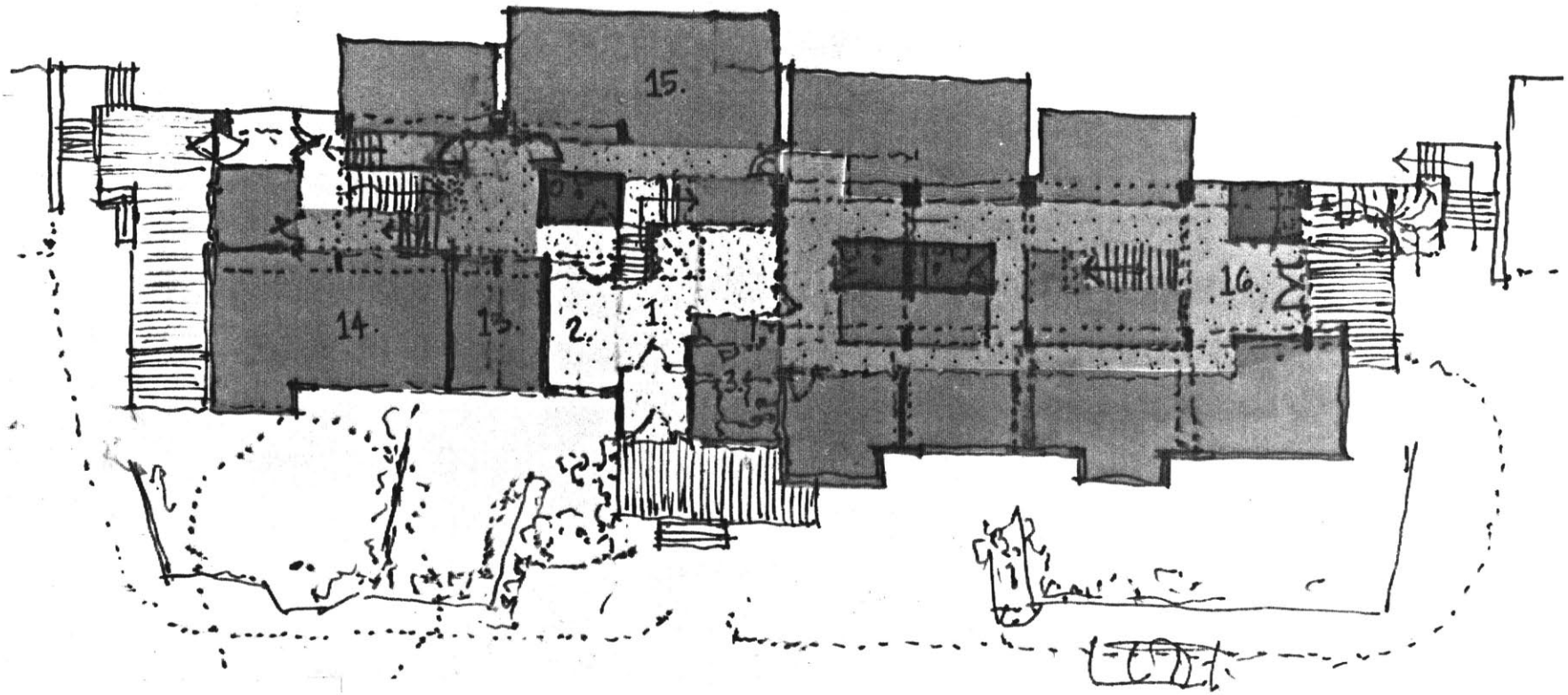
work changes, groupings of settings will need to be able to expand or contract in different directions within the building. Settings such as entrance and reception areas and conference rooms may need to be relocated to keep their appropriate place within the whole. As the network of settings goes through these transformations, the path network must also change in its local directionality and in its placement with respect to settings and building edges. The conditions which permit these multiple options will be discussed later.



Office Use - Third Level Plan



Office Use - Second Level Plan



Office Use - First Level Plan

Key:

- Primary Circulation
- Secondary Circulation
- Sedentry Activity Settings
- Core

Entry-Related Settings

1. Main Entry/Reception
2. Waiting
3. Receptionist
4. Large Conference Room

Common Settings

5. Kitchen
6. Lounge

Administrative Settings

7. Office Manager
8. Secretary
9. Copying Machines

Marketing and Sales

10. Sales Conference Room

Research and Development

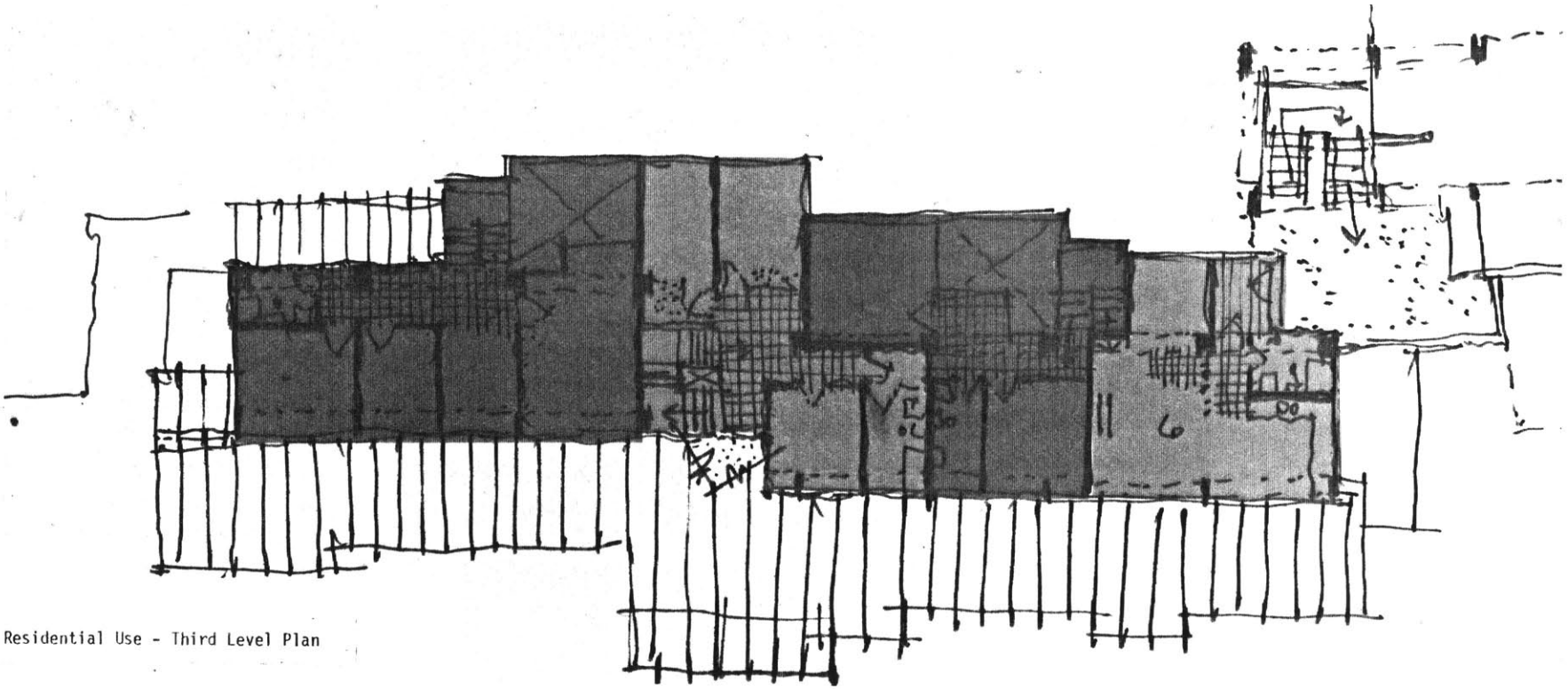
11. Hardware Lab
12. R & D Conference Room

