

A DEVELOPMENT OF A SPATIAL PROTOTYPE
RELATED TO BUILDING A HIGH DENSITY URBAN FORM

SANFORD BOND
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ABSTRACT

It has been observed that the form of most American cities is the result of the use of a single inappropriate prototype applied uniformly over the urban area to create many of the problems which currently beset our cities. This thesis develops another prototype which may be used to develop other organizations than the one now employed. Typical urban conditions are analyzed in terms of the projected prototype to demonstrate how it may be applied within the existing organizations to produce local changes. Building methods are discussed to investigate how one may actually build the projected prototype.

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CORRIDOR/CELL PROTOTYPE

DIRECTION

CONCAVITY

EDGES

ENTRANCES

PLAZAS

INTERSECTIONS

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GROUND REFERENCE

BUILDING METHODS

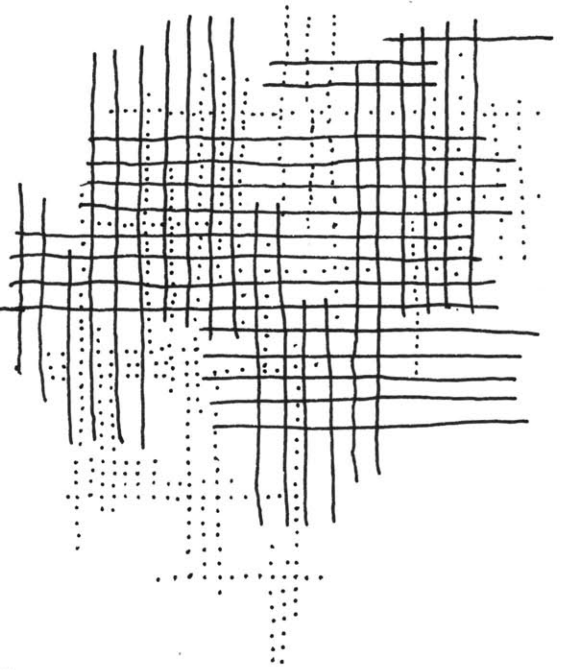
CONTINUOUS SURFACE

LINEAR ASSEMBLAGES

PLANAR ASSEMBLAGES

CAPSULES

The form of existing American cities is partly due to the use of a single prototype, applied to produce a hierarchic organization which increases as the city gets denser. The only way to increase the density is to extend the hierarchic sequence which has a disastrous effect on urban space. Towers, adding more people to the same area of ground by new vertical corridors--elevators--cause congestion, noise, and dirt on the existing streets. The solution is to add more circulation space to accomodate more people; a new scale is added but the quality remains the same or is decreased because the hierarchic sequence remains the same. It is essential to the future of the cities that the existing hierarchy be broken and new methods of organization be employed. The following is a projection of a new organization, an explanation of the principles behind it, how it may be applied to



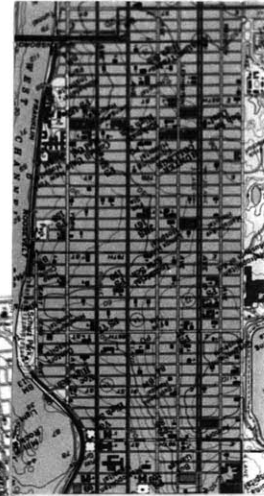
NEW YORK ~
A CONGESTED CITY



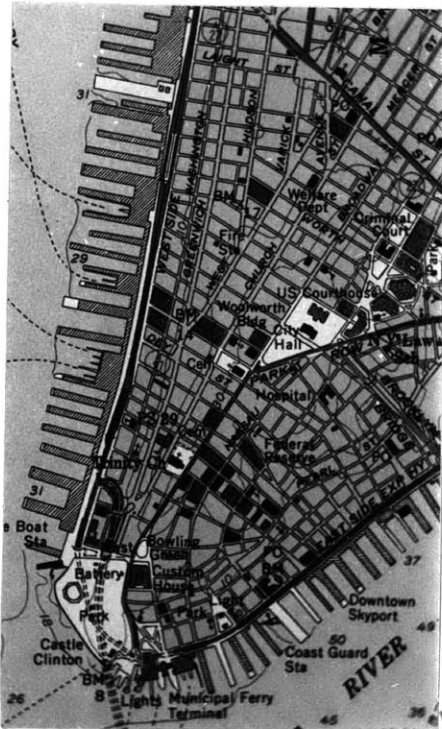
VANCOUVER, B.C.

THE ORTHOGONAL GRID
STRETCHES ACROSS THE
CONTINENT FROM EAST
COAST TO WEST COAST.

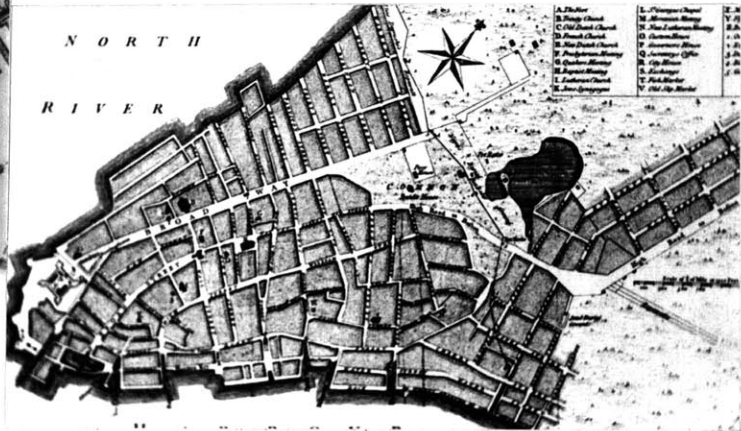
UPPER EAST SIDE
MANHATTEN



SAN FRANCISCO

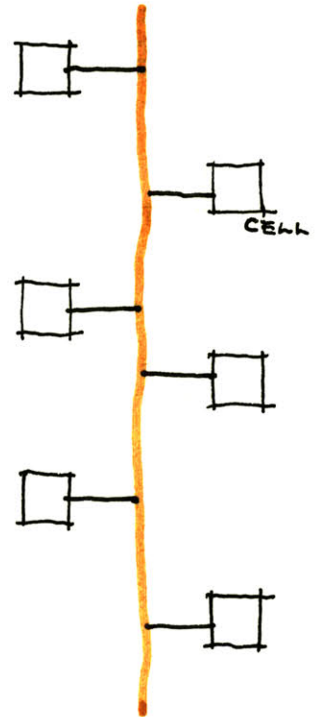


LOWER
NEW YORK
NOW AND
THEN
(1763)



existing situations, and how it may be built.

In the current tradition of urban design, space is categorized into two elements--the use cell and the movement corridor. These two categories form the absolute minimal way space can be organized--the cell is the minimum form of a place to be, and the corridor is the minimum form through which one may move. Once this separation into categories is made each is considered as isolated from the other. The cell is thought to be a complete unit capable of existing only by itself, with a minimum contact on the corridor. It is designed to operate very efficiently as a unit for a specific use. Since it is considered to be independent of everything external, its edge is minimized to completely enclose the use space as efficiently as possible. The movement area is considered to be a separate element whose only function



is to service the cell. It is thought to be a non-use; therefore the edges are minimized and the corridor is made as straight as possible to facilitate the flow of movement. The contact of the cell on the corridor is only large enough to allow efficient servicing and to pack as many along the corridor as possible.

In general the key concepts to the negative qualities of the cell/corridor prototype are¹:

- .use-circulation duality
- .optimization of the independent parameters
- .isolation of the use cells and a one to one association of a specific use with a specific cell.

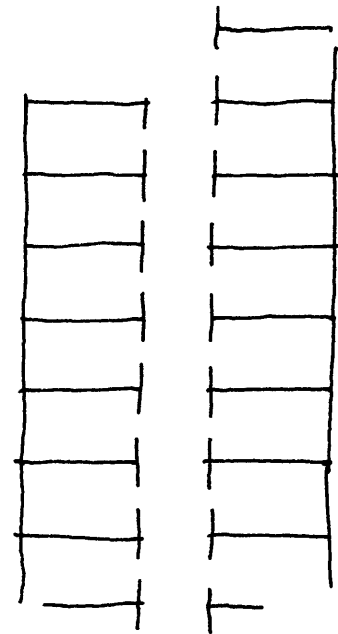
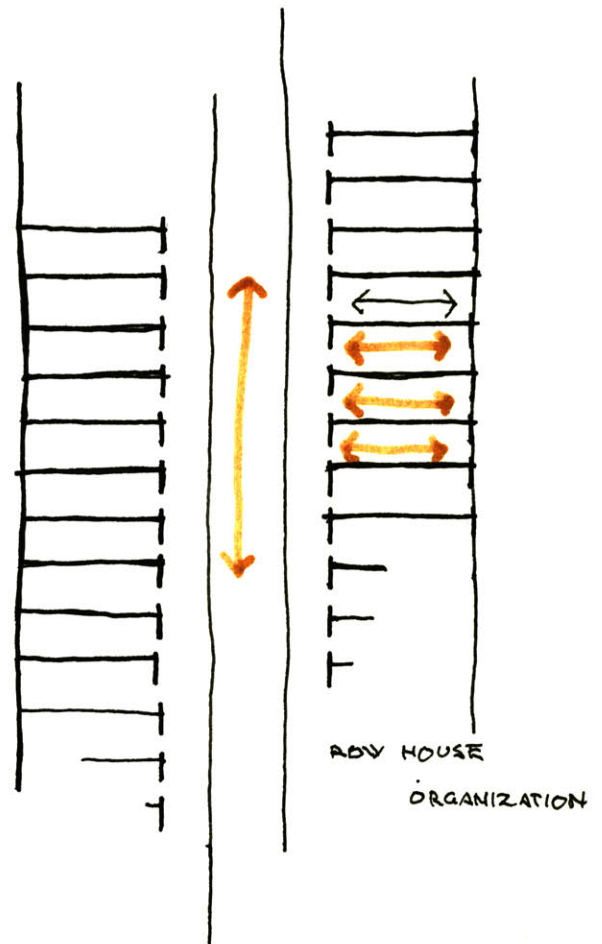


DIAGRAM OF
CORRIDOR/CELL
PROTOTYPE

1. Alfred F. Sanford III, Some Formal Topics Related to The Architecture of Developing Suburban and Low Density Urban Areas. M.I.T. B.Arch. Thesis, 1969. p.16.

- .independence of corridor lines
- .completeness of built definition
- causing - cellularity
 - packing
 - uniformity

The cell corridor prototype and the desire to pack unrelated cells along a corridor result in the common form or organization we see in the cities today. The cells are generally organized perpendicular to the movement space--either vertically or horizontally. An important physical feature of this perpendicular organization is that major built definitions run perpendicular to the major reference direction. The row house is a well known example of this type of organization. The row house is quite separate from the street, lacks privacy, often must have special service roads behind it, and has practically useless backyards with little privacy.²

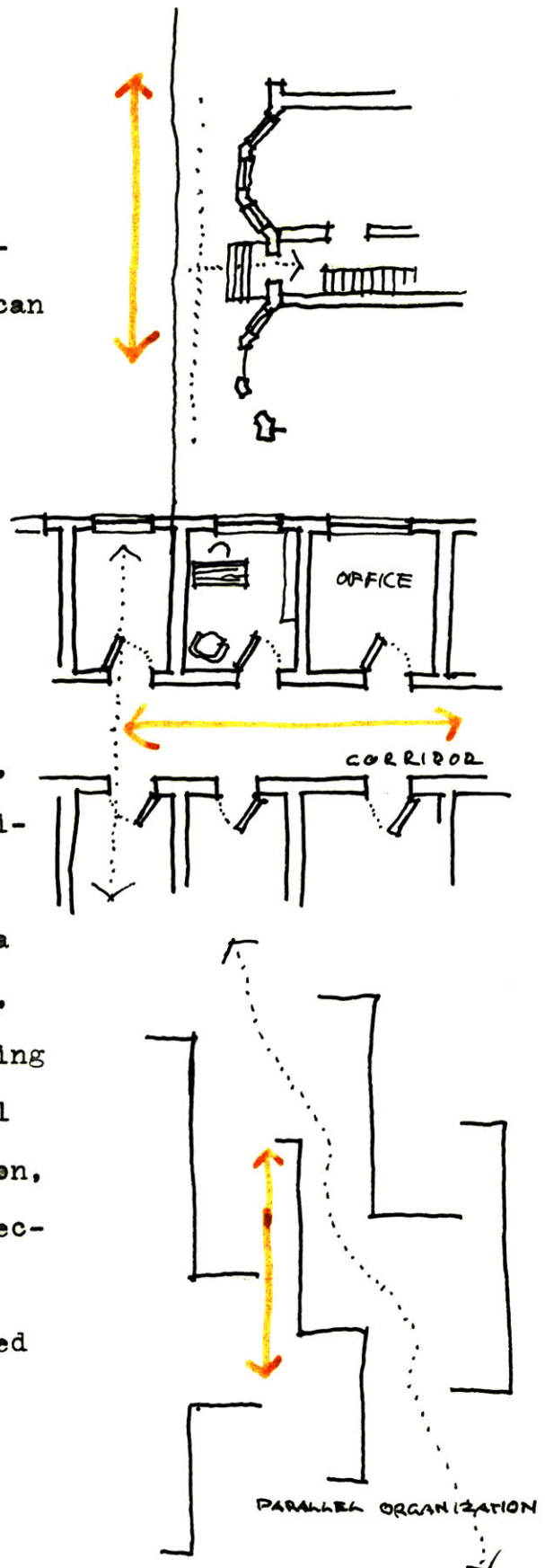


2. Ibid., p. 22.

Generally the characteristics of the perpendicular organization are:

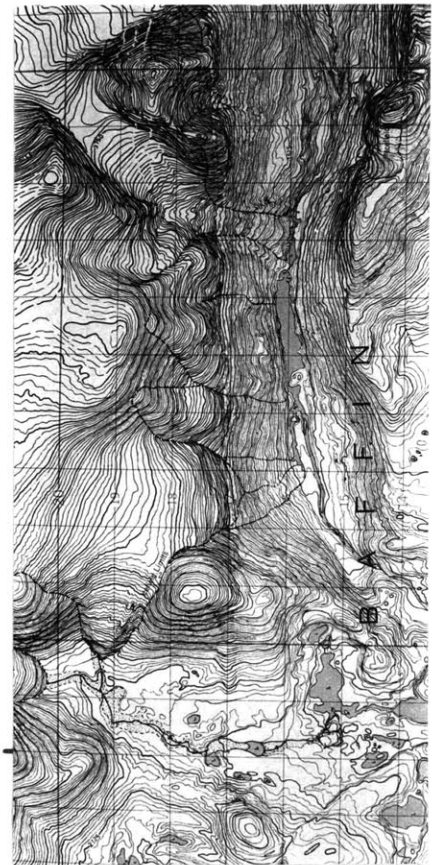
- .distinct separation between use cell and corridor eliminating the possibility of double use.
- .limited growth possibilities - due to packing situation one can only add more of the same.
- .privacy is difficult and expensive - privacy by built definition is often more economical in the city than privacy through distance.

To avoid these characteristics, one might build partial or open definitions not completely filling the space and allowing the movement area to be used along with the use cells, which in turn could be used for moving through. The major definitions will be built to run in the same direction, parallel, as the major reference direction defined by the movement. New spatial prototypes might be developed through this parallel organization.

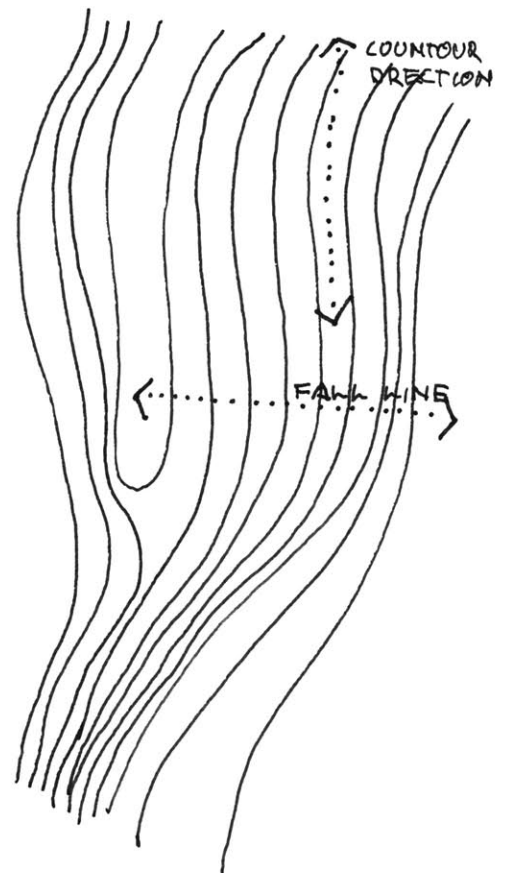


DIRECTION:

A key concept to understanding physical form, which must exist in a context and respond to forces and influences around it, is direction. It is a quality which may be ascribed to any physical form and it is intimately associated with change and growth. If one looks at a contour map of a ground surface which changes elevation, two directions are apparent--one along the contours and one perpendicular to the contours, the fall line. The contour line is a line of constant elevation. Every point on the contour line is the same vertical distance from any point on another contour line. In order to change elevation slowly and easily one moves closely parallel to the contour lines. The fall line represents the path of maximum elevation change. It is perpendicular to the contour lines and every point on the fall line is at a different elevation. A stream tends to follow the fall line, the



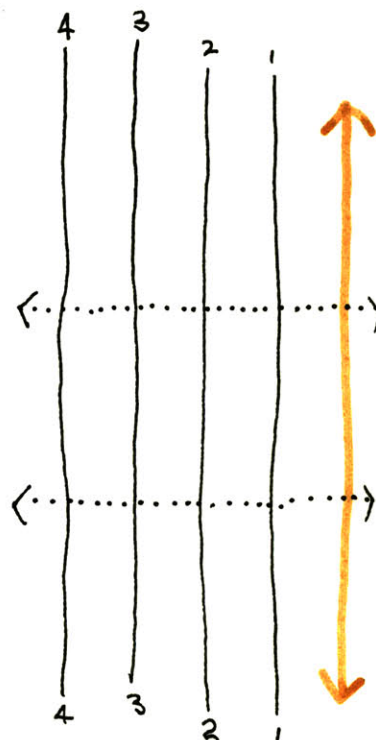
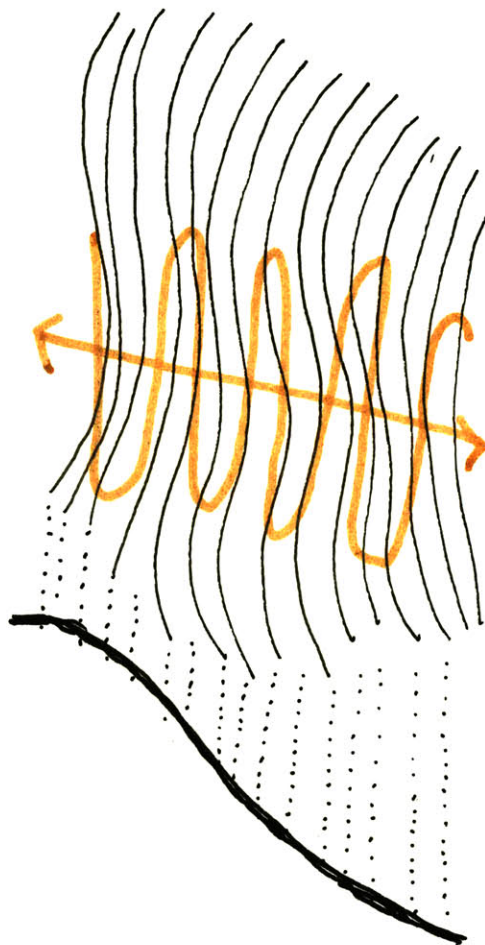
NORTHWEST TERRITORY
CANADA



path of least resistance.

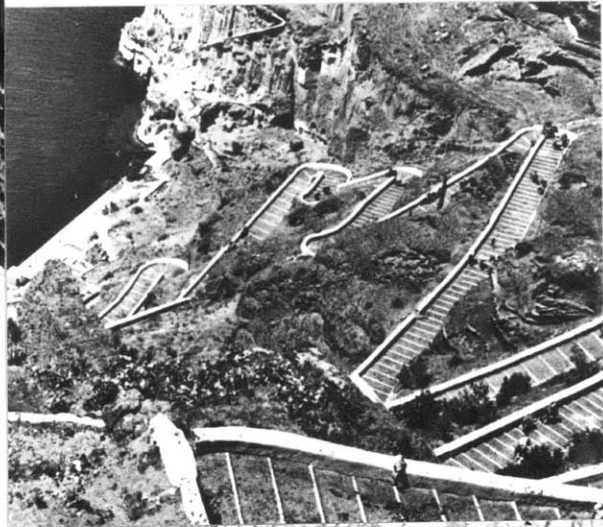
Clearly movement paths changing elevation will tend to move in close association to the contour lines if the slope is too steep to negotiate safely. A road zig-zags up a mountain traversing the slope with hairpin turns to stay in close proximity to the contours. The local direction of travel is roughly parallel to the contours, but the major direction is along the fall line up the slope. Some roads may spiral up around a small isolated hill or peak for the same reasons.

Direction is the only attribute of a line. It describes how the line runs relative to something else, or a movement relative to the line. A movement parallel to the line is one which does not change relative to the line, and the opposite is a movement in a direction perpendicular to the line which has



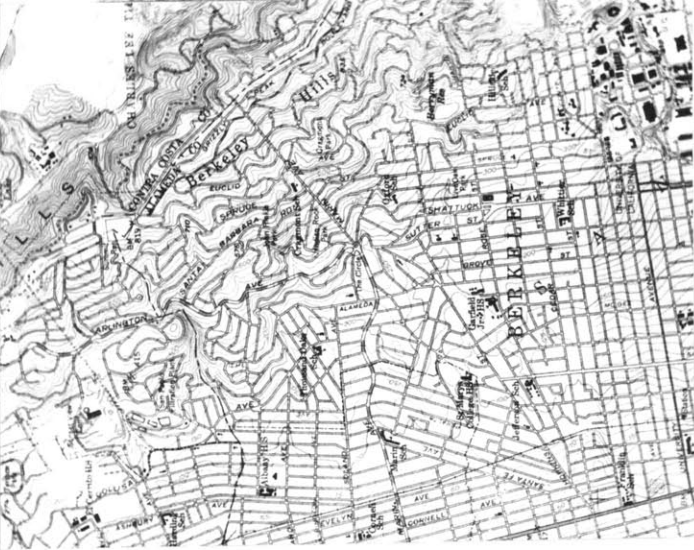
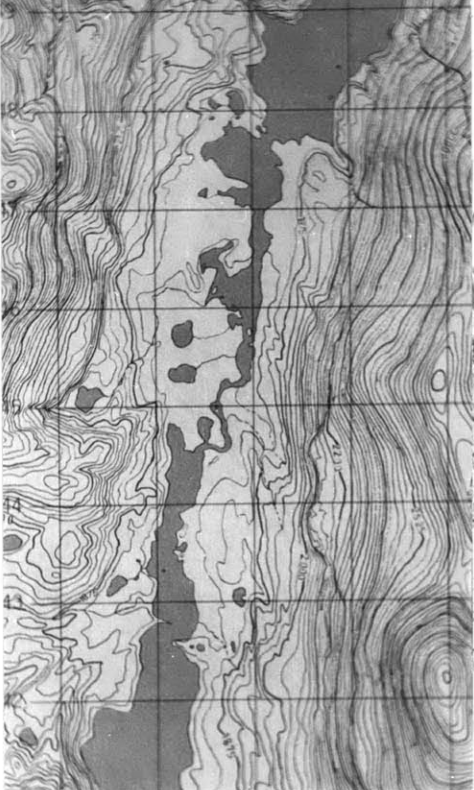


BURMA ROAD



CREEK ROAD

CLOSE ASSOCIATION OF PARALLEL DIRECTIONS N. V. TERRITORY



DIRECTIONAL ASSOCIATION OF STREETS AND HILLS IN BERKELEY, CALIF.

the maximum change relative to the line. In coastal towns major roads frequently run parallel to the coast, the major influence in the region, and do not change their relationship to it having a constant association. Any change in direction is usually due to a change in the direction of the coast. The roads perpendicular to the coast are constantly changing relative to the major influence in the region, and get inland to a new condition as quickly as possible, rapidly changing association to the coast.

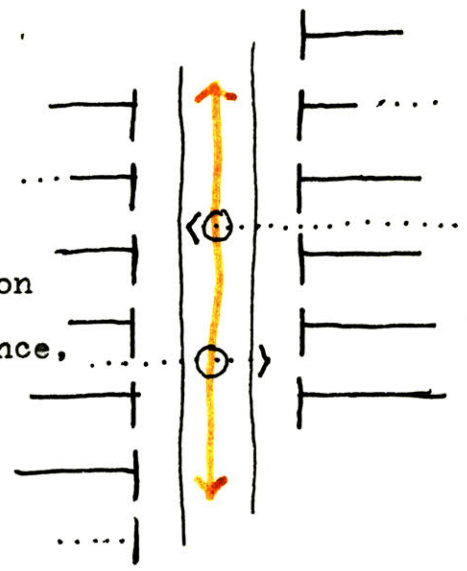
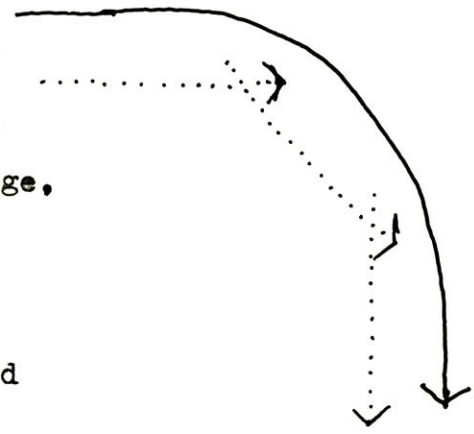
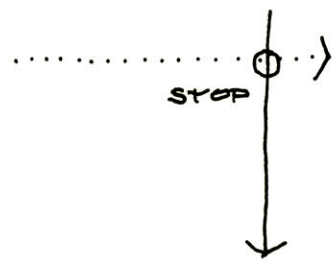
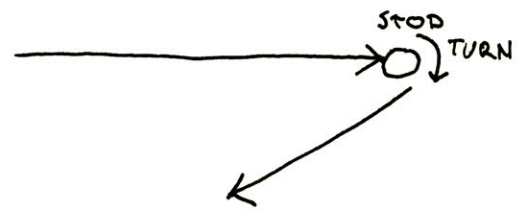
Generally one may say that a direction parallel to a given directional reference is closely associated with it because it does not change its relationship to the reference abruptly. Physically the lack of change aids orientation if one is changing other spatial references. A direction perpendicular to a given



NEWPORT

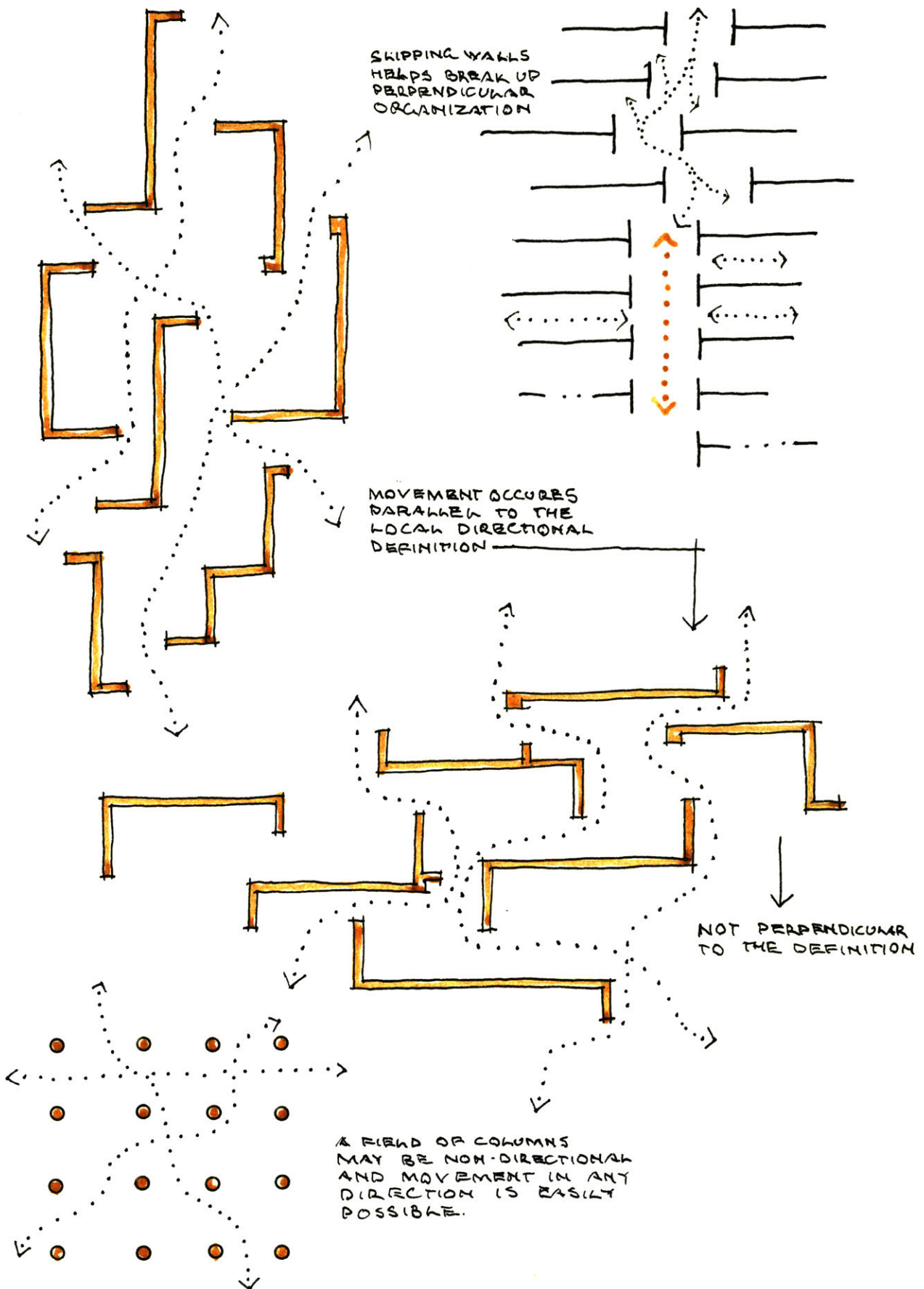
directional reference is constantly changing and has little association with the reference. An abrupt change at the point of intersection is often very disorienting and tends to have an isolating effect separating the two directional organizations. A person making a 90° direction change while moving has to completely stop all motion, turn in the new direction and resume moving. The two directions of motion are separated by a completely different action, turning. In order to avoid the separation one may turn while moving and make a gradual change, which has a characteristics of both.

The perpendicular organization previously described is characterized by the abrupt direction change, ensuing qualities of isolation, and separation of cell from corridor. Applying the directional principles just stated, one can align the major built definitions in the same direction as the street, the directional reference,



and to a great extent eliminate the directional change causing isolation. By bending the street or movement flow from side to side, and up and down, one could enter the use area with no change from the movement direction. Obviously if the street turns the directional reference changes and so would the built definition to remain parallel. The places where the different directions of built definition come together would produce a great many different spatial definitions increasing the variety of the built form in the total field of organization, the city. Of course, it is possible to make isolated cellular definitions in a parallel organization just as uniformly as in a perpendicular field, but the disorienting effect of an abrupt direction change is eliminated as one changes from one kind of space to another (as public to private). Other characteristics of the parallel organization include privacy in

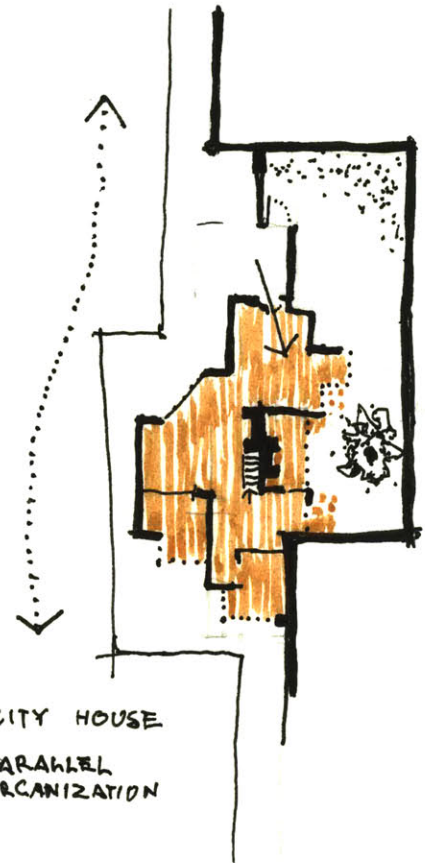




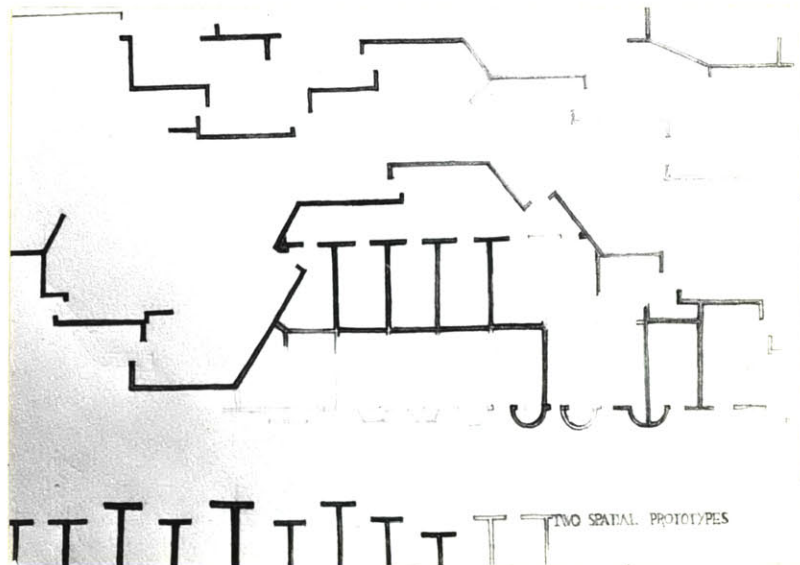
a dense region and a more economical use of space since the use space and corridor are capable of expanding into each other as needs change.