Data-Disc Production

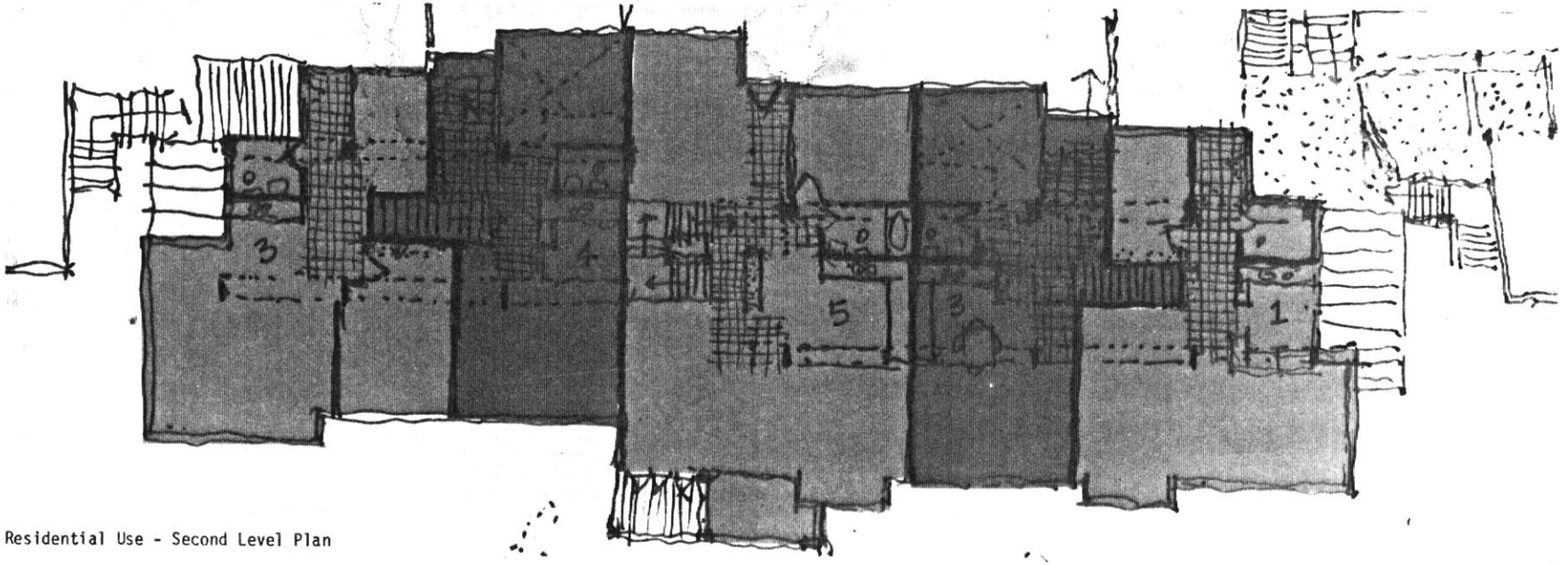
13. Senior Analyst
14. Data-Disc Lab
15. Machine Room

Other Settings

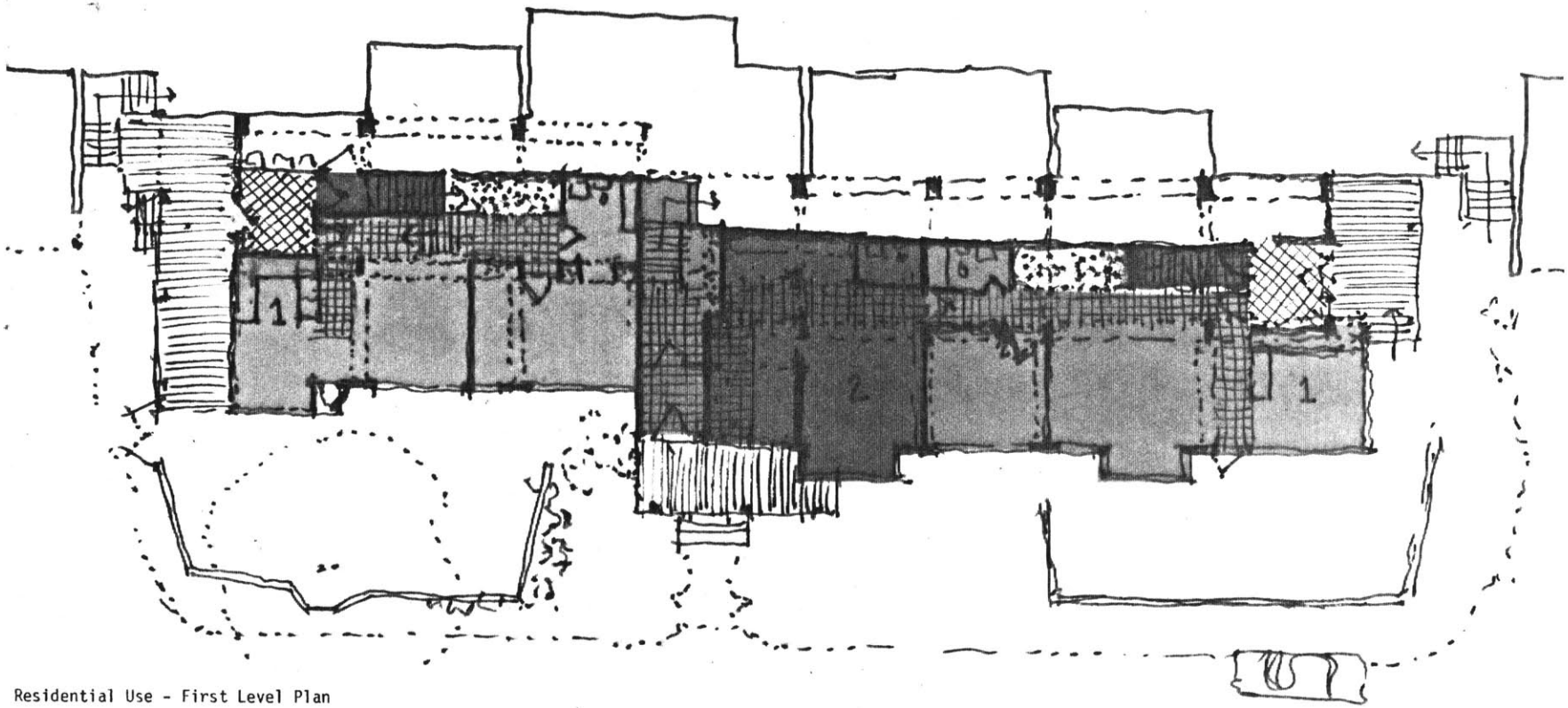
16. Receiving
17. Care-taker's Apartment



Residential Use - Third Level Plan



Residential Use - Second Level Plan

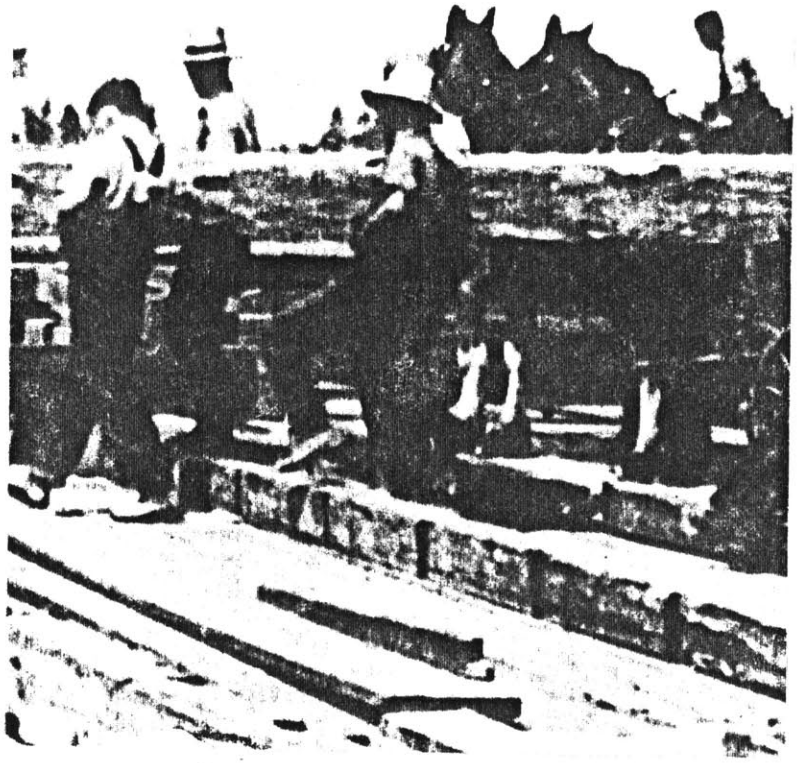


Residential Use - First Level Plan

Key: Apartment Circulation

1. 1 - BR unit
2. Office
3. 2 - BR unit
4. 3 - BR unit
5. 4 - BR unit
6. Studio unit

This inhabitation is planned to give each apartment North and South exposure, and private outdoor space where possible.

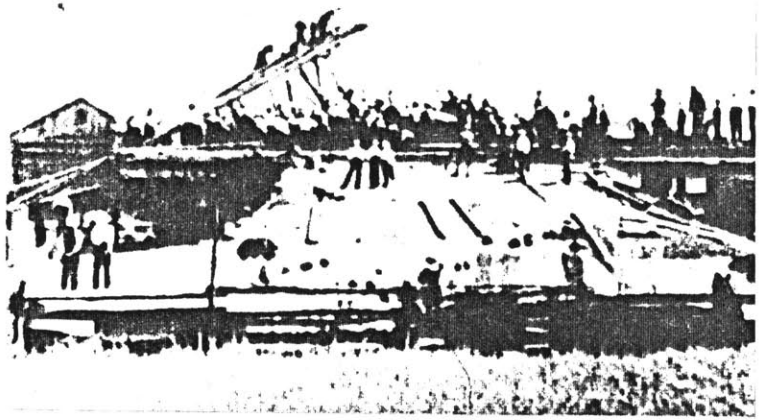


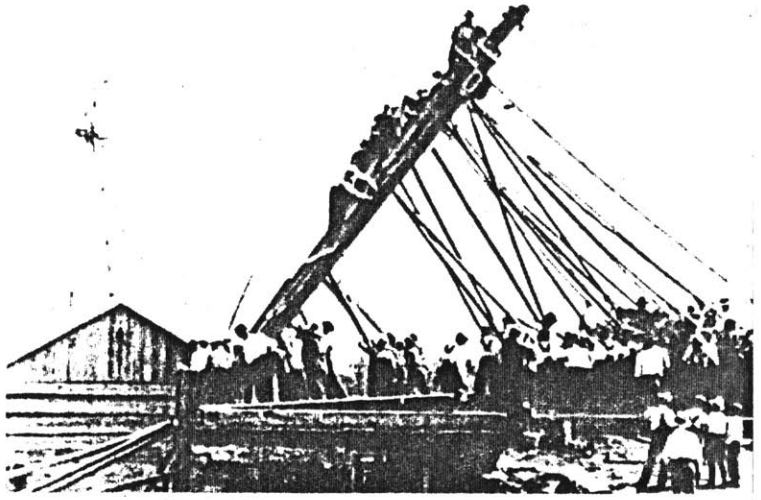
Mennonite Barn-Raising in Ontario

Structuring the Intermediary

The central locations of access points and services cores within the diagram of the intermediary allow certain freedoms in the disposition of peripheral spaces. This freedom is important in allowing a building to be fitted to the topography of a difficult site, to specific compass orientations, or to tighter building clusters.

The intermediary can be structured physically to take advantage of this hierarchal ordering of core and peripheral zones within the building. Figures 5 - 7 illustrate a panel system which allows the physical structuring of the core zone of the intermediate as a primary condition. The panels are constructed of light wood framing members and plywood sheets and are lifted in place by crane to the full building height and bridged with girders.





The Barn-Raising Continued
Raising the "bent."

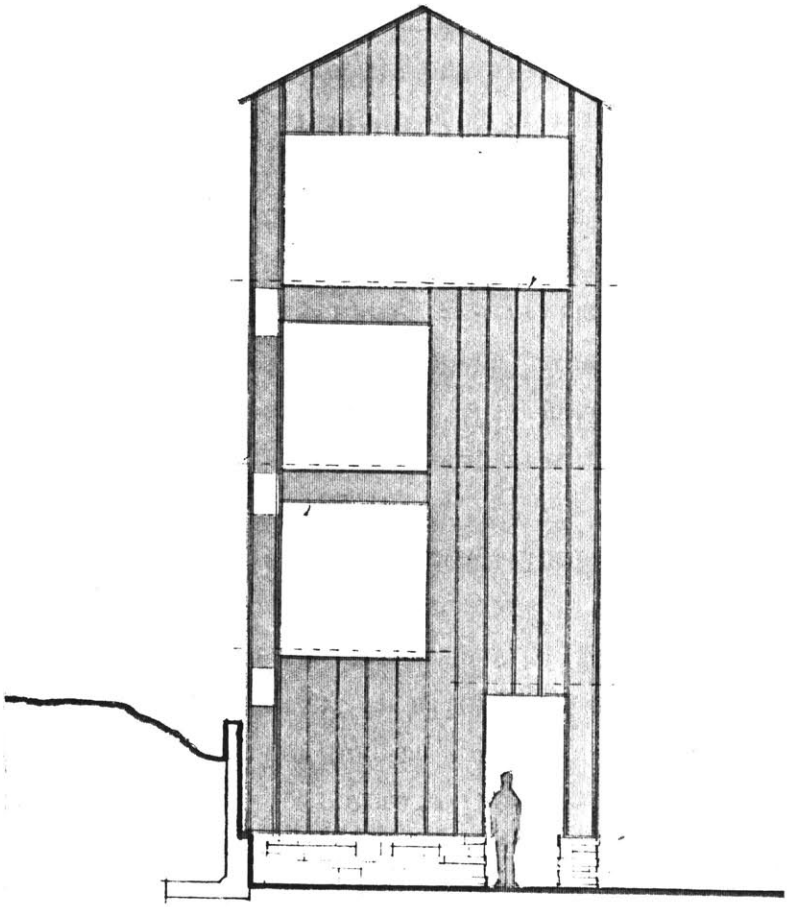


Fig. 5 A Lift-Panel in Place
Balloon framing and plywood put in place by crane.