VIEW ALONG A PARALLEL ORGANIZATIONAL FIELD



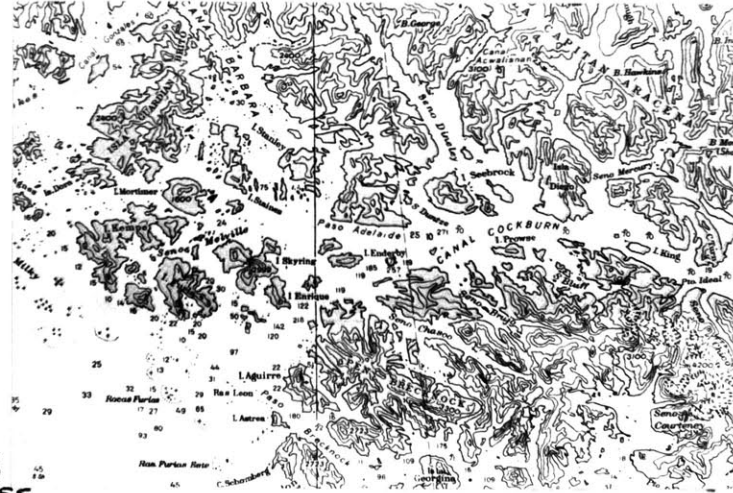
CITY HOUSE
PARALLEL
ORGANIZATION



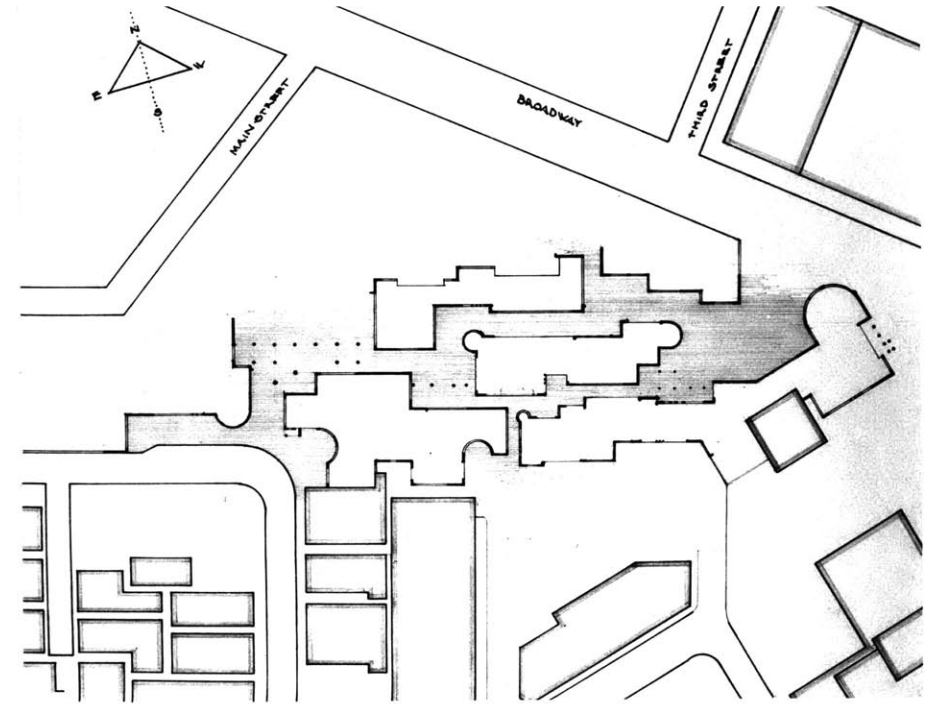
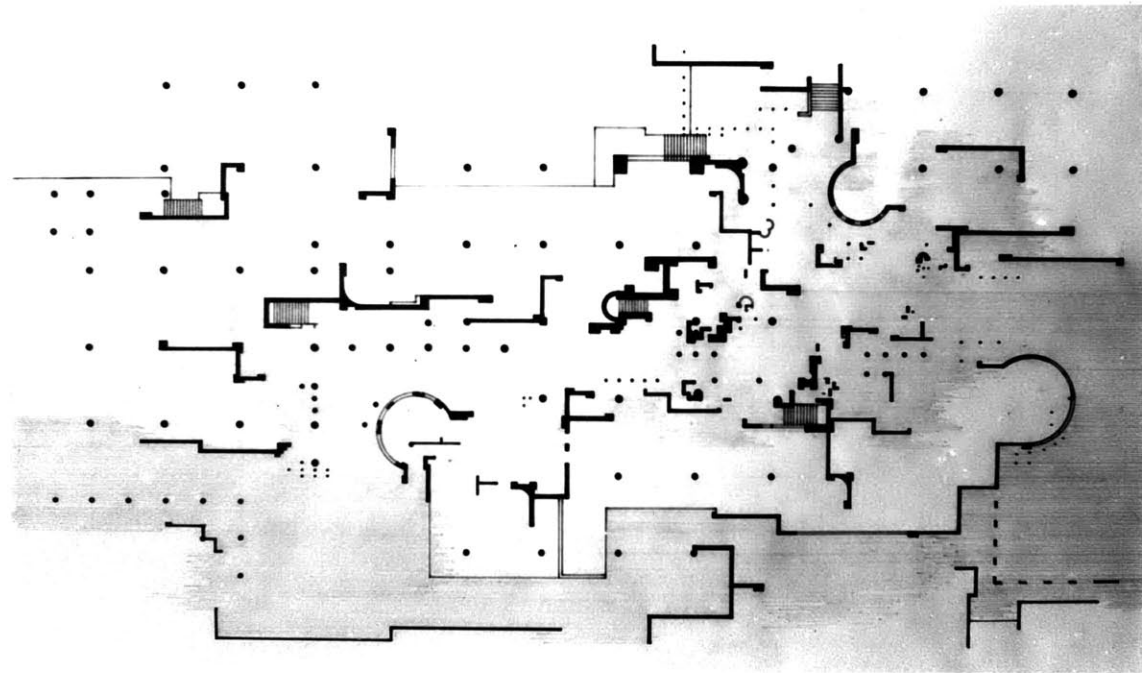
FROM: ALFRED P. SANFORD III
M.I.T. B. ARCH. THESIS 1969
P. 18

SHOWS INTERESTING SPATIAL CONDITIONS RESULTING FROM MEETING OF TWO ORGANIZATIONAL PROTOTYPES.

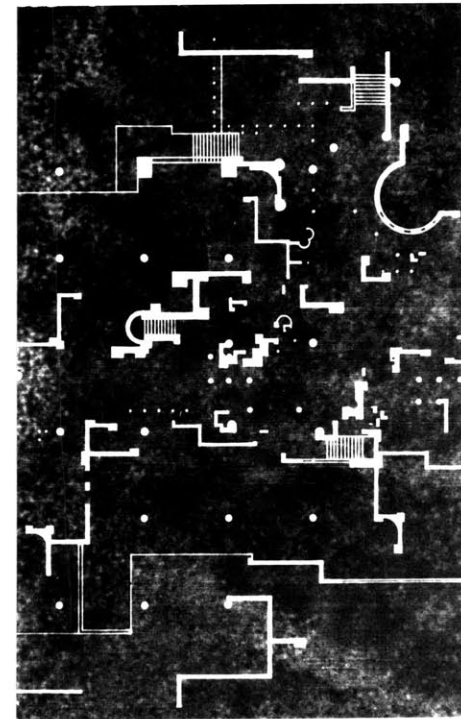
A PARALLEL, THICK-EDGED ORGANIZATION
FROM SOUTH AMERICA:
TERRA DEL FUEGO

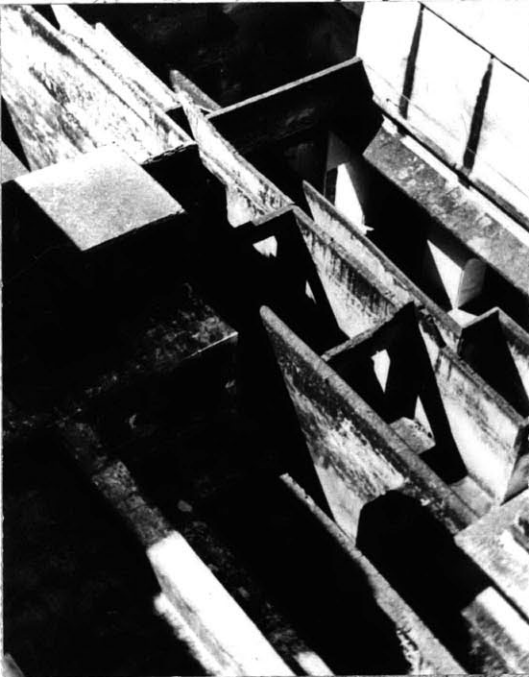
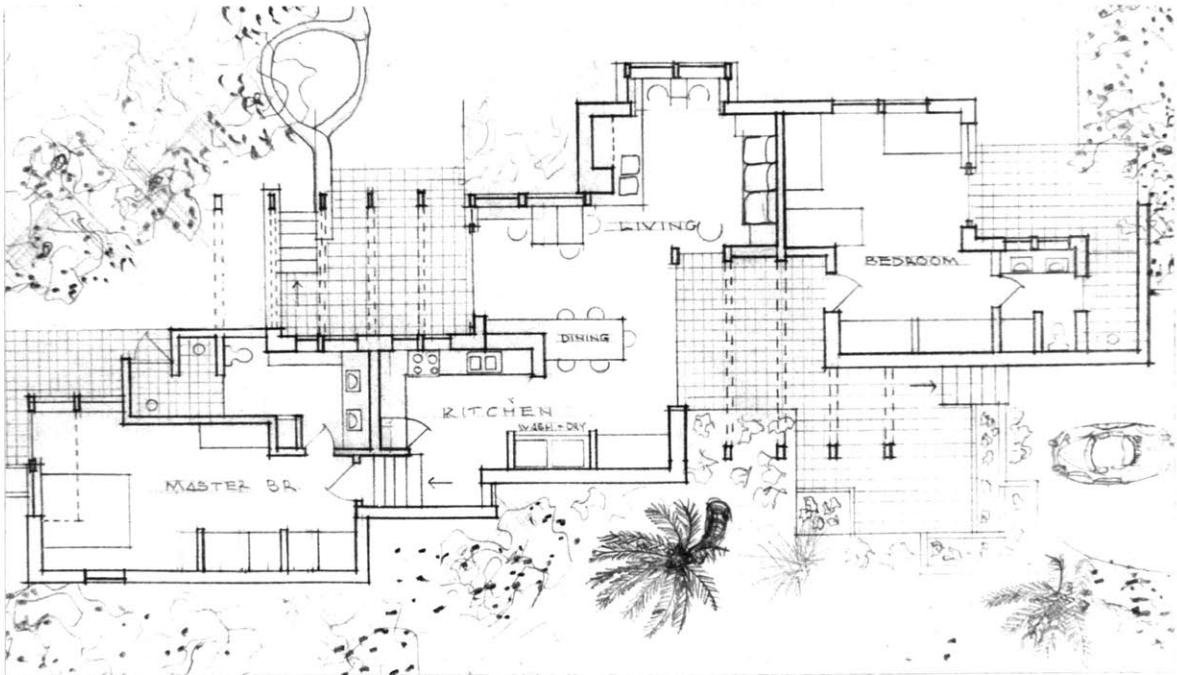


A PROJECTED PARALLEL
PEDESTRIAN/COMMERCIAL
STREET ORGANIZATION/LANDSCAPE;
KENDALL SQUARE, CAMBRIDGE, MASS.
A FIELD OF PERMANENT PARTIAL DEFINITIONS,
BUILDING UP A THICK EDGE OF INTERACTION
BETWEEN PUBLIC/PRIVATE; "USE"/CIRCULATION;
OUTSIDE/INSIDE...

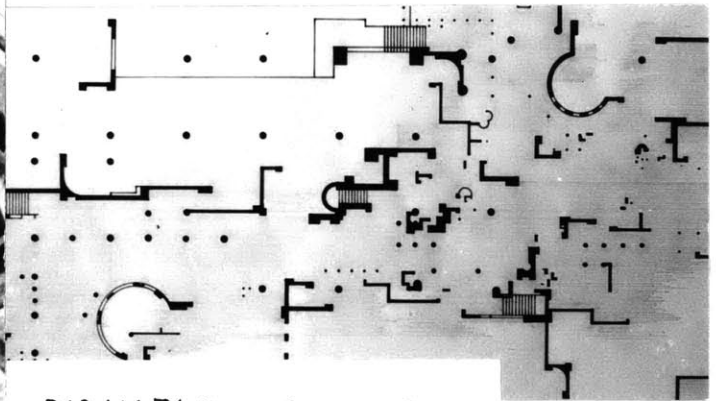


GENERAL SITE PLAN,
SHOWING PARALLEL
STREET ORGANIZATION





- PROJECT: ISLAND HOUSE
- MAJOR DEFINITIONS PARALLEL TO MOVEMENT AND ORGANIZATION
 - PARALLEL ENTRANCE



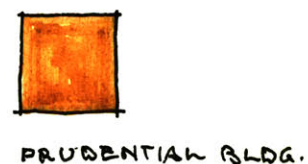
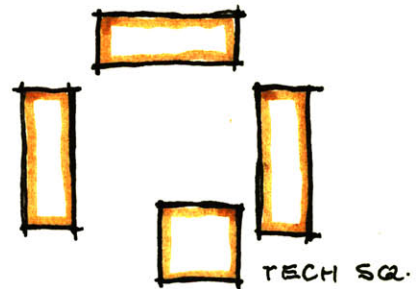
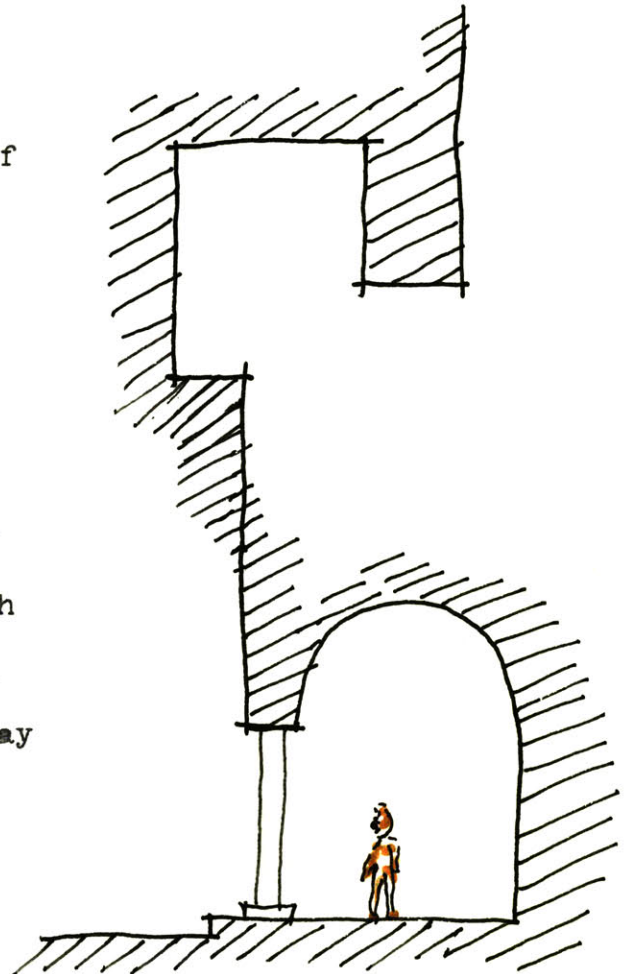
PARALLEL WALLS: INDIA

A PARALLEL FIELD IN B.C. CANADA

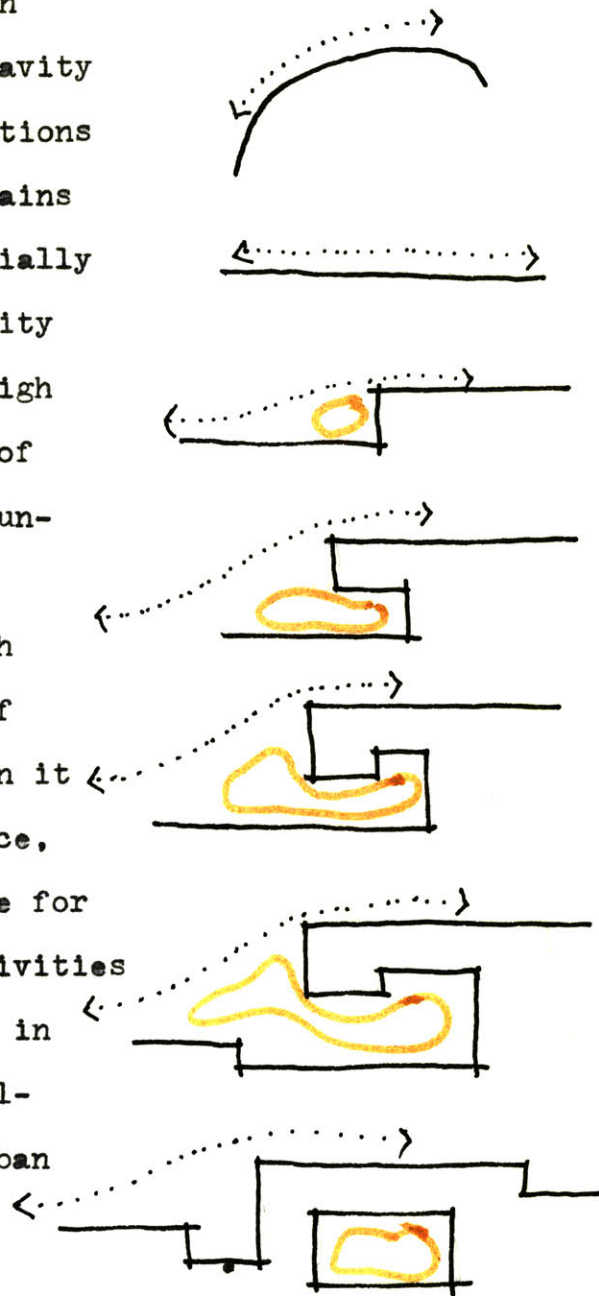


CONCAVITY:

Related to the application of some of the ideas projected for building an urban form is the notion of concavity. A concave definition is one that partially encloses space, either in plan, section, or both. The quality of closure is usually associated with interior use spaces, and not with exterior spaces. In the city today the exterior spaces are usually defined by convex edges as Tech Square is. This is a result of considering buildings as isolated cells unrelated to each other or to the exterior. In order to make useful exterior spaces it is necessary to build concave definitions on the exterior edges of building exterior spaces with interior qualities. The concave definition makes a space which cannot be used for moving through and lends itself to other



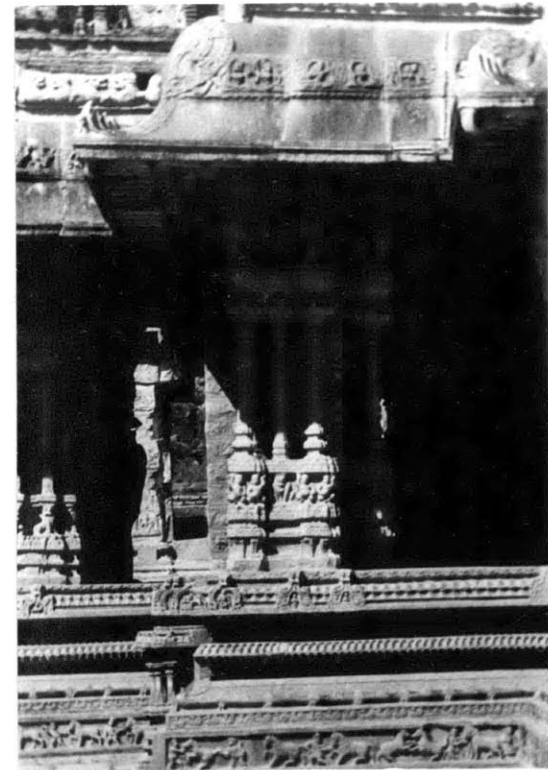
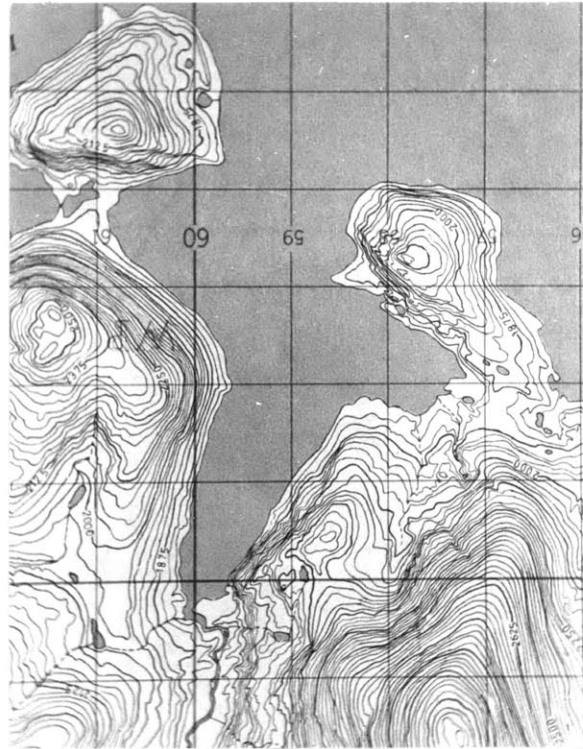
activities which could make up an urban life. This notion of concavity can be extended to making definitions on any scale as valleys in mountains or low density urban areas, partially enclosed by a ridge of high density building. Of course any large high density region will be composed of smaller definitions such as a mountain has rocks and trees on it. A local concavity associated with a movement flow makes a region of space next to the flow but not in it which might be used as an entrance, as a site for a house, as a place for a sidewalk cafe, etc. These activities and places are generally lacking in our urban environment today. Following is a series of typical urban conditions and different ways of dealing with them.



FORMATION OF CONCAVITY FROM A CONVEX EDGE TO A TOTAL ENCLOSURE



THE ISOLATION OF COLD AIR POCKETS

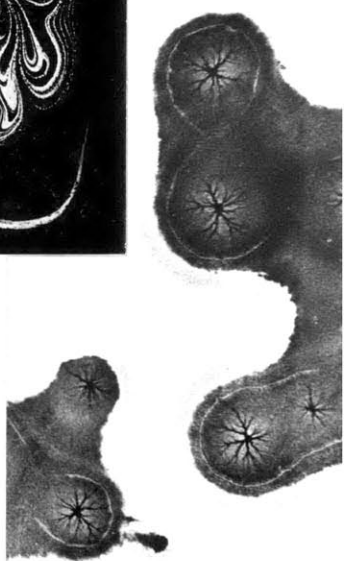


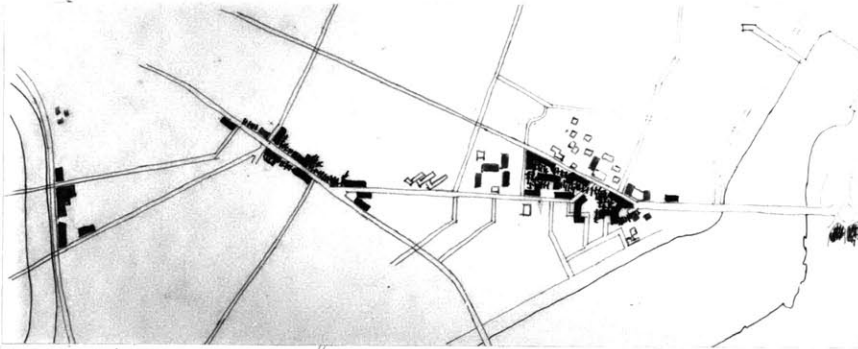
CONCAVITIES

CONCAVE DEFINITIONS
OCCUR NATURALLY
AT ALMOST EVERY
SCALE



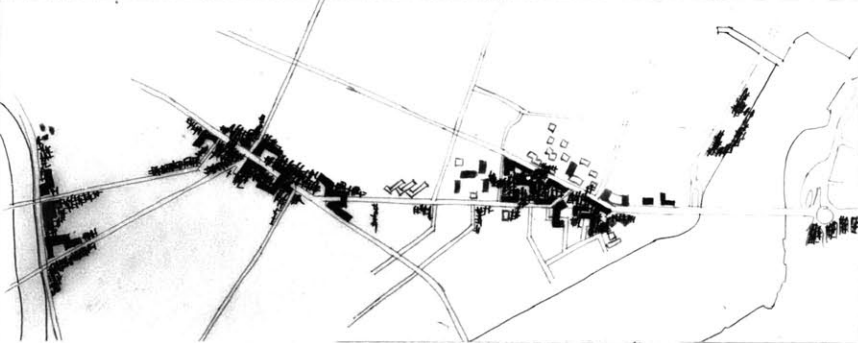
A BUILT CONCAVITY
IN INDIA





A PROJECTED
URBAN GROWTH
PATTERN IN
CAMBRIDGE

BLACK REPRESENTS
A BUILT UP HIGH
DENSITY RIDGE
THAT ENCLOSES
CAMBRIDGE PORT -
A LOW DENSITY
RESIDENTIAL AREA.





NOTION OF CONCAVITY
USED ON A LARGE
URBAN SCALE.



HIGH DENSITY RIDGE
USED TO GIVE
IDENTITY TO AN
AREA, HELPS
DEFINE CAMBRIDGE-
PORT AS A PLACE
DEFINED (ENCLOSED)
BY A MOUNTAIN AND
A RIVER.

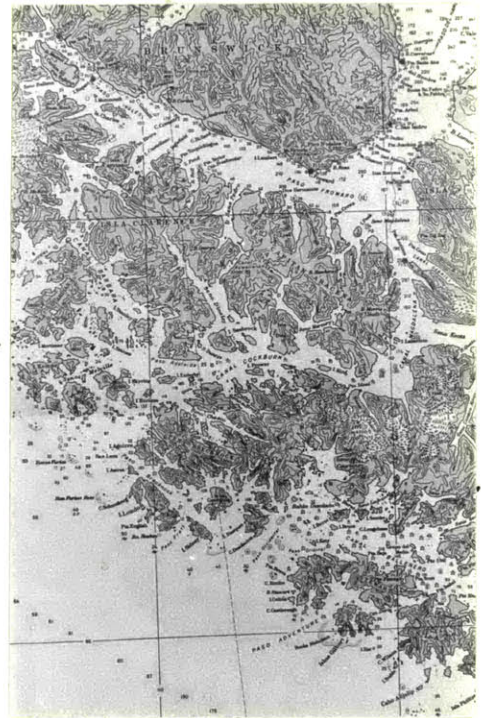


 SMALL PIECE BUILT UP
 LARGE PIECE BUILT UP

EDGES

An edge is a place where one thing stops and another begins. The following discussion will specifically deal with street edges, but the principles are the same for dealing with almost any built edge. A straight "hard" impermeable edge is a great discontinuity and separator because it minimizes the use potential at the very place where the potential is greatest - the place where two regions meet. If the edge is allowed to move around making concavities in each side, new places begin to occur with characteristics of both sides. Also the actual line of contact which is often considered valuable is increased. Natural edges always seem to be the latter type (straight lines never occur in nature), and our built edges in the city usually seem to be of the former type.

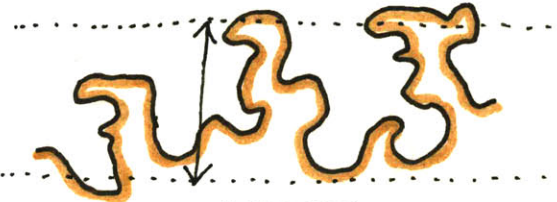
Street space in the city is normally composed of three regions - the



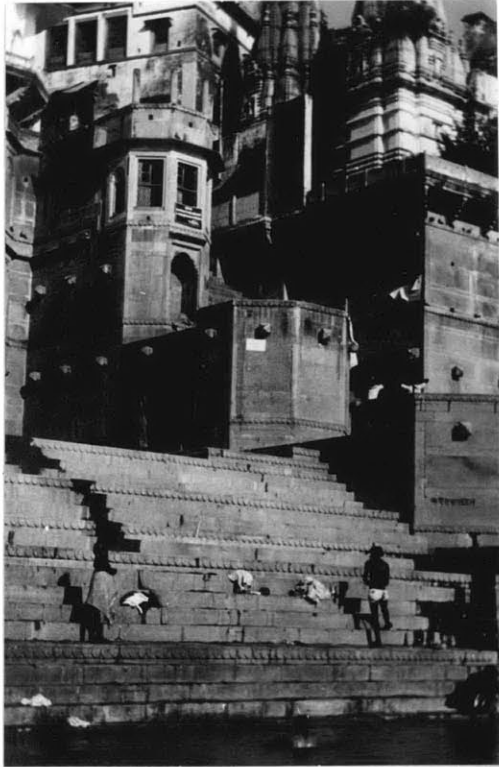
A NATURAL EDGE
A MULTI-DIRECTIONAL
FIELD ORGANIZED
IN A MAJOR DIRECTION



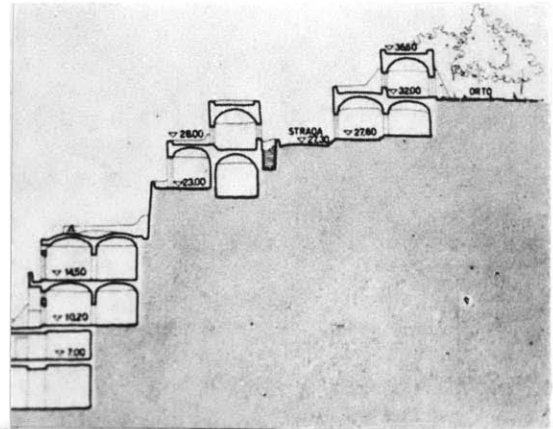
MINIMAL EDGE



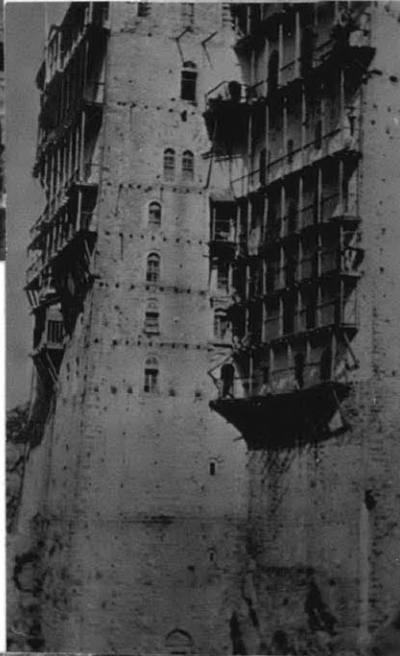
INCREASED EDGE



INDIA



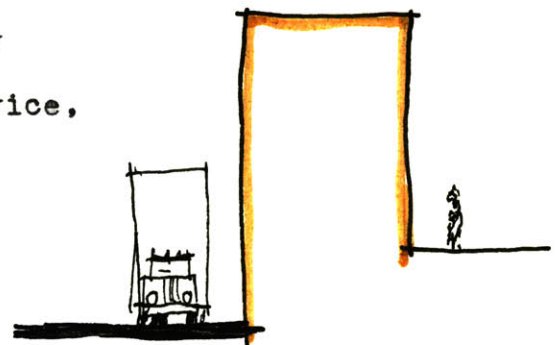
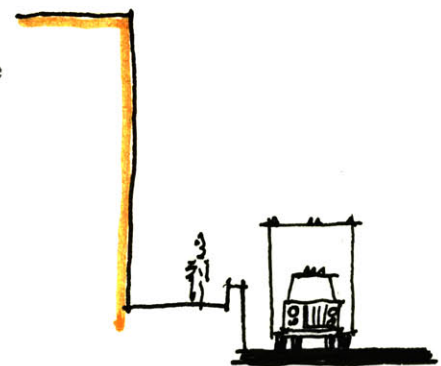
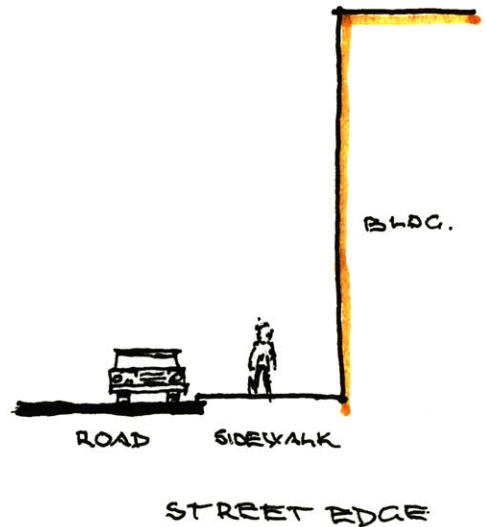
PROCIDA, ITALY