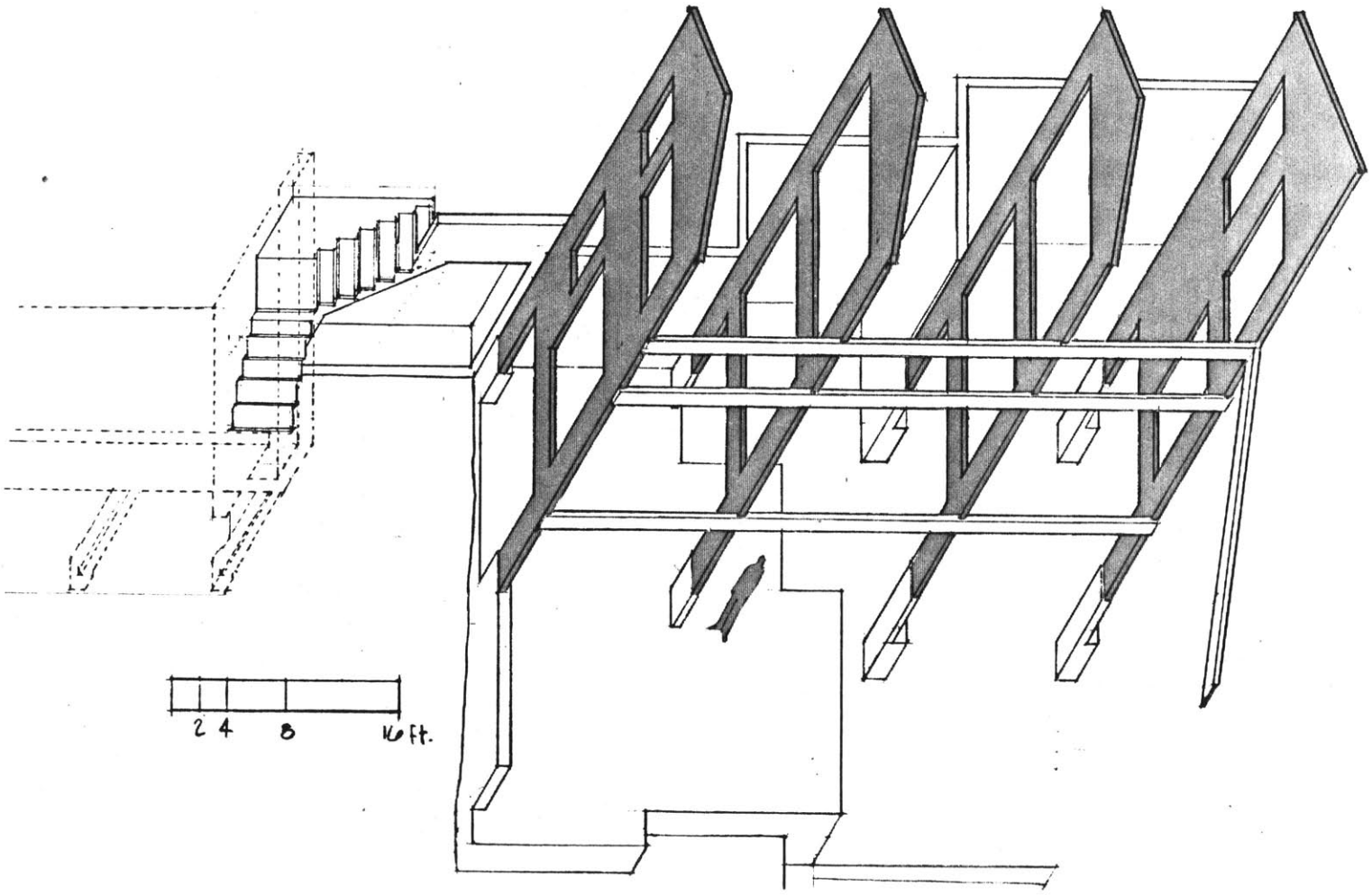


Fig. 6 The "Nave" of the Intermediary Structured by Panels and Beams

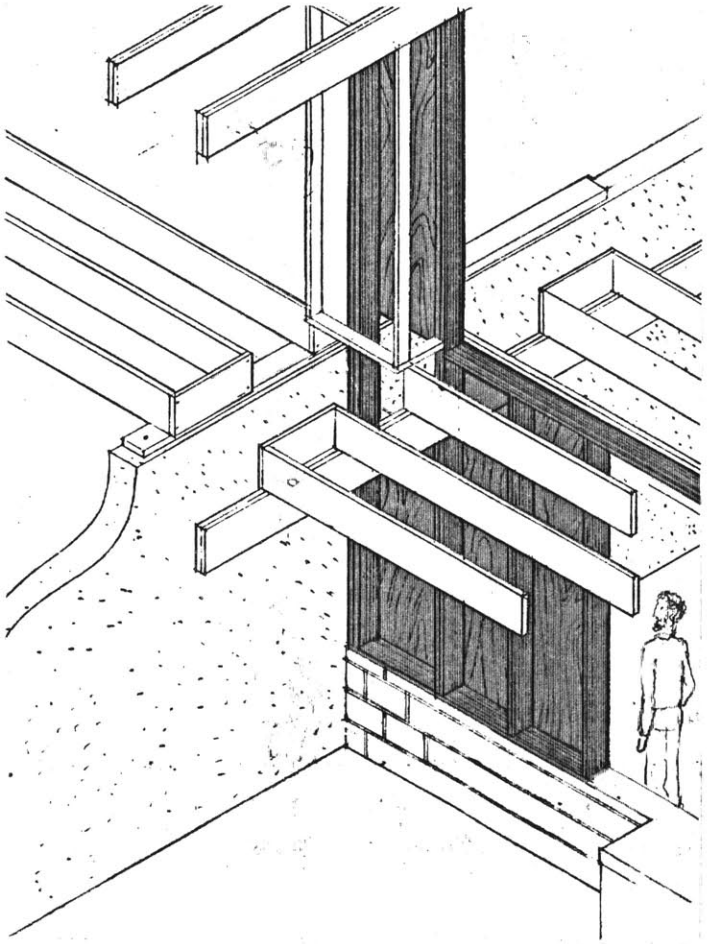
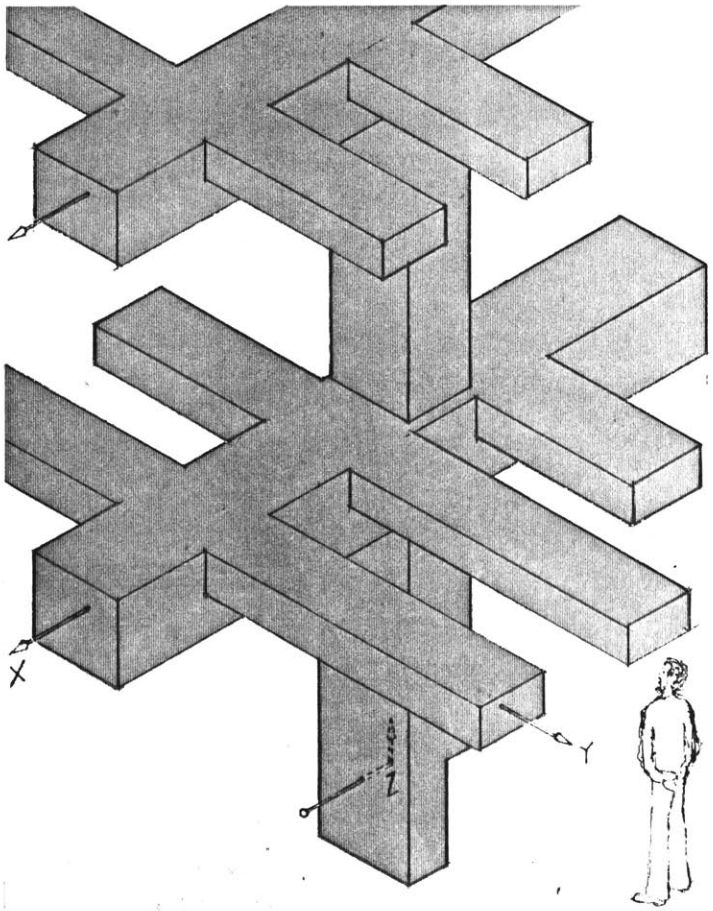
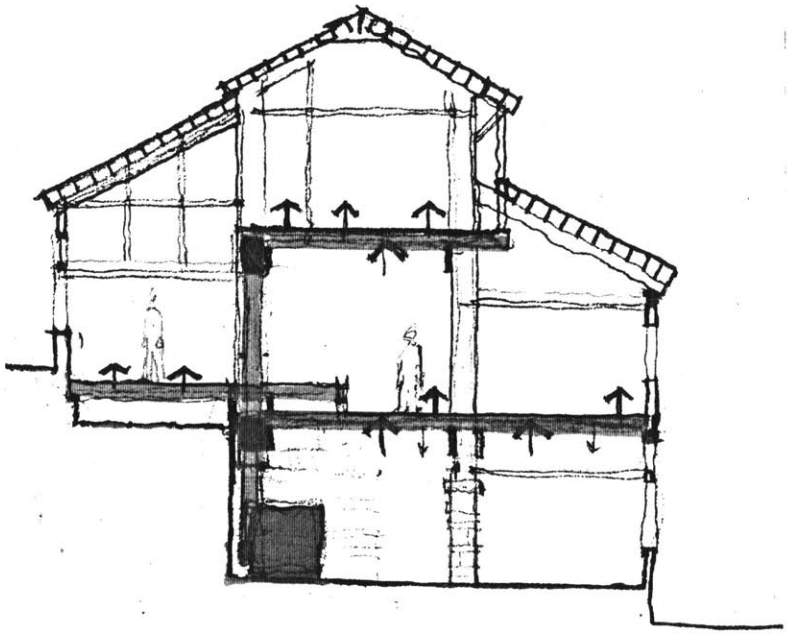


Fig. 7 Foot of a Lift Panel and Additional Bearing Structure



Plenum Network Defined by Primary Structure and Additional Enclosure



Distribution of Central
Heating or Cooling

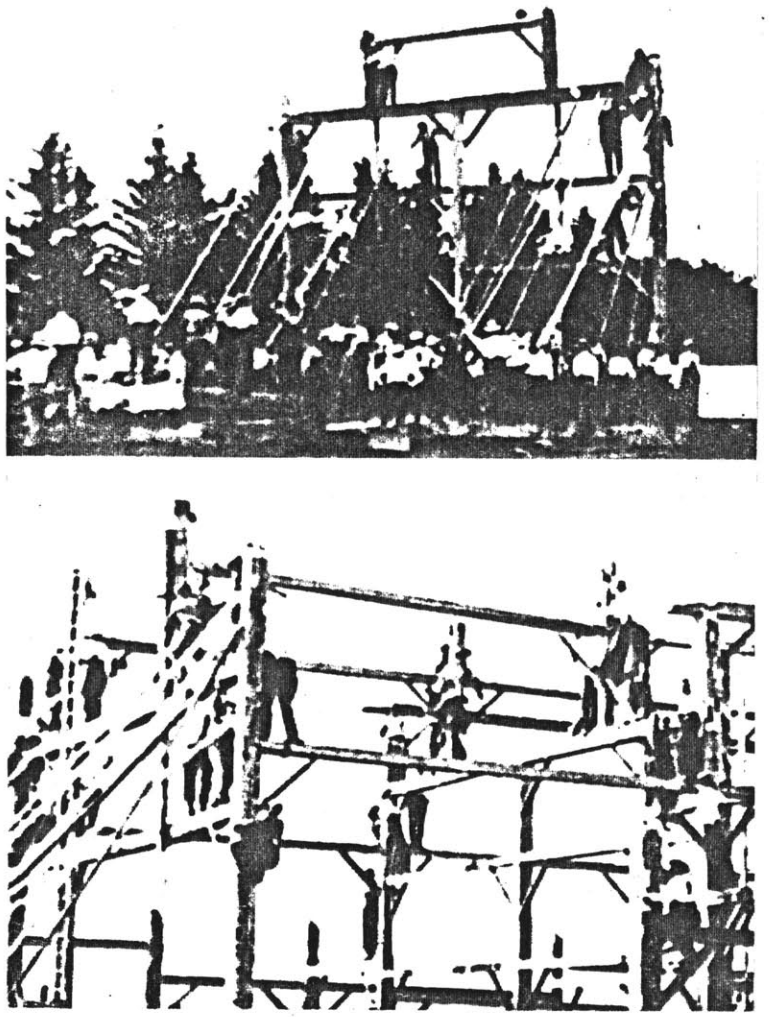
This system has several advantages and potentials:

1. Simplicity of fabrication. The panels can be constructed on site or in the factory with jigs similar to those used in the fabrication of wooden trusses.
2. It permits the use of conventional wood framing (platform, balloon, or post and beam) or prefabricated panel systems to complete the structure.
3. Since the core frame is a stable entity from the beginning, it acts as a rigging to facilitate the assemblage of the peripheral structure and establishes the building center as a lateral stablizer in the finished building.
4. By deploying girders and additional framing spatially in combination with the panels, it is possible to give the primary, load-bearing system a clear character distinct from the secondary structural system.
5. A system of plena can be structured into and around the core framing system which can house HVAC's. By allowing mechan-

icals and other systems to be incorporated this way into the existing primary framing, their constraining impact on the spatial freedom of the building can be minimized.

6. The system permits simultaneous assemblage of buildings' mechanical systems and peripheral framing, thereby potentially reducing the total initial construction time.
7. The primary structure of the buildings, because it is wood, is easier to manipulate and add to on a 'day-to-day basis than concrete or steel frames, because the level of technology required to manipulate it is lower. This contributes to the inhabitability of the building as a whole.