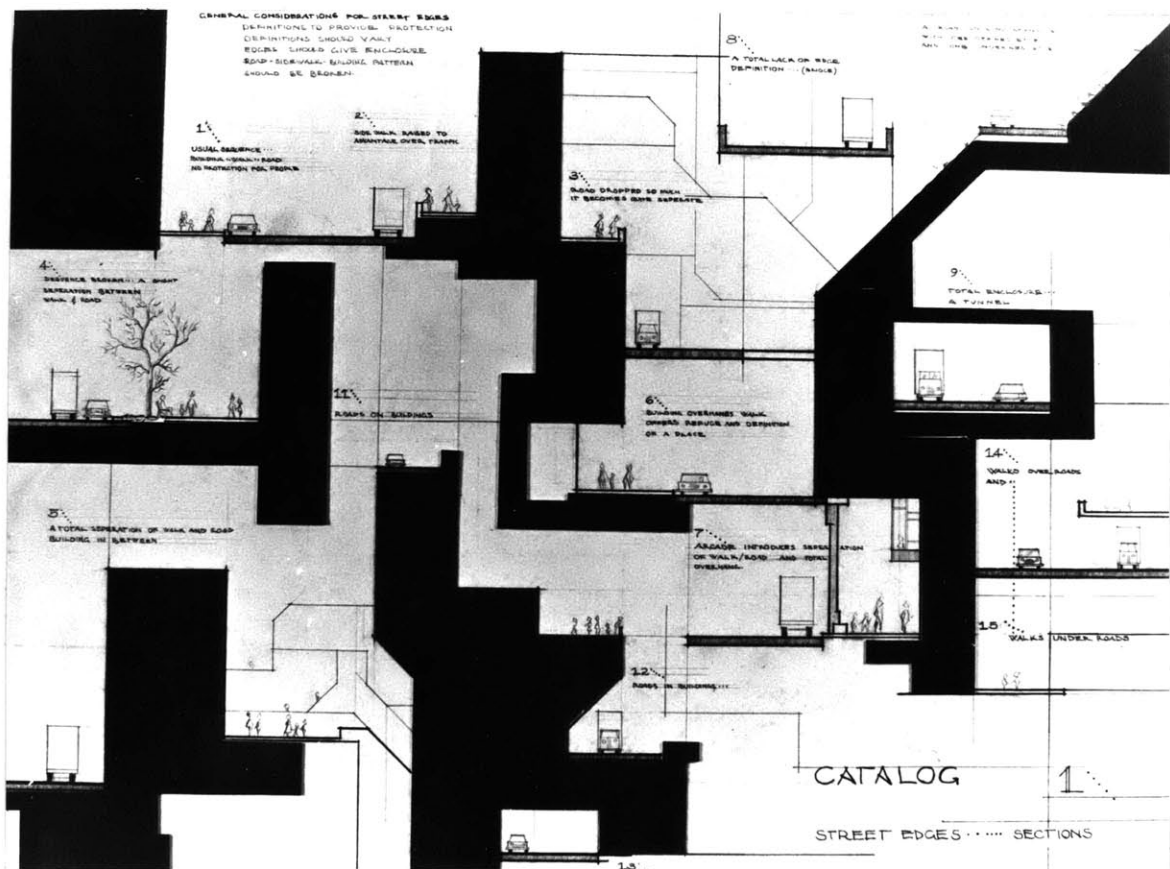
EDGE DEFINITIONS
SOME MORE INHABITABLE
THAN OTHERS.

road for vehicular traffic, the sidewalk for pedestrian traffic, and a habitable edge of building. Probably 90% of the cities in this country are composed of only such a sequence: street-sidewalk-building.

If one believes that the pedestrian might be protected from the traffic by the definition of the edge, that the edges could give enclosure, that it might be desirable to vary the edge to break the stultifying uniformity; one might consider the following: raising the sidewalk above the road, breaking the horizontal sequence by introducing elements between the road and the sidewalk, overhanging the sidewalk through a collonade, walking over or under the road, the road may be part of the building it must service, and on and on. The most important points are that the street edge can and should be varied and that the pedestrian could be protected and enclosed in several ways making walking in the city a richer experience. Protection from the

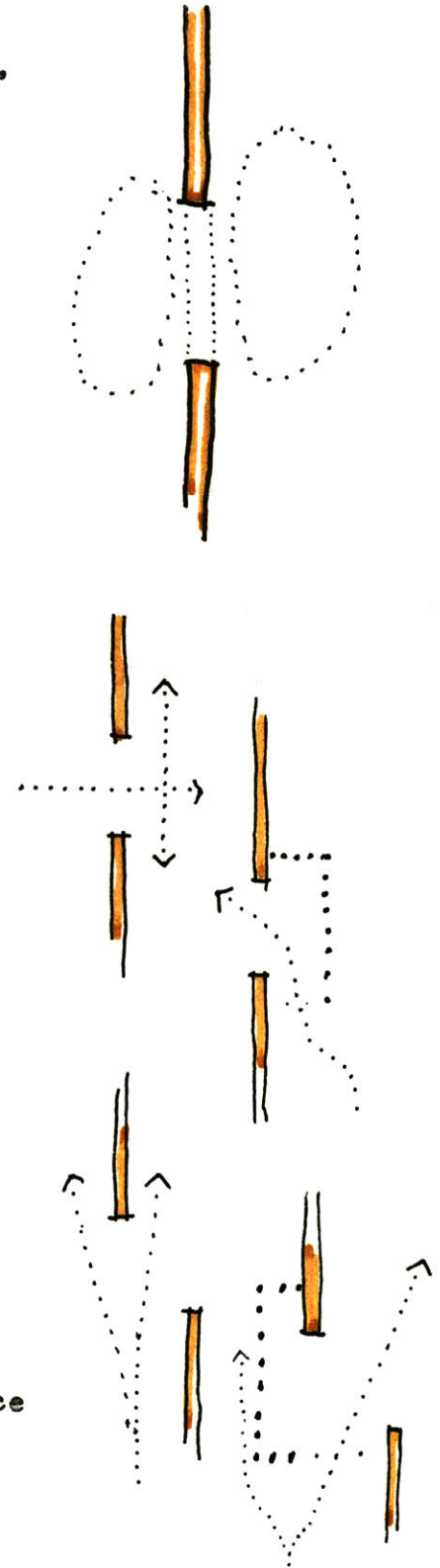


traffic offers quiet, fresh air,
 less noise and dirt; and one might
 also be protected from the elements -
 rain, sun, heat, and cold. Clearly
 the notion of edge definition is an
 amenable one.



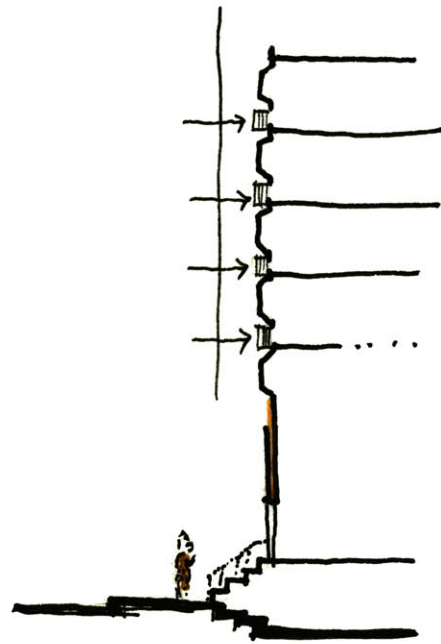
ENTRANCES

An entrance is a region where one may move from one space to another, one use or another, or one kind of definition to another. A hole in a plane or a surface is the most minimal kind of entrance; there is no shared space common to both to constitute the entrance region hence the two spaces are isolated even though it is possible to move from one to another. To minimize the separation, a transition zone which has elements common to both spaces must be built, particularly if the two spaces are organized in different directions. Since the act of entering is a movement, it may generally be effected in three ways: a change of motion, a direction change, and a level change. Any entrance which stops motion, changes direction, and changes level all at once will tend to separate the two spaces, particularly if the entrance

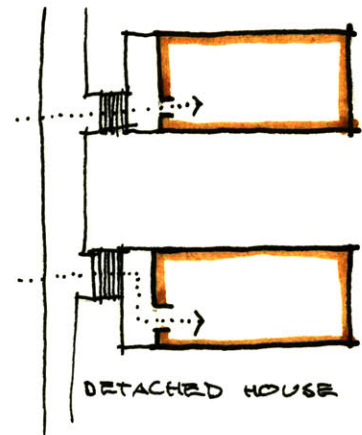


is differentiated from both. A typical row house entrance in the Back Bay or Southend does this. The entrance of a typical detached house, as in Cambridge, is less isolating than that of the row house: the direction change occurs slightly before the level change and the porch is an actual space associated minimally with both outside and inside. However the whole entering motion is straight through and is perpendicular to the street. A better entrance region might be made if the steps were not opposite the door; then part of the motion is parallel to the street.

Unless the major system of definition implies a space at an entrance, one needs another system of definition to create an entrance zone, and there will be little or no reinforcement between the building methods. Not only is this inefficient and expensive because all the place



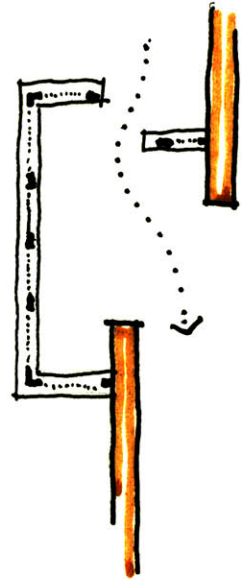
ROW HOUSE ENTRANCE



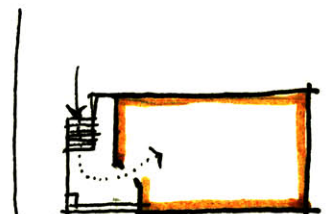
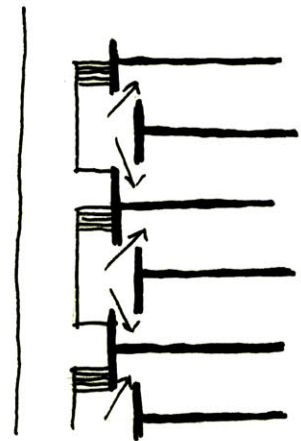
DETACHED HOUSE



definition comes from the secondary system, but it further separates both major spaces by introducing something different between them, causing a one to one hierarchical relationship, and reinforcing the notion of the structure only as structure and not as space definer. If the major definition does respond to the entrance and makes a partial definition, the secondary system completes the definition and the entrance zone is defined by all the elements used, breaking down the hierarchy and separation. Row houses and detached houses could be built with entrances parallel to the street, making a space not singly associated with either street or house, public or private, outside or inside. The entrance can screen the actual door from the street aiding privacy. An entrance region in the city could also build hierarchically from public to private with a series of partially enclosed open spaces with varying

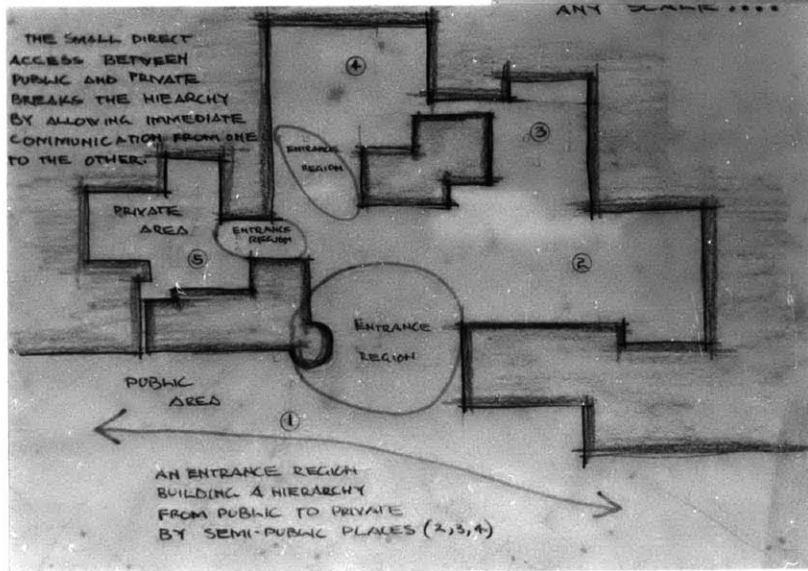
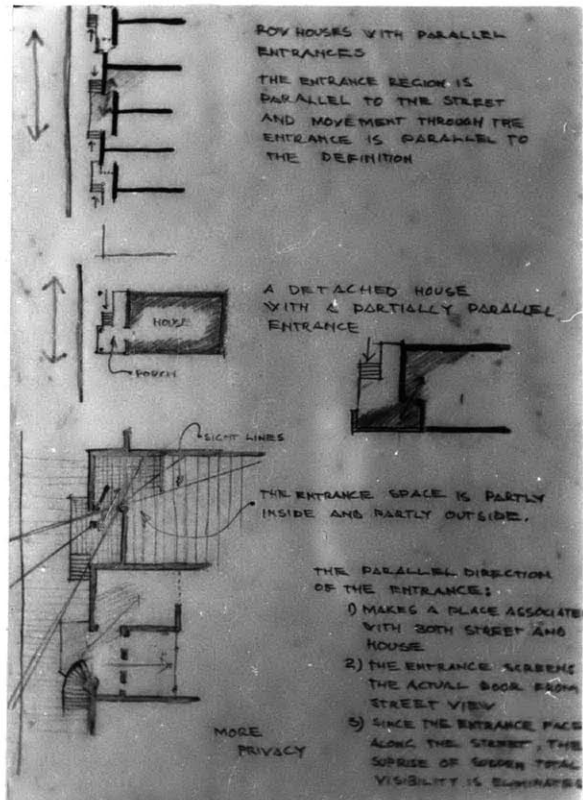


SLIPPED WALL MAKES ENTRANCE REGION



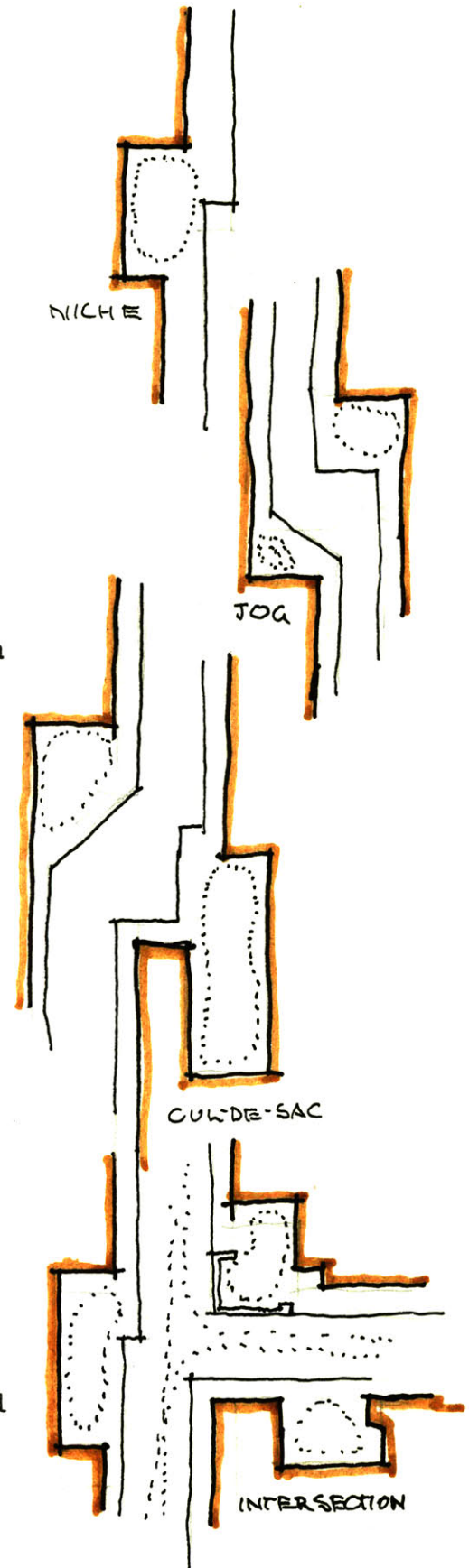
PARALLEL ENTRANCES

degrees of association and public use. The hierarchic order could be broken down by allowing a direct access or communication between the extremes.



PLAZAS

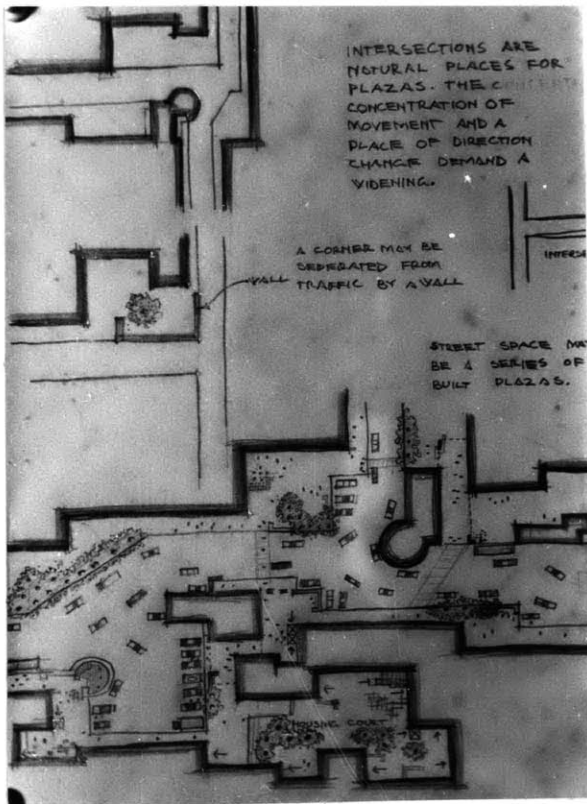
A plaza is basically exterior use space, and as such has the following general characteristics: enclosed exterior space, non-circulation space, defined by concave definitions. The simplest form of plaza may be a niche or concavity in the building edge along a street, as might be produced by slipping a row house back. Jogging the street will also create a slight opening which can be a plaza. If the concavity or opening is made by moving the jog in the same direction as the street, a cul-de-sac results which begins to get privacy from the street. Such a plaza could be used for an entrance court for houses or shops. Intersections mark important points in the movement through cities and by breaking the built edge lend themselves to making plazas. The concentration of movement demands widening and is traditionally a coveted

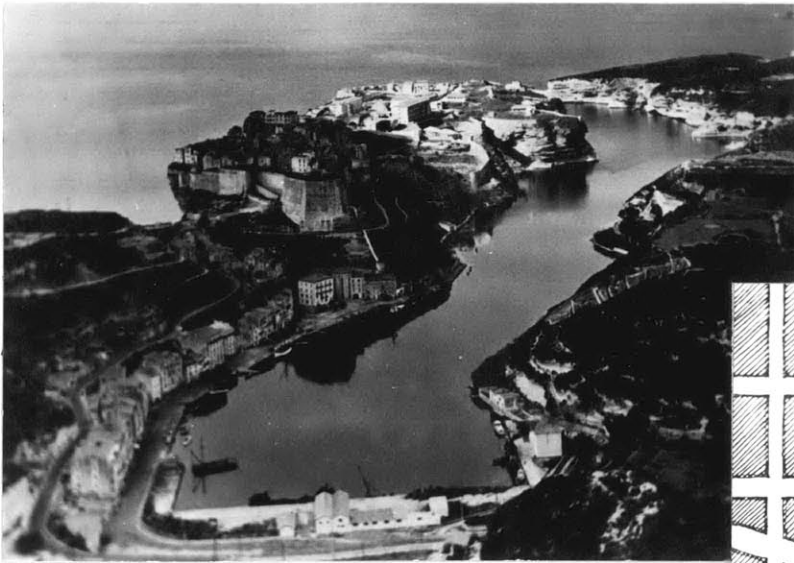


commercial site. A wall may separate a plaza at a corner from the street traffic. A series of plazas may make up an urban environment or part of the urban environment.



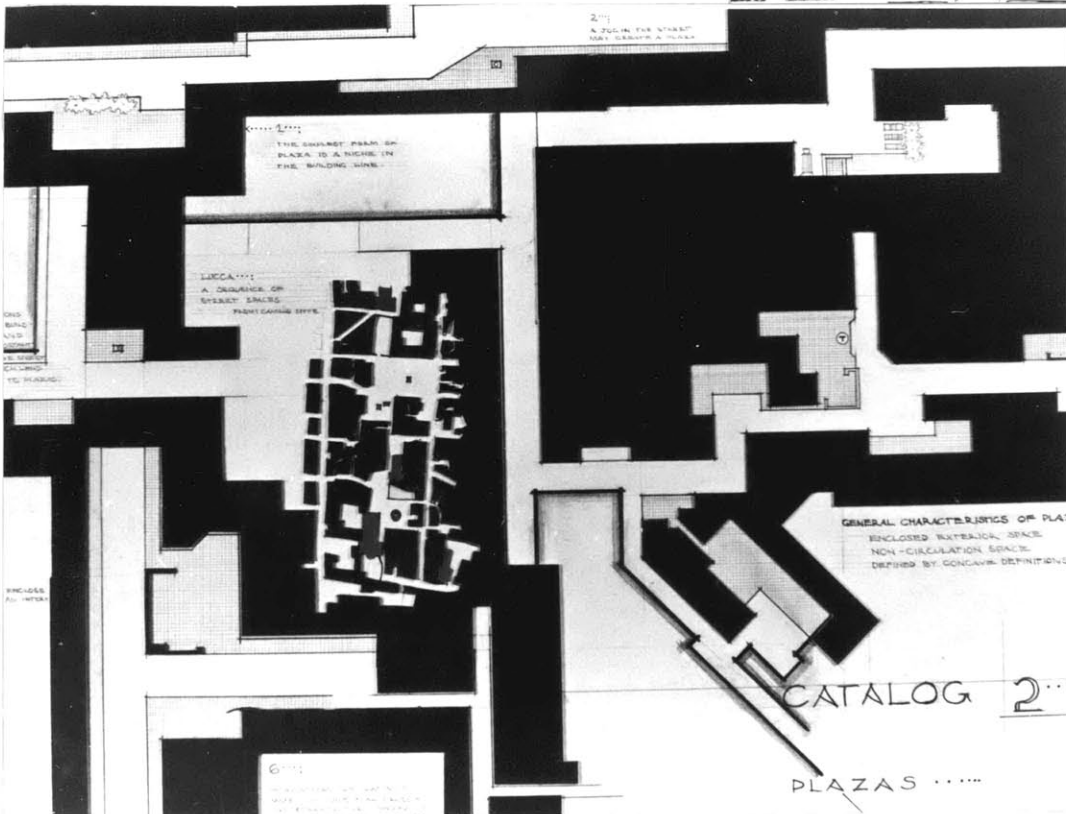
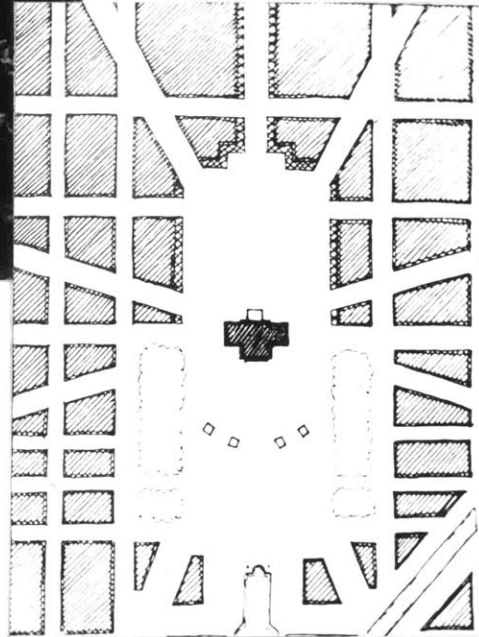
STREETS CHANGE WIDTH TO FORM PLACES ALONG THEM AND AT INTERSECTIONS



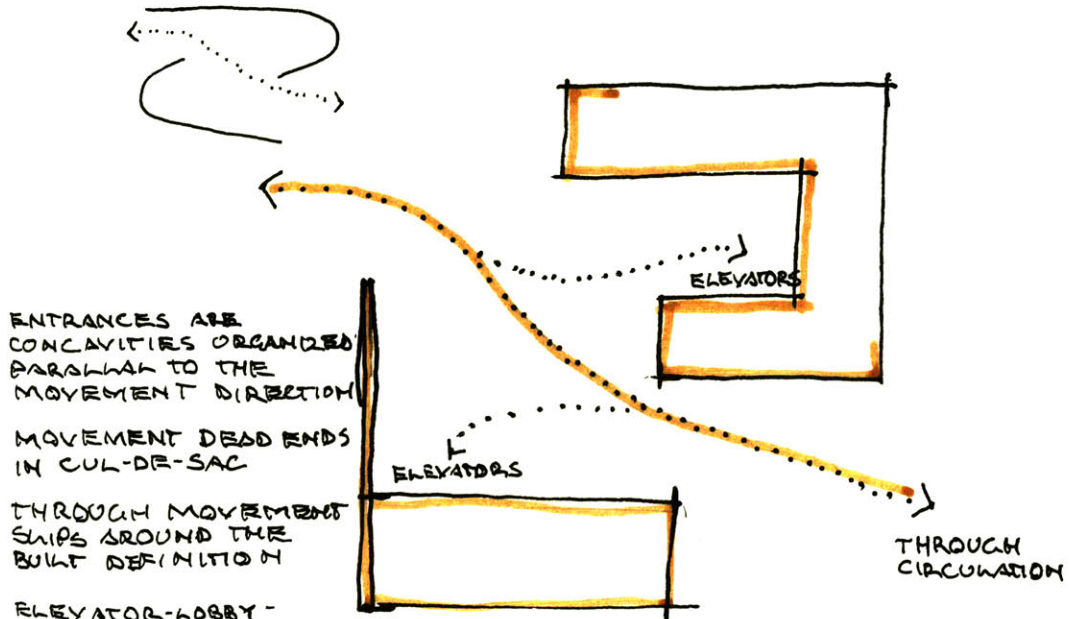


A CUL-DE-SAC USED AS A HARBOR FOR A TOWN. (AN ENTRANCE)

L'ENFANT'S PLAN FOR THE CAPITOL IN WASHINGTON D.C. AN EXAMPLE OF A NON-PLAZA FORMED ENTIRELY BY CONVEX DEFINITION.



PROJECT BOSTON GAS OFFICE BLDG.



ENTRANCES ARE CONCAVITIES ORGANIZED PARALLEL TO THE MOVEMENT DIRECTION

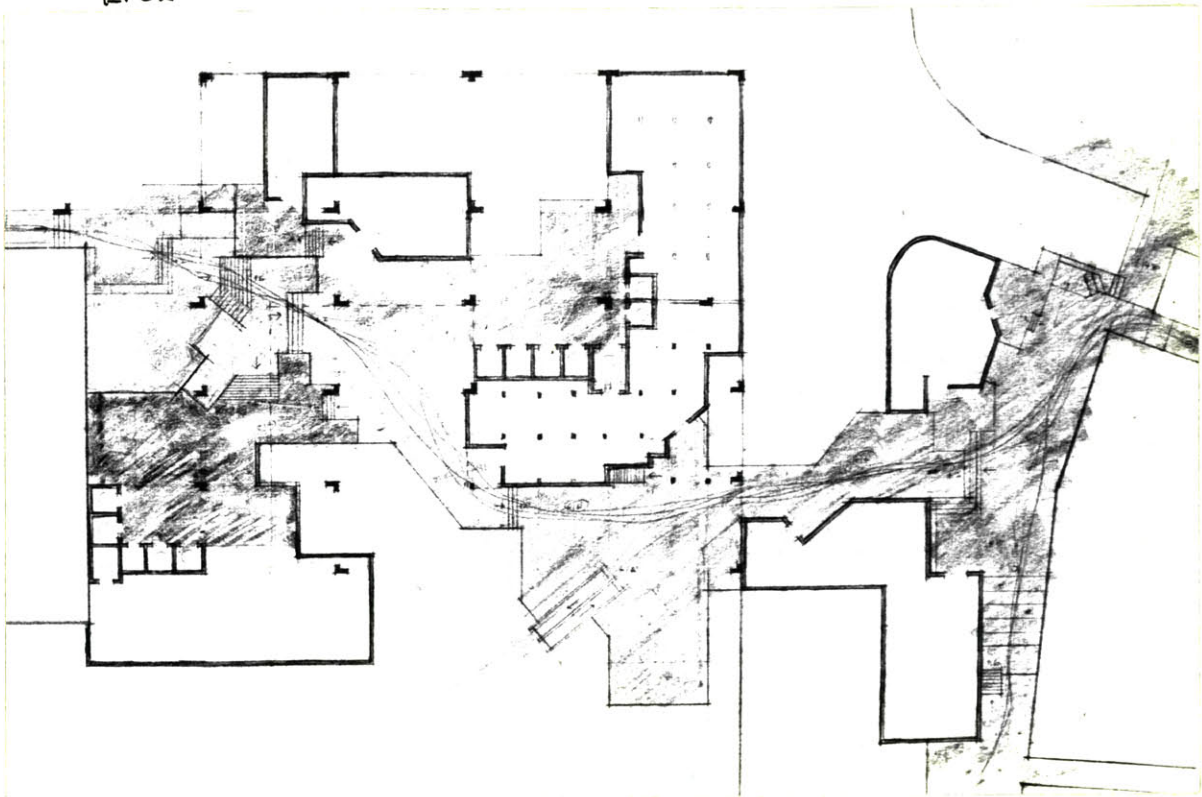
MOVEMENT DEAD ENDS IN CUL-DE-SAC

THROUGH MOVEMENT SLIPS AROUND THE BUILT DEFINITION

ELEVATOR-LOBBY-ENTRANCE SPACE MAY BE USED AS A PLACE ASSOCIATED BOTH WITH PUBLIC MOVEMENT AND AS BUILDING ENTRANCE.

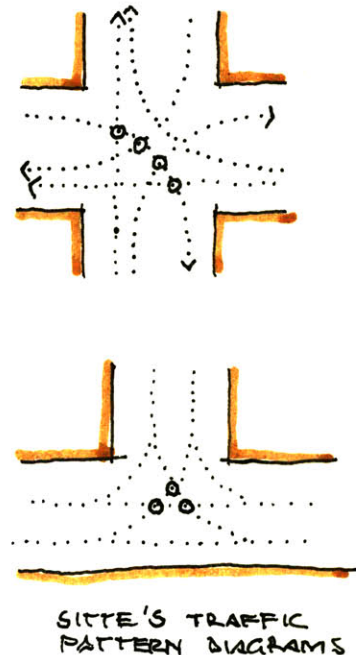
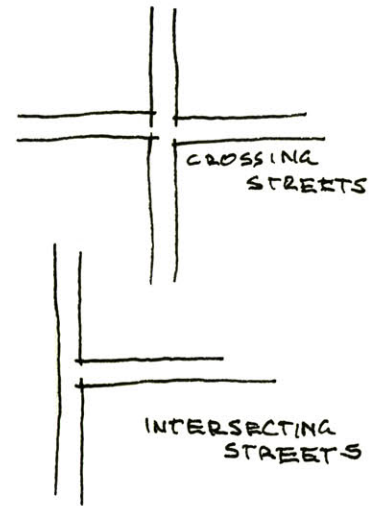
DIAGRAM OF ENTRANCE

THE BUILDING SEPERATES THE SIDEWALK FROM THE ROAD, MAKES A STOPPING PLACE IN THE CIRCULATION AND ENCLOSES A PLAZA.



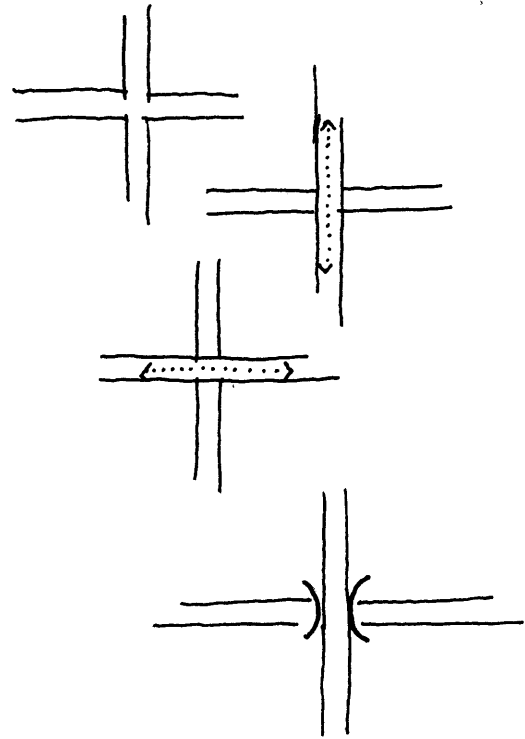
INTERSECTIONS

Two types of intersections occur most frequently in cities today, the four way intersection of crossing streets and the three way or "T" intersection. Intersections of a greater number of streets do exist but they are generally handled by rotaries which as a variation of a "T" intersection. According to Camillo Sitte crossing streets is much the worst situation. Pointing out that at such intersections there are 54 possible traffic encounters and of these 16 actually cross trajectories, one 4 times,³ busy crossings tend to slow traffic down; and for pedestrians the situation is even worse because he has to leave the sidewalk at every intersection which is the busiest place. The modern solution is to put traffic lights at every crossing to stop one flow while the other goes. The



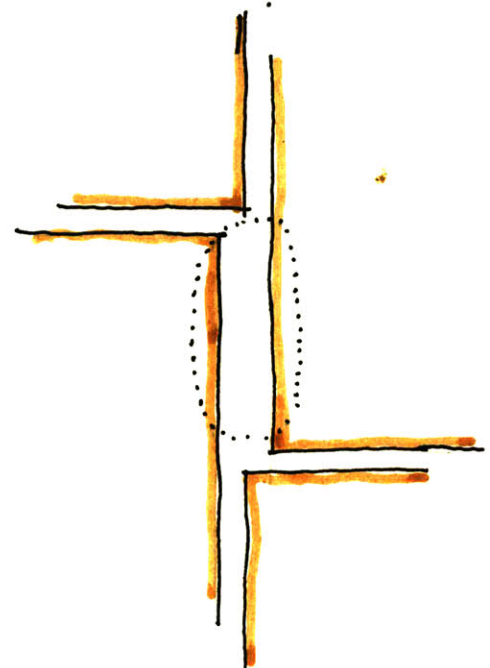
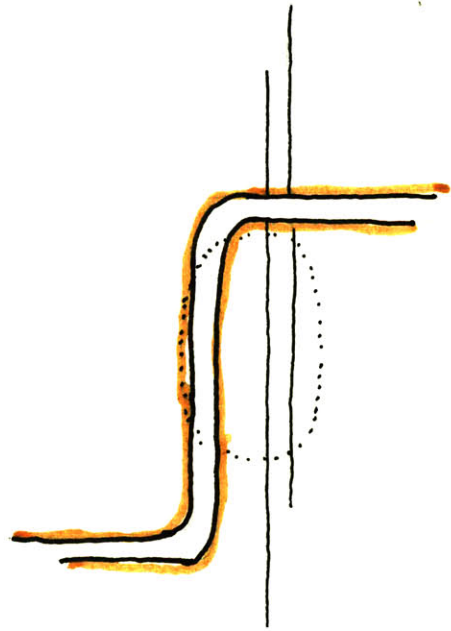
3. Camillo Sitte, City Planning According to Artistic Principles; p. 94.

traffic light in effect builds a wall to allow each path to move without any interference from the other. Non-interference implies a spatial separation, and indeed the most efficient crossings are made by bridges which allow both lanes to move with no interference or effect by the other. They are both independent. If one diagrams the effect of the traffic light, the result is the commonly used map-making symbol for bridge. Unfortunately actual built bridge crossings do have a certain amount of interference, being close enough together, spatially, to allow the dirt and noise from each to reinforce the other, with a detrimental effect on the surrounding area. The spatial separation must be great enough so that in the region of one, a person will be totally unaware of the other, and the uses and associations of each are unaffected by



the other. However it is often desirable to let the two movements reinforce certain uses which are associated by having access to the movement; a corner is a prime commercial site because of the increased exposure to two streets. Without interfering with the movement flow, a relation may be made through these associative elements if the two paths share an edge, or define a region in between both. Parallel directions near the crossing point will maximize such a desirable region.