The plenum network might play an important architectural role in the office. Air conditioning may be required in settings which need thermal stability. If these settings are dispersed then it may be expedient

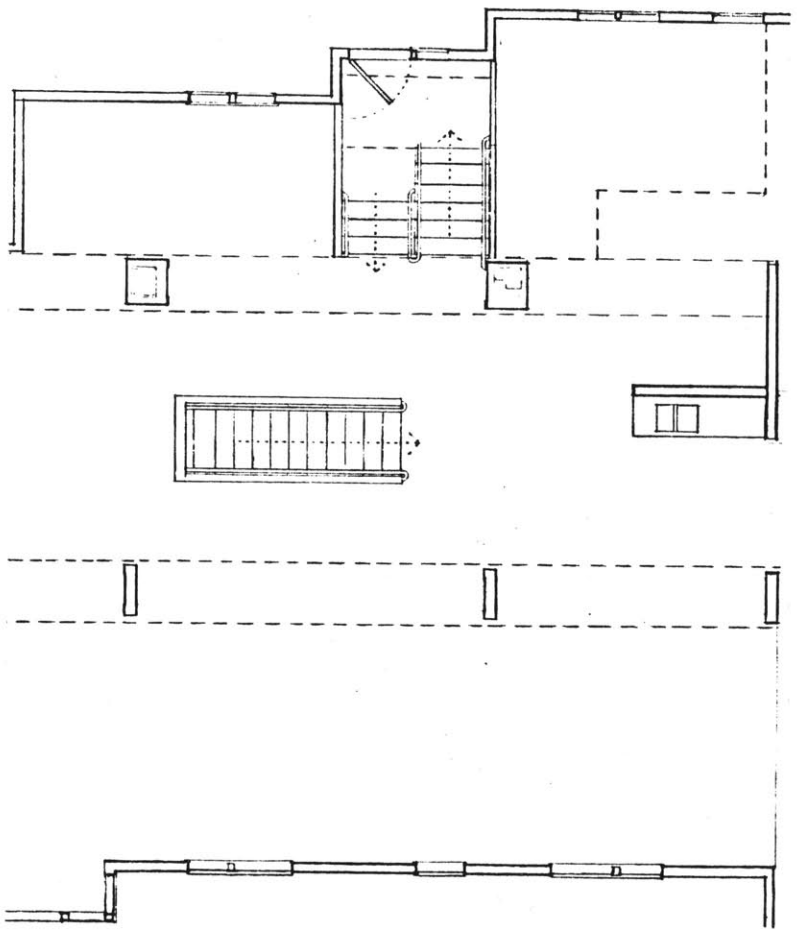


The Barn-Raising Continued

Bracing and bridging the "bents."

to install a central cooling plant and use the plenum network for distribution. In an office with central computers in one or several locations and dispersed terminals, the plenum could house the cables connecting the various machines. With most wiring and ductwork housed in collaboration with the primary structure, it would be possible to eliminate the usually unpleasant alternatives of hung ceilings, or exposed ductwork within the office.

By consolidating water supply and return, waste stacks and vents into the primary system and using short branch lines to supply individual settings, a greater degree of flexibility is achieved in settings near "wet" walls. Without effecting main water lines it is possible to add or remove the run of tubing required for a kitchen sink, for example.

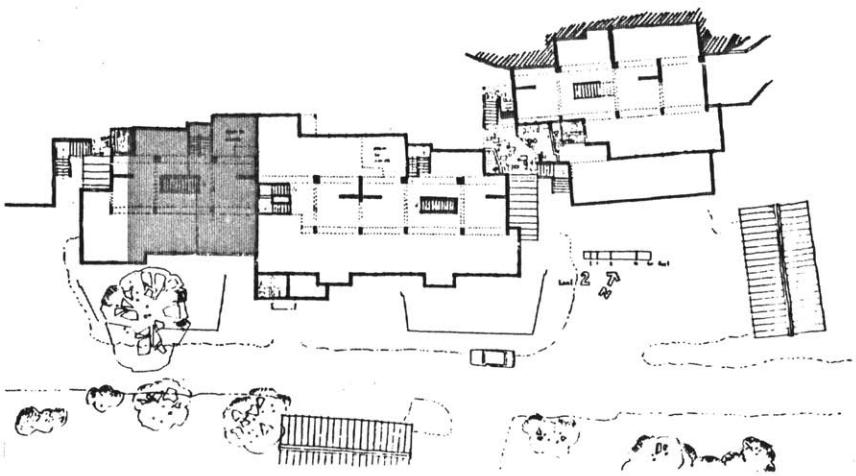


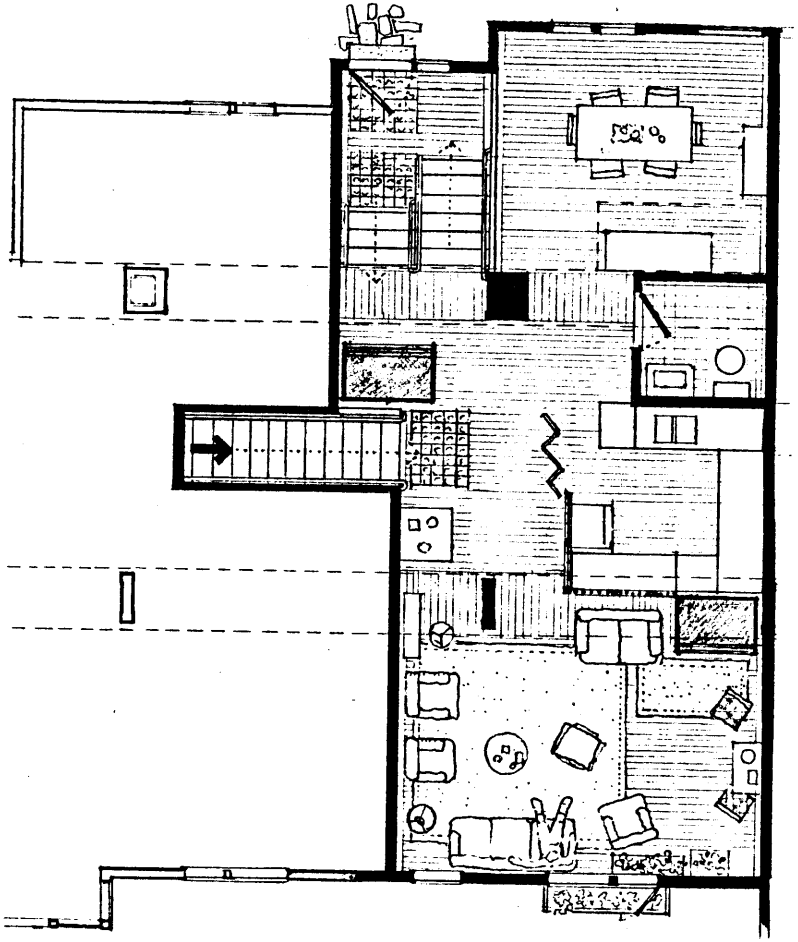
Piece of Primary Structure

Enclosure, bearing structure, vertical connections, wet walls.

Articulating the Fine Grain

If multiple options for building access and internal paths are provided in a primary framework, spaces or portions of them may be used for either entries, movement paths or more sedentary activities, depending on the scenario. This suggests that spaces defined by primary definitions: load-bearing structures, wet walls, and building enclosure should be configured to permit a range of plausible inhabitations.

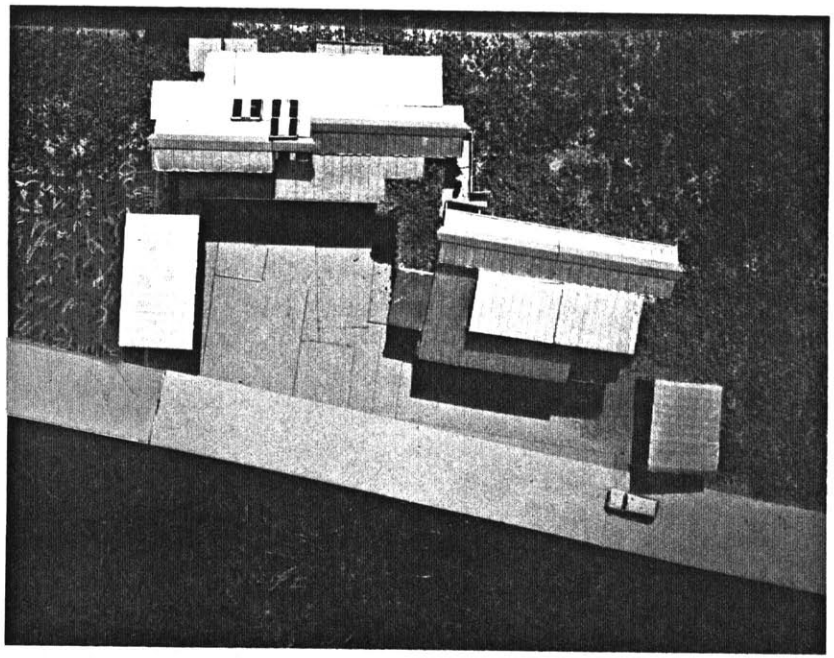




Dwelling Inhabitation of a Building Piece

In an "open" office setting, a minimum work setting is a space of about 7 feet by 8 feet. In an enclosed office, small sleeping setting or lounge in a residence, this minimum size is about 9 feet by 12 feet; larger settings can be defined by secondary structure to allow them to be reconfigured to accommodate more than one minimal setting or some combination of smaller settings of access and/or slack spaces.

An alternative to built-ins is a moveable system of cabinetry which can be used in slack spaces where desired, or for space definition.