A three way intersection of streets causes total interference of the two because they share a common path for an interval. The shared region allows traffic to change from one path to another without stopping movement, and it creates a combined region bigger than either alone. Such a combined region may be commercially desirable





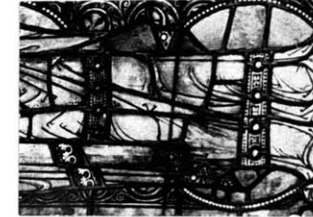
INTERSECTIONS:

4 WAY INTERSECTIONS OCCUR RARELY
IN NATURAL FORM

FARMING IN LA VENDER
WESTERN FRANCE

NOTICE WHERE THE
CROSSING STREETS
OCCUR.

STAINED GLASS WINDOW



OYSTER BEDS IN FRANCE

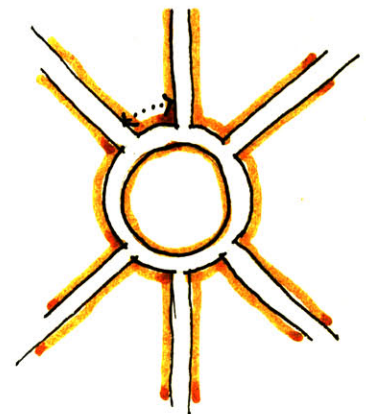
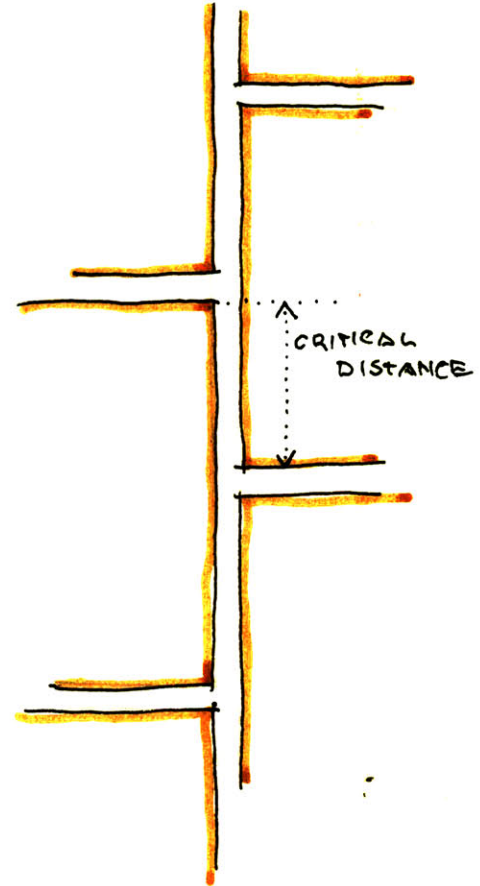


LACK OF CROSSING STREETS
WIDENING AT INTERSECTIONS
TO FORM PLAZAS
ENCLOSED EXTERIOR SPACES

EL DUED

much as the corner is in the crossing situation. Formally a "T" intersection is more continuous because one edge remains unbroken, and, according to Sitte, is more desirable from the pedestrians point of view because he does not have to leave the sidewalk as often. Spatially the continuous edge helps enclose the intersection and make a sense of place. It gives dominance to the through street, which remains less effected by the intersection than the street which ends. In building a "T" intersection between two crossing paths, the distance between the actual intersection, the combined region, is critical and must be large enough to allow the moving traffic to sort itself out without causing any tie up.

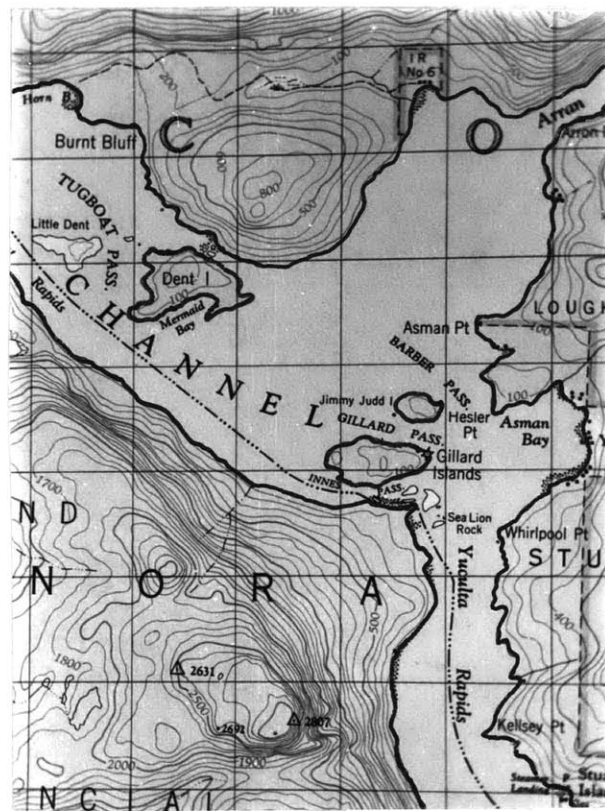
A rotary is basically a compressed and bent "T" intersection. It combines the movement paths of the different intersecting directions and



allows the cars to sort themselves out with no halting of motion. It must be designed to store a certain number of cars until they find their new movement path, and if the critical dimension, between intersecting paths, is too small; it will not work. A bad feature of a rotary is the loss of space in the center, but if the rotary were large enough, several blocks, the center would be useful space.

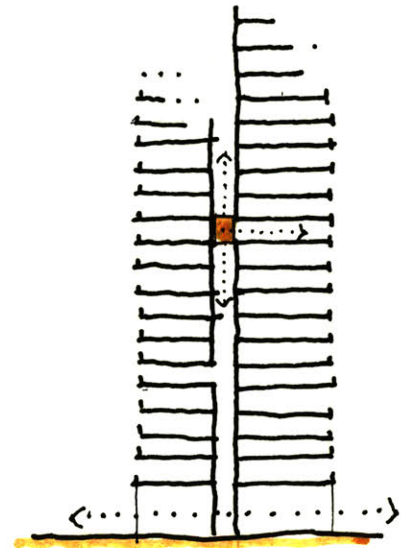
NOTE THE WIDENING AT THE INTERSECTION AND THE NUMEROUS CONCAVITIES IN THE EDGE WHERE PEOPLE LIVE.

A "T" INTERSECTION IN B.C. CANADA ALONG THE COAST NORTH OF VANCOUVER

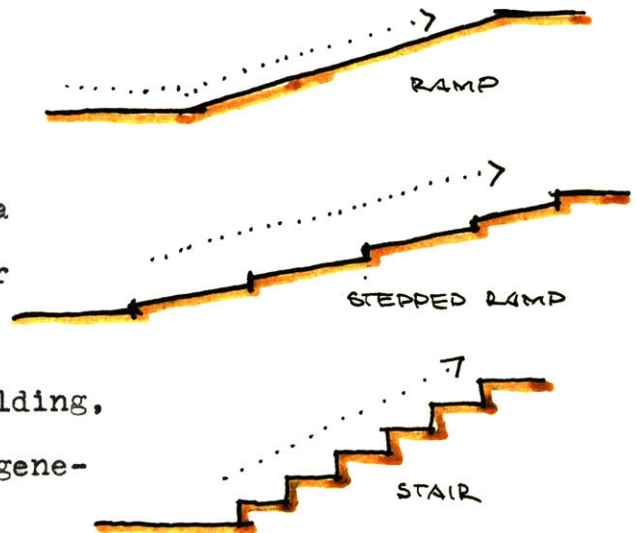


VERTICAL MOVEMENT

Any high density urban situation must build up in space and change levels to accommodate more use space, and obviously people must move vertically to use those levels. Vertical organization generally tends to be treated by a corridor-cell prototype with the same problem of cellular isolation as horizontal organizations and the same discontinuity associated with an abrupt 90° direction change. The issues are not as clear however due to the difficulty of moving against gravity which is a directional influence. Generally vertical movement is confined to a vertical corridor, a stacked stair shaft, or an elevator shaft, each existing independently in the building, or built field. The elevator is generally a totally enclosed box in which one has no orientation to any directional reference (except gravity) on the ground level or any other built



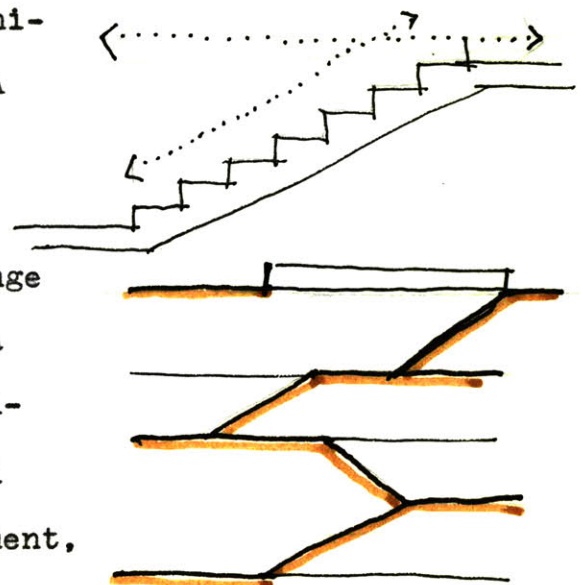
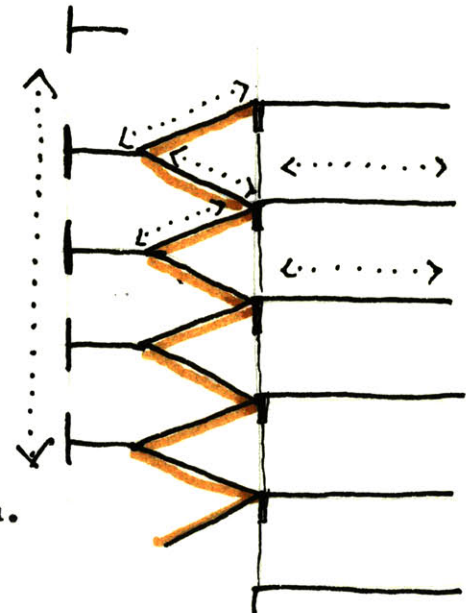
DISCONTINUOUS
VERTICAL MOVEMENT



CONTINUOUS VERTICAL
MOVEMENT

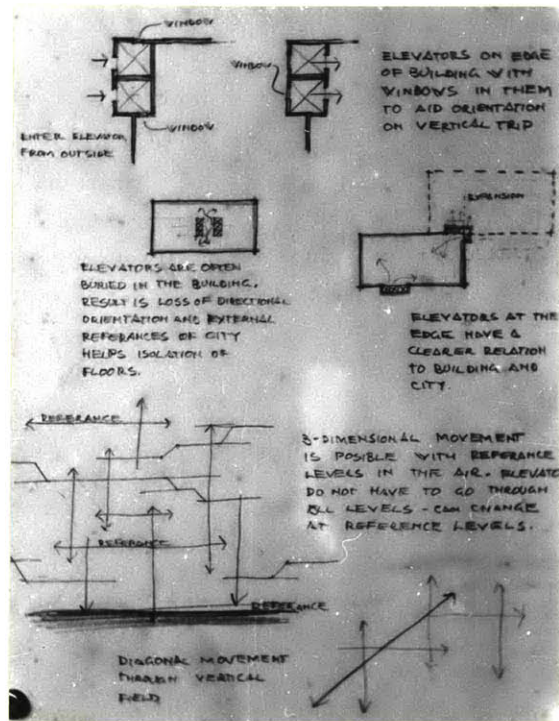
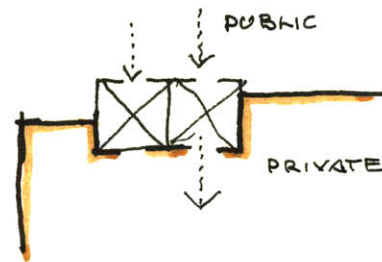
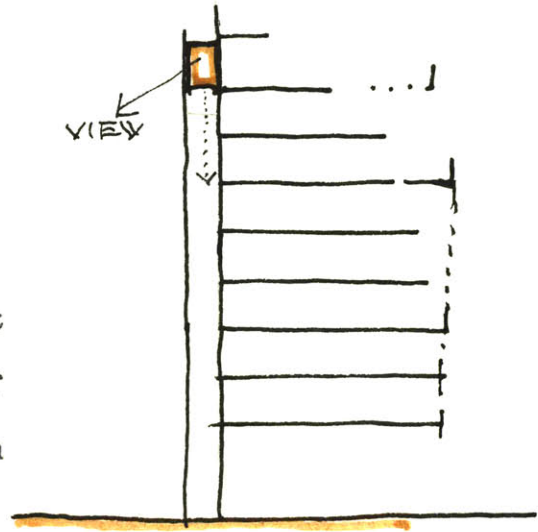
level. The elevator has the same relationship to each floor and helps separate the levels from each other, only relating them back to the ground reference. The stacked stairway is similar to the elevator - a vertical corridor reinforcing the isolation of each floor, generally enclosed, and unsuitable for anything but circulation.

If one considers the ground a directional reference plan and wants to use vertical movement as an element relating different levels (as an entrance does), a horizontal movement must be introduced with the vertical movement in order to create a direction associated with the horizontal organizational direction of the ground. A flight of stairs is directional by nature and by not stacking them in an enclosed shaft, a continuous change could be made from a horizontal to a vertical movement. Half levels, balconies, double height spaces may all occur with a diagonal vertical movement,



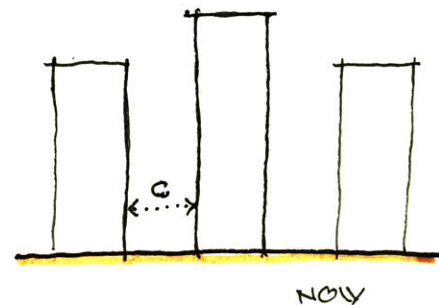
and help relate the levels.

Even the elevator as traditionally used could be made much better. If the street or a plaza were used as the elevator lobby at the ground, and the elevator were at the edge of the building, instead of buried, with windows looking to both the outside and the inside, the vertical trip might not be as disorienting as it is now. One might consider the elevator to be part of the street and not even enter the building until after one gets off the elevator at a use level.



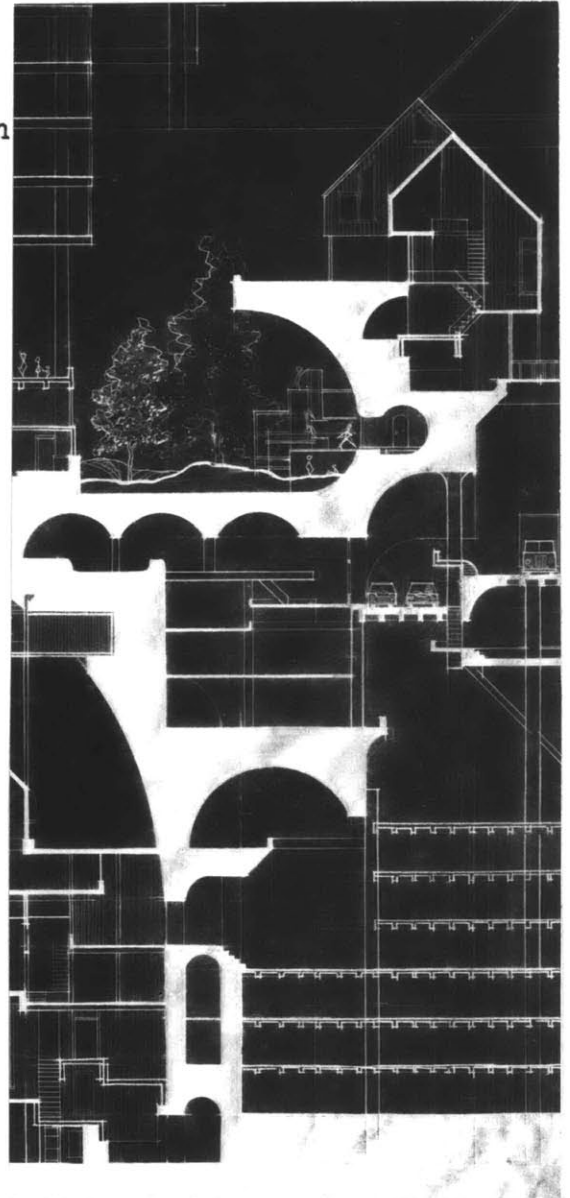
GROUND REFERENCE

Today density is increased in the city by extending the built area upward from the ground in order to increase the amount of use area resulting in the familiar towers which make up the skyline. Currently in Boston the economical height is 50-60 stories or approximately 500-700 feet. Due to the organization at the ground level and the prototype established by private ownership of the detached building, these towers all are serviced by the same plane in space - ground level. No matter how high the structure, or how many more people it accomodates as it gets higher and higher, the service facilities remain at the ground limited by the amount of area available when the land was laid out in a street pattern--usually a time of much lower density. The results are confusion, congestion, dirt, noise, and untenable traffic conditions on the ground; and the incredible isolation of cells 600 feet in the air which essentially have



no reference other than the elevator shaft. People live and work in such an isolated environment. There is indeed a difference in how one can live at different distances from the ground - living in a row house 3 to 5 stories from the street, walking distance is much different than being several hundred feet away from the ground, so high one cannot even see the street out of the window.