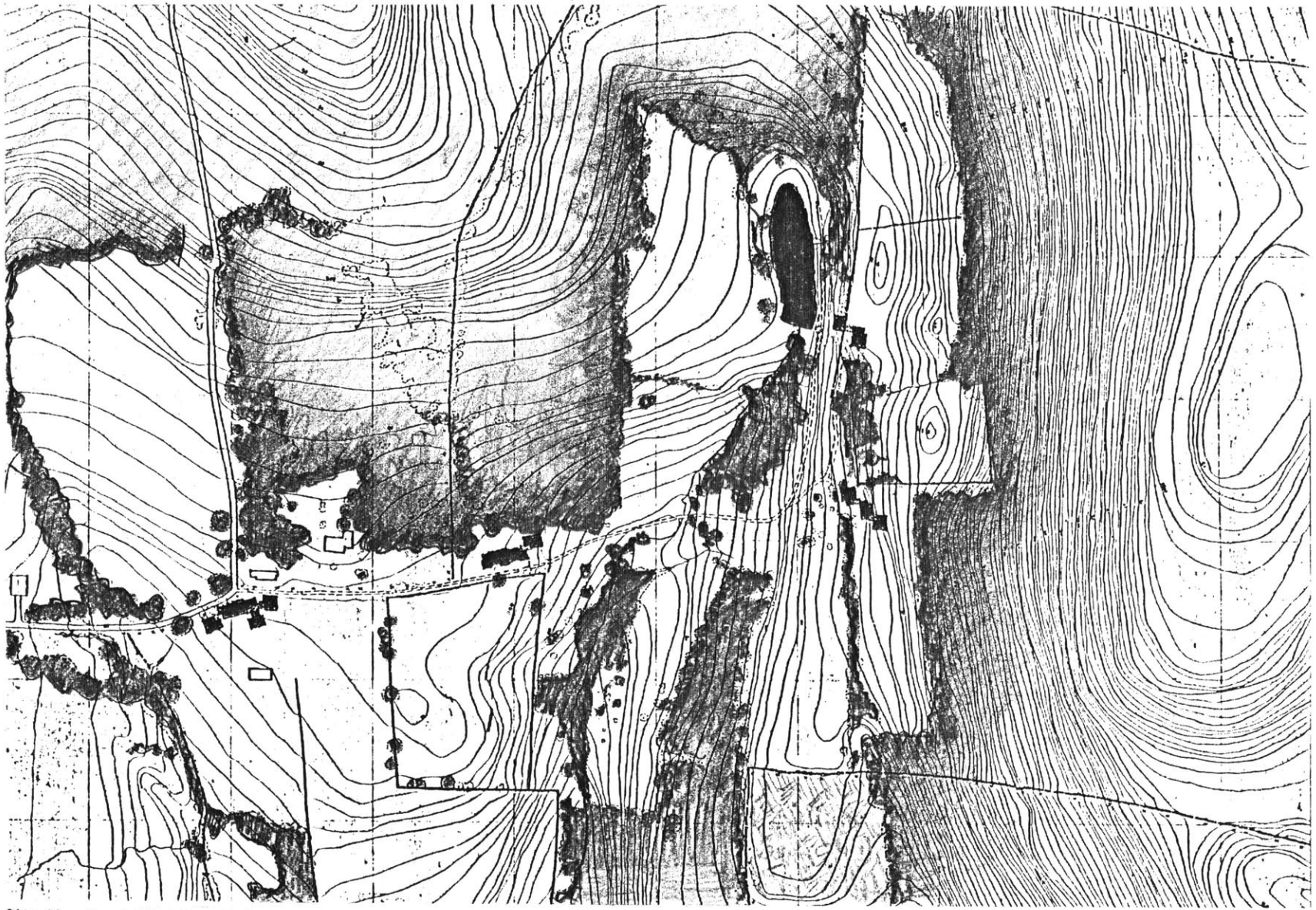
Cluster Study Model

Building the Larger Scale - Cluster and Site

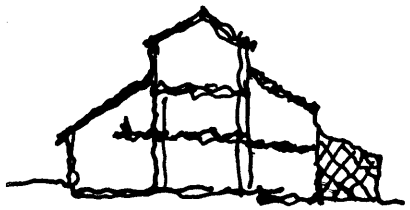
By clustering adjacent buildings tightly it is possible for internal connectors to be established between them, at the ground level or above, with or without additional activity settings. These connections can work either along or across the lay of the land.

At the scale of the farm valley, the deployment of buildings can serve practical as well as aesthetic purpóse. Farmland is becoming scarce because of the growth of suburbs, with many negative repercussions. In a development like the one projected here, the preservation of farmland should be given a high priority. By locating buildings and building clusters on edges of farmland in a dispersed fashion the land can be cultivated in its entirety as a unified farm, or can be divided among the building clusters to farm large communal "gardens." The building clusters, in this way, can

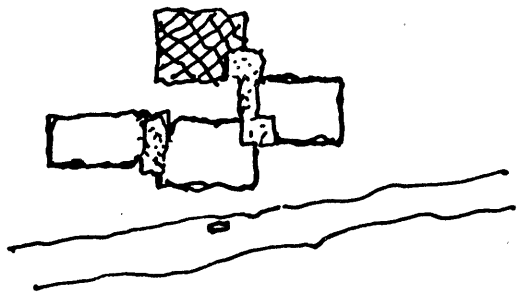
serve as nodal points in a network of access and service to workable land in the majority of the site.



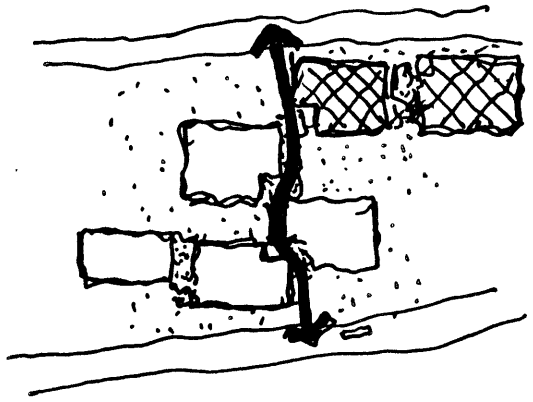
Site Plan for Initial Program



Additions at the Small Scale



Additions at the Scale of the Intermediary



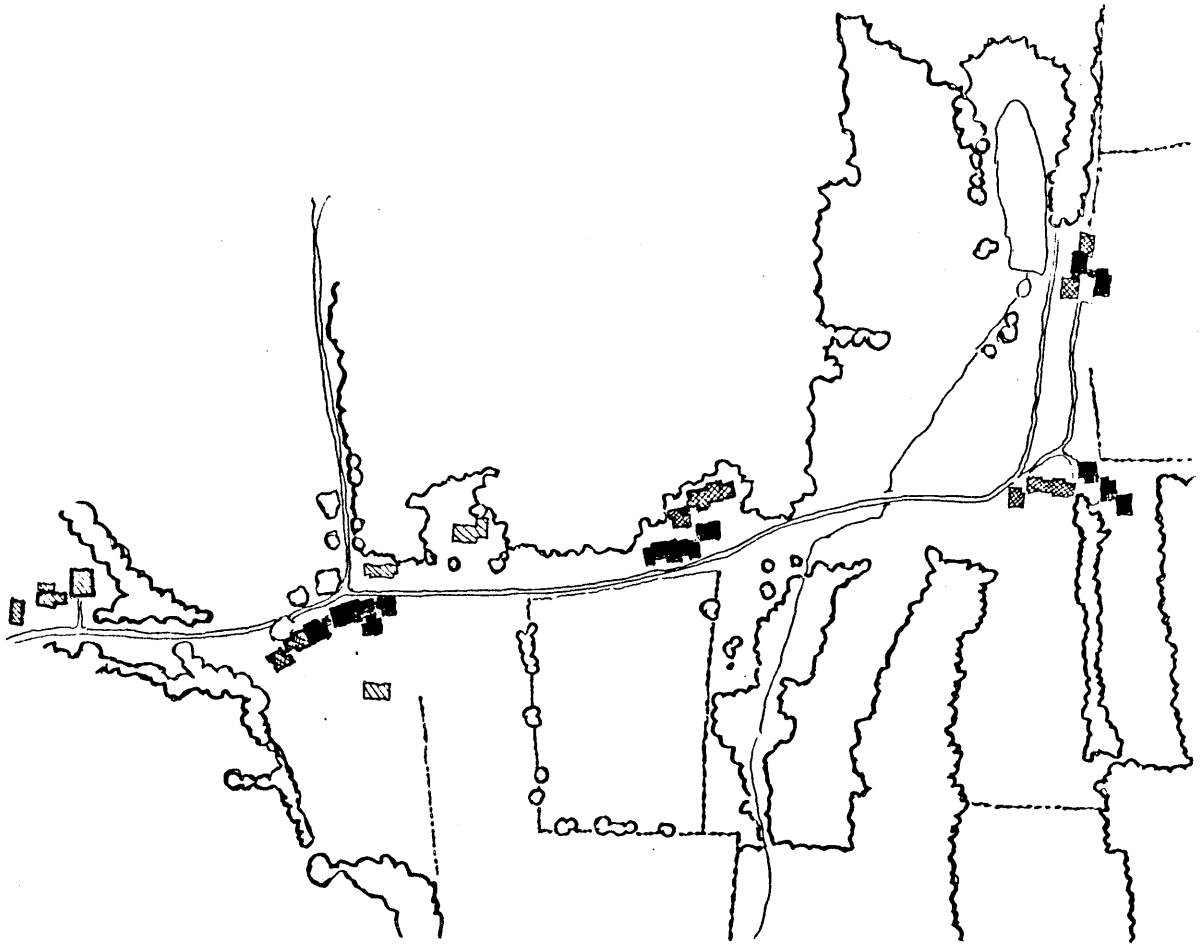
The Connections Can Build into Paths

The dispersed deployment of high density building clusters preserves the land and makes it accessible, but it also establishes a mode of inhabitation that can allow expansion to occur organically at different scales:

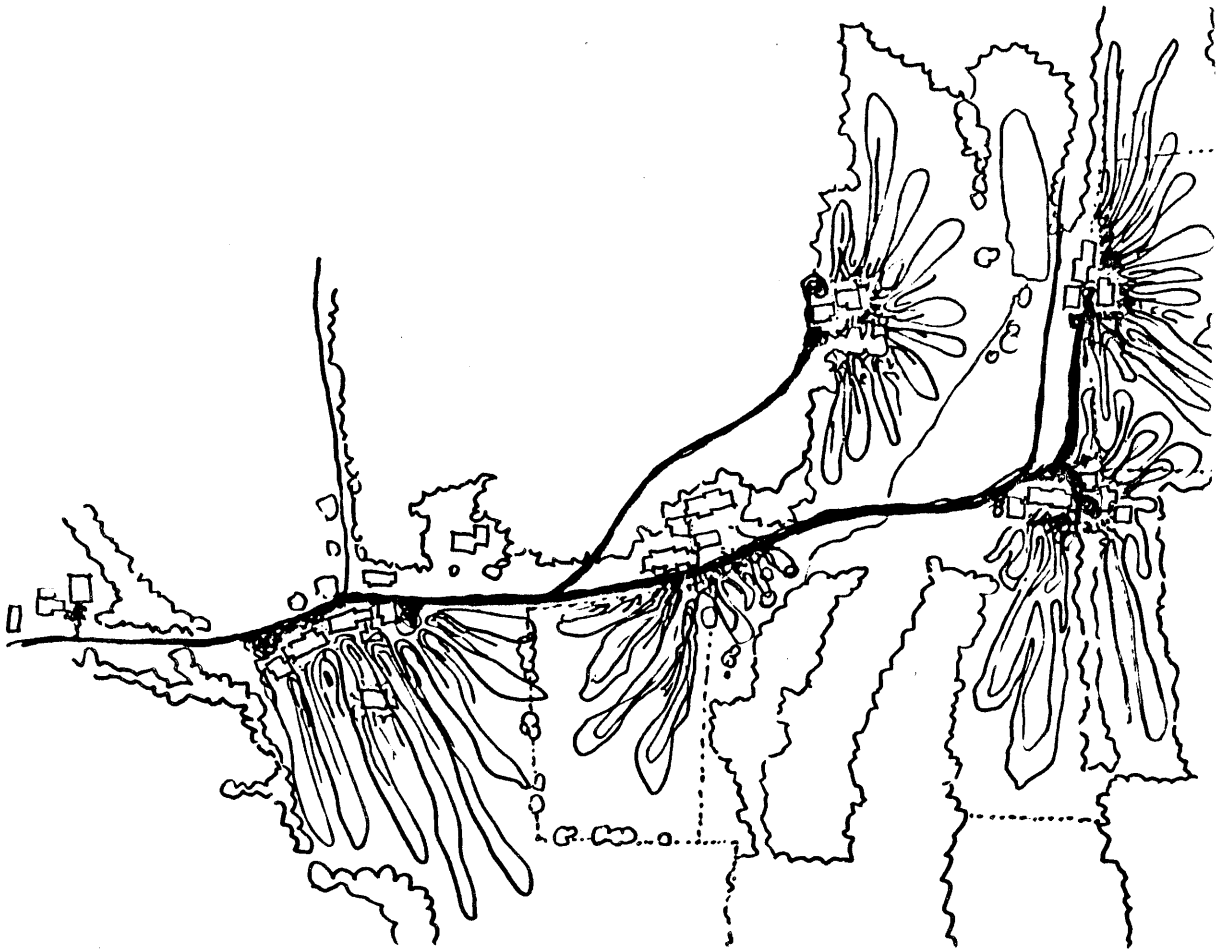
1. Through addition of sheds to the sides of a building.
2. Through addition of intermediary pieces to an existing cluster with internal or external connections to other buildings.
3. Through additions of new clusters.

The environmental and economic ramifications of adding each new cluster are great; there is an incentive to add to clusters at the intermediate or small scale rather than establish new building sites if growth must occur. The original area program for the site can be accommodated within four clusters of varying size, for a total of 44,000 square feet of interior space. By adding sheds and intermediary pieces to these

clusters, it is possible to double the area program, with minimal additional disturbance to the site or loss of amenity to the dweller.



First Accommodation of Programmatic Growth at the Site Level



Site Access Network

Reasons and Ranges of Versatility

This thesis project investigates, explicitly and implicitly ways to expand the range of use that buildings might reasonably accommodate in a particular context and ways to facilitate the utilization of this versatility. The term "range" is critical in discussing and qualifying the concept of versatility, because no building is universally useful and not every use is compatible with a specific context. "Reasonableness" talks of the judgement required to determine the desired potential of an environment for use and meaning, and the formal means used to achieve this potential.

An important area of discretion for designers and developers is the mutual compatibility of site, uses, and program. It would be possible, for example, to deploy deep, atrium-type buildings to satisfy this project's basic building program for offices and dwellings. This type would provide potential to accommodate very large, continuous uses, but seems inappropriate for the chosen site and its culture.

The building type developed during the course of this project seems workable within its context for the following reasons:

1. Constructive, spatial, and visual associations with established New England framed building types.
2. Flexibilities of scale inherent in the type at the level of the building.
3. Ease with which buildings can be fitted to varying topographic and vegetative conditions.

Reference was made in the Introduction to the symbiotic relationship between building and inhabitant; a building which serves its diverse inhabitants well over the years may receive the care required for it to last and continue to serve. Lewis Mumford places this observation in a larger context when he says that "Beauty is justified because

it has 'survival value.' The fact that houses which bear the living imprint of the mind are irreplaceable is what prevents them from being quickly and callously replaced." I hesitate to elaborate on Mumford's succinct statement, other than to liken architectural beauty to some large and multi-faceted gem. A building's continuing fitness for use is one face of this stone, a face sometimes hidden from obvious view, but one which, upon closer observation, is seen to be as important to the whole as any other.

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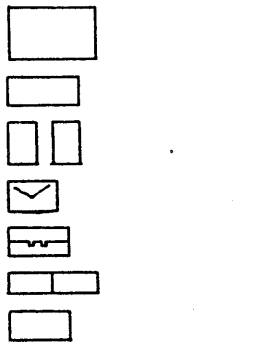
APPENDIX A

Domestic Furniture, Activity Settings.

TYPICAL FURNISHINGS



dining table 30" x 40"

coffee table 18" x 48"

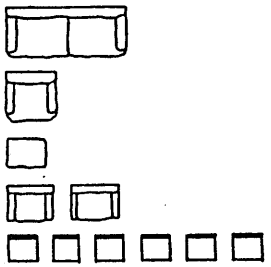
end table 18" x 30"

TV 20" x 32"

cabinet 18" x 42"

shelves 14" x 30"

desk 20" x 42"



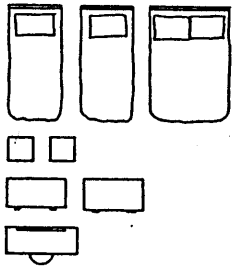
couch 36" x 82"

easy chair 34" x 36"

footstool 18" x 22"

armchair 24" x 29"

side chair 18" x 18"

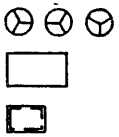


vanity 18" x 48"

bureau 20" x 42"

single bed 39" x 82"

double bed 54" x 82"

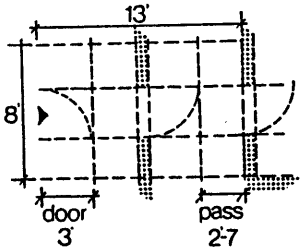


lamp 20" diameter

plant stand, etc. 24" x 42"

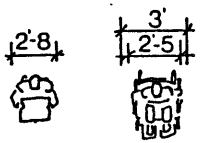
TV tray 18" x 24"

INTEGRAL SETTINGS



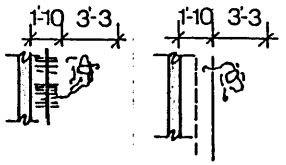
e

ENTRY



p with TRAY

p in WHEELCHAIR



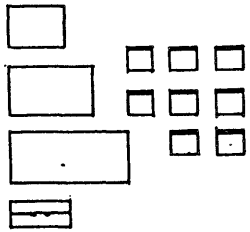
st in CLOSET

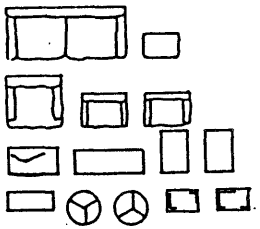
st on SHELVES

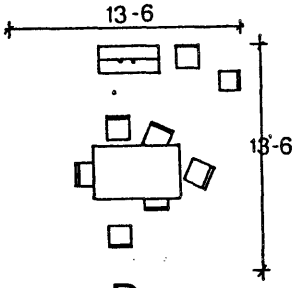
PASSAGE

STORAGE

PRIMARY SETTINGS







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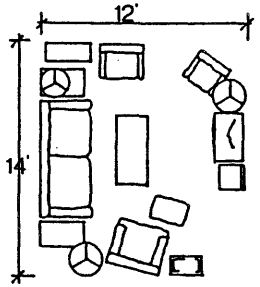
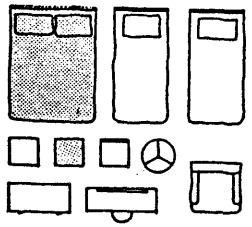
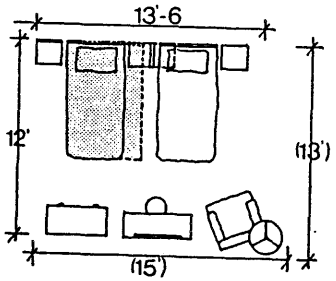


L

FORMAL DINING

LOUNGE/ENTERTAIN





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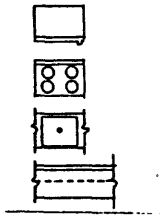
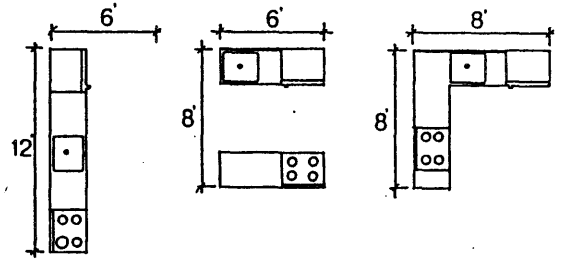
SLEEP/DRESS

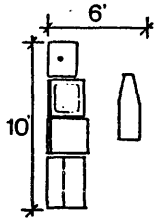




fp

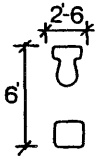
FOOD PREPARATION

SECONDARY SETTINGS



u

UTILITY



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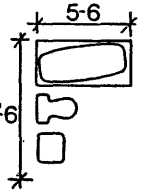
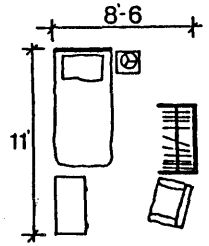
TOILET



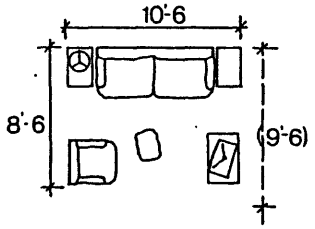
b

BATH



1sd

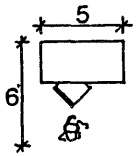
SINGLE SLEEP/DRESS



sL

SMALL LOUNGE

SECONDARY & COMBINED SETTINGS



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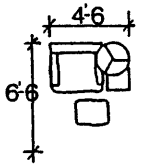
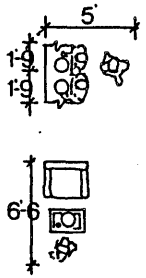
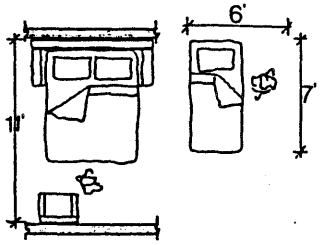


t

TASK OPTIONS



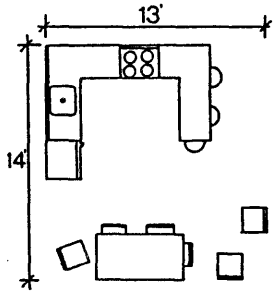
iD



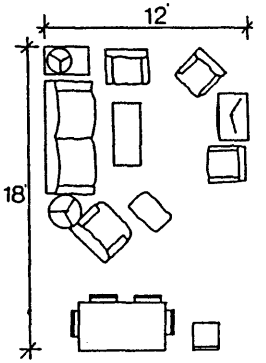
g

INFORMAL DINING

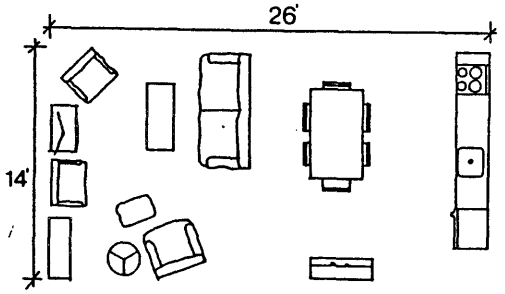
GUEST OPTIONS



fp-D



L-D



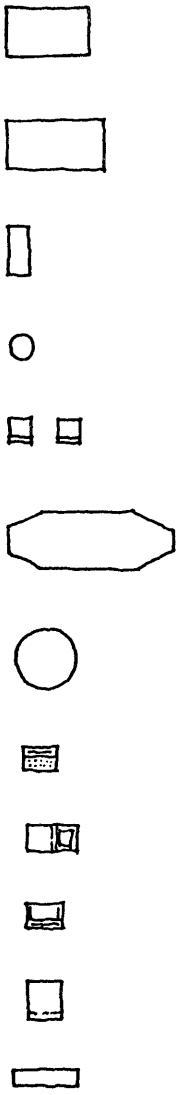
fp-D-L

FOOD PREPARATION - DINING - LOUNGE OPTIONS

APPENDIX B

Office Furniture, Activity Settings.

OFFICE FURNISHINGS, EQUIPMENT



SMALL DESK OR TABLE 30" x 60"

LARGER DESK 36" x 72"

FILE CABINET 18" x 36"

STOOL 13" DIAM.

SWIVEL CHAIR 18 x 20"

CONFERENCE TABLE 120" x 42"

ROUND CONF. 48" DIAM

TYPEWRITER 20" x 16"

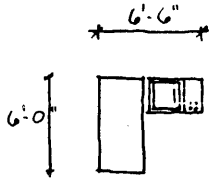
XEROX MACHINE 36" x 24"

CRT SCREEN 24" x 18"

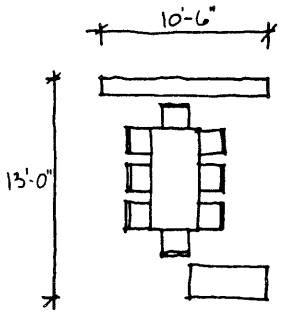
CPU, DISC DRIVE 30" x 36"

SHELVES 12" x 48"

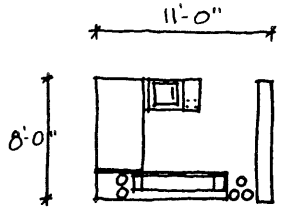
OFFICE SETTINGS



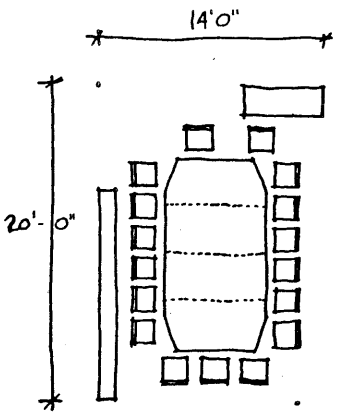
MINIMUM COPY SETTING



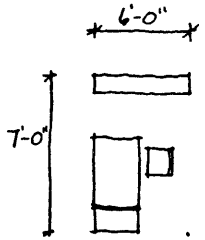
SMALL CONFERENCE



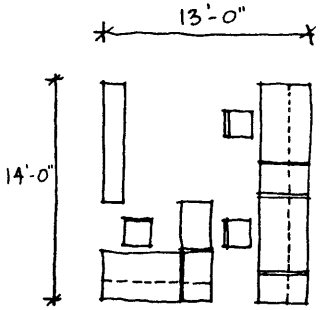
COPY, BLUEPRINT SETTNG



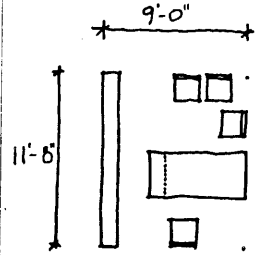
CONFERENCE FOR 20 PERSONS



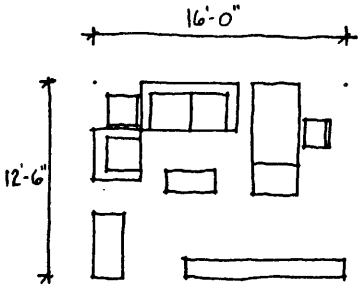
MINIMAL WORK SPACE



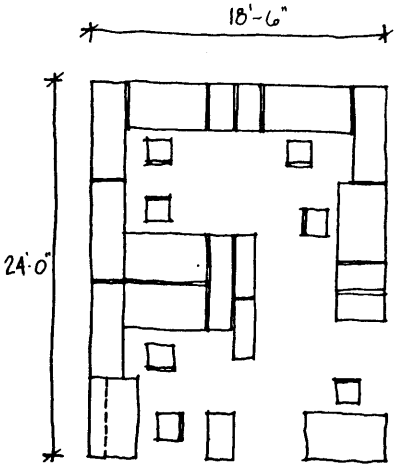
OFFICE FOR 3 PERSONS



SMALL OFFICE



LARGE OFFICE



OFFICE FOR 7 PERSONS