The idea is projected that it would be valuable to build additional reference planes above the ground, but with many of the same qualities presently existing only on the ground. Certainly horizontal movement, pedestrian, vehicular, mass transit; telephone, and gas; shops, gardens, and houses could conveniently be related to and part of such reference planes. A critical feature is actual uses associated with these reference levels to prevent them from becoming movement channels, and being another

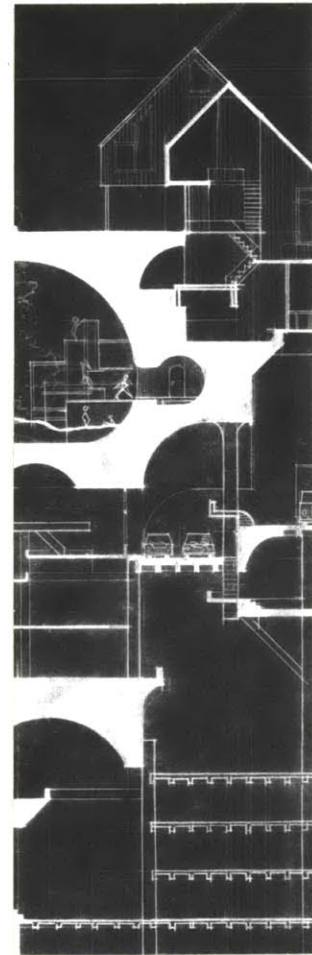


SECTION - KENDAH SQ.
PROJECT.

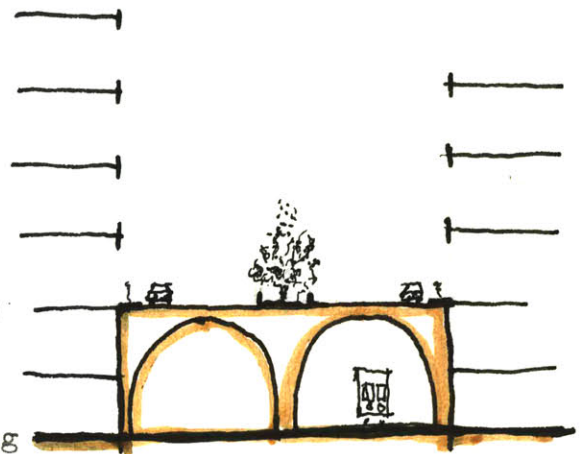
REFERENCE LEVELS ABOVE
ACTUAL GROUND EXHIBITING
GROUND LIKE QUALITIES.

discontinuous element in the built field. This type of reference is essential to break the hierarchical stratification which crowds and pollutes the existing ground. A reference with ground qualities in the air could be used both from underneath and above since it is not solid like the actual ground. One might be able to take the elevator up 20 stories to another street; stopping at use levels along the way. Then, leaving the 12th story, one could go up to the street or back down to the ground, depending on the ultimate destination.

Many city streets today are already several stories in the air with service tunnels and subways underneath. Park Avenue is about 30' above the actual ground level yet it has a garden down the median strip. Clearly the raised ground reference would be different than the actual ground. One would only expect to find a forest growing



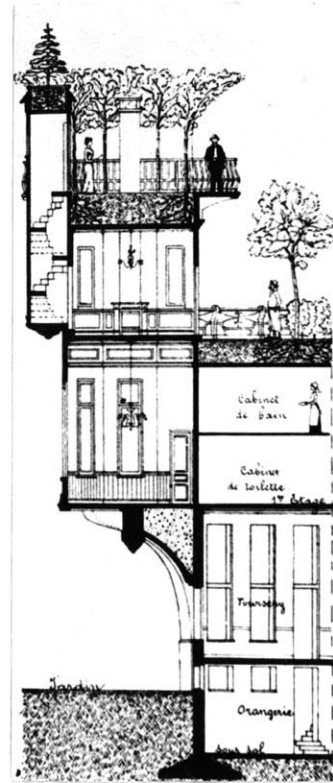
EXTENDED GROUND
USABLE ON BOTH SIDES,
TOP, AND UNDERNEATH.



SECTION - PARK AVE.
EXTENDED GROUND

on real ground, but there is no reason why small plants and shrubs cannot be grown in the air. The actual ground might be used for those things which require ground and add further variety to an urban environment.

Potential references such as that just described already exist in the cities. Expressways several hundred feet from the ground have a tremendous load bearing capacity and are often up to a hundred feet wide. Roofs of buildings such as M.I.T. are unused sites for additional structures or uses. High rise towers might be considered as habitable columns for supporting other structures and streets. Parking garages are used very inefficiently and could be jumping off places for streets above the ground. Now they are merely coiled dead end streets.



FRANCOIS HANNEBIQUE
HOUSE SECTION
BOURC-LA-REINE 1904

DEVELOPER OF REINFORCED
CONCRETE EXHIBING
GROUND LIKE QUALITIES
OF THE MATERIAL

THE NATURAL LANDSCAPE AND THE BUILT ORDER

The natural landscape is still the dominant "built" order in the world, and as such provides our major reference as to space, scale, range and type of definition, material, texture, light, etc., all of which are normally (and somewhat glibly) ascribed to the man-made landscape. If man is indeed a product of his environment, then it would seem reasonable to describe the qualities of the natural landscape in order to discern what man is trying to accomplish in the environment he creates for himself.

The natural landscape is a continuous , directional, multiple, changeable field of partial reciprocal definitions and qualities.

Movement through the natural order is a continuous experience of varying forms and qualities, with near-alikes and opposites juxtaposed and interdependent...

little/bigger/open/cold/windy/
smaller/just right/smooth/
rougher/rocky/large/above/
on top of/wide open/enormous/
out of sight/misty/clear/lower/
underneath/shady/inside/shadowy/
next to/around/outside of/bright/
hot/beneath/cooler...
a real trip...

The natural landscape is a directional field. There is almost invariably a norm, a directional ground, i.e., contour and fall lines, upon which a virtually unlimited number and variety of local changes, directions, definitions, concavities, places, etc., can occur, always in relation to a larger order.

The directional ground is further characterized by thick edges; zones of interaction and reciprocity between major definition types; i.e., coastlines, river courses, mountain ranges and plains, etc. Violent and invariant edge changes are eroded and overgrown until the actual edge is a zone exhibiting qualities of both.

The naturally habitable portions of the landscape, that is parts where the climate will support life, are further characterized by multiple definition types; rocks, trees grass, sand etc.

which reinforce and subdefine definitions in the piecewise **continuous** ground. The full range of natural definition is constructed of reciprocal "building types": the more or less permanent definitions, mountains rivers, oceans, rocks, ridges (generally continuous surface types of definitions) and the growing, changing, seasonal and daily variant forms; trees, grass, leaves, moss, ferns (generally linear and planar assemblages).

Definitions in the natural landscape are **partial, directional, continuous, and multiple**; they range from very open and implied, to **relatively contained and complete**. Because of their partial quality and extended directional reference, **natural definitions are locally non-isolated and non-cellular**.

The actual responsive and interpretive quality of the landscape is of course dependent on the changing, ephemeral activities of nature, light, shadow, rain, mist, wind, waves, erosion, **upheaval** etc.

Perhaps the most associative quality of the landscape is its sense of time and change; time, continuity from the bits and pieces and parts and wholes of old and new, and the clear formal and existential interdependence of it all.

The built order can of course and even sometimes does possess the qualities of the natural order. Indeed, the older, timeless, most personal parts of the built landscape seem so clearly generated in their own formal and material consistency from their immediate natural context that it seems almost superfluous to state that such places are desirable and valuable both in themselves and as prototypes for a larger order. Yet in a time when virtually any feat of form and/or structure is considered readily accessible, the actual form and quality of the built environment is sterile, monotonous, piecewise

discontinuous, and locally invariant. The intellectual and spatial prototypes the geometric ordering of conceptualized and containerized space have virtually exterminated the continuity of the natural landscape in the cities, and reduced any association with nature to an occasional tree and bits of grass. The built landscape as we know it now is merely a collection of geometric habitable rocks, depending on the change of light and shadow, and the rather frantic circulation efforts of its captured populace to give it any of the quality of change and density which occur so effortlessly in the natural landscape.

Yet there are numerous examples of built landscapes so clear in their natural associations of form, methods, and materials that they seem to us now to have an almost religious quality but were understood and accepted as commonplace by those who built and inhabited them.

The need for shelter in a **difficult** and some-
times hostile environment did not dictate **cellular**
isolation and local domination of the n
natural order; the inhabitants **lived on**
and with the land, taking their forms,
materials **and sustenance** from it. It is
becoming clear in our own time **that a**
technocological society which contends
that the **natural order** is at best irrelevent
and at worst, **hostile** and to be conquered,
is non-the-less dependent on, **and part**
of, **that same order**, and is exterminating
itself simultaneously with it.

¶ A built order whose **prototype** was the
natural order would not be a **col-**
lection of discontinuous closed objects
(buildings) but an open continuous
assemblage **of partial definitions**,
themselves of varying degrees of
containment, which were in turn re-
inforced and completed by lighter,
changeable **systems of definition**.
There would, of course, be much more
than the so called minimum, the same
way that the natural landscape has more
than "necessary". **The partial definitions**

would be a directional field in themselves,
and the building systems that provided the
actual closure and protection and owner-
ship etc. would not dominate and obscure
the permanent definitions, but further them
and make the field locally habitable.

BUILDING METHODS

Building methods may generally be described by four families of definitions; continuous surface, linear assemblage, planar assemblage, and capsules. Each family has particular characteristics which are responses to material, how it is made, what it will add up to, and also how it goes together. Each family has inherent economies associated with its form and material which further define how it should be used. Any kind of definition may technologically be made with almost any type of material, unit masonry produced rose windows, and stud walls make caves, but generally there is a formal and economic range associated with a particular building method which defines how it should be used. Of course there is a great deal of overlap between building methods which adds richness and range

to any definition. It will also be clear that many of these families of definitions will not form a complete enclosure by itself and must be combined with other methods to produce a complete definition. Although one particular building method is able to produce a complete closure, often a more economical construction may be made using several systems each performing what it does best. The intent is not to limit any particular building program by a building method, but to expand the range of all buildings by using more than one family of definitions. Each family of definitions will be described, examples given, and a building system of each explained. Sweet's catalogue abounds with building systems of almost every description which are already developed and being used today. What is lacking is a clear understanding of the formal implications of each and the ability to combine methods. For instance, all of the panel systems

already designed are merely infill systems with no attempt made to use them as structural pieces. Infill housing as the name implies is a dry wall panel system, but it is not used with any other system and always makes complete enclosures.



CONTINUOUS SURFACE
CONTAINMENT CONTINUITIES...

KRAK DES CHEVALIERS

LINEAR FRAMEWORK
INSIDE/OUTSIDE CONTINUITIES...





INDIA

MULTIPLE SPACIAL ORDERS AND
DEFINITION TYPES IN A
CONTINUOUS FIELD...

ORDERS OF SIZE, SURFACE, LIGHT...



STANDARD OIL, NEW JERSEY

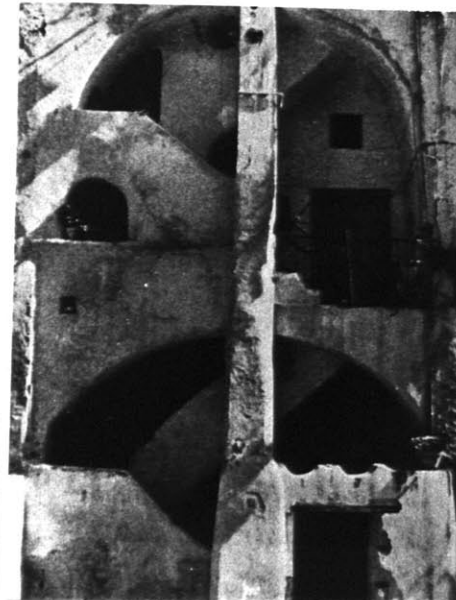


A SEQUENCE OF BUILDING
METHODS / FAMILIES OF
DEFINITIONS, FROM SINGLE-
SIDED GROUND FORM TO
LINEAR / PLANAR / SURFACE
ASSEMBLAGES...



AL-KERAK

SINGLE-SIDED GROUND....
CHINA PROCIDA

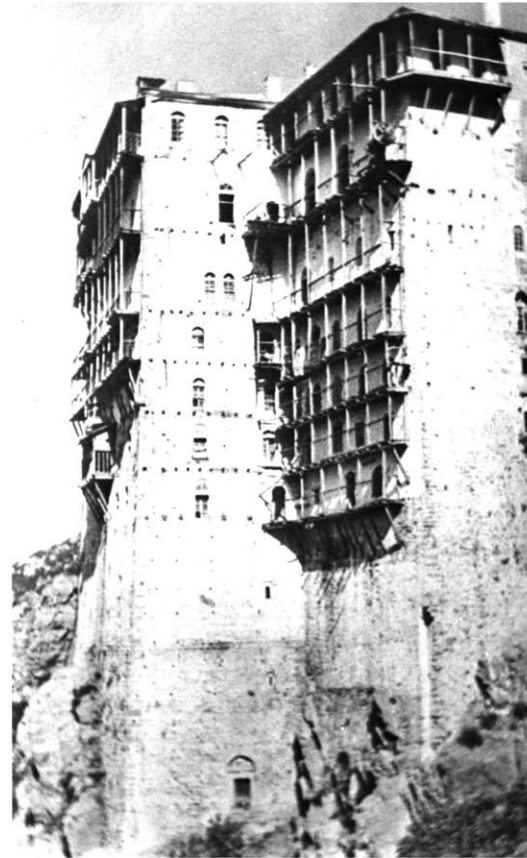


SINGLE AND DOUBLE-
SIDED CONTINUOUS SURFACES-
INDIA

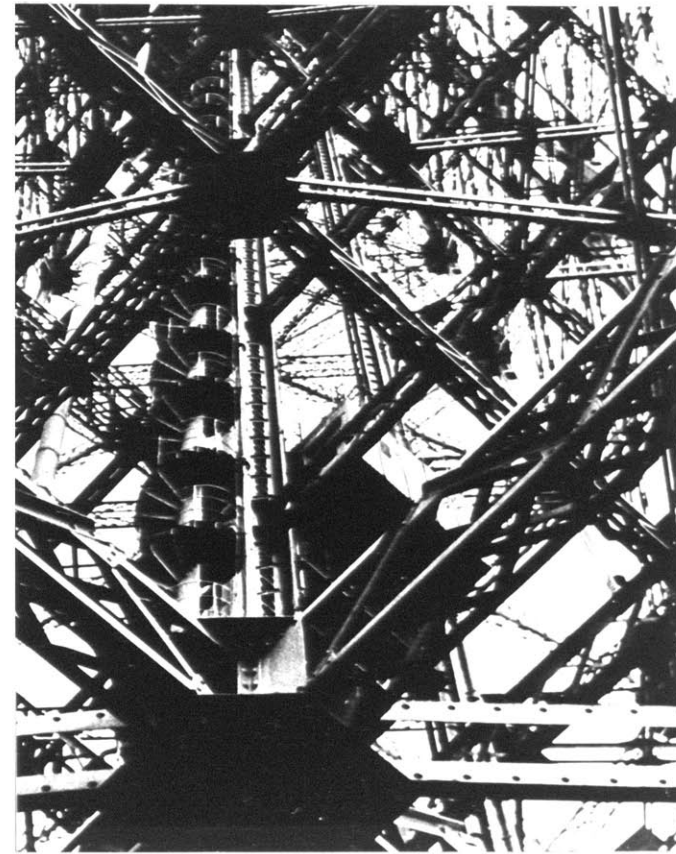


MONT ST. MICHEL

LINEAR / SURFACE
ASSEMBLAGE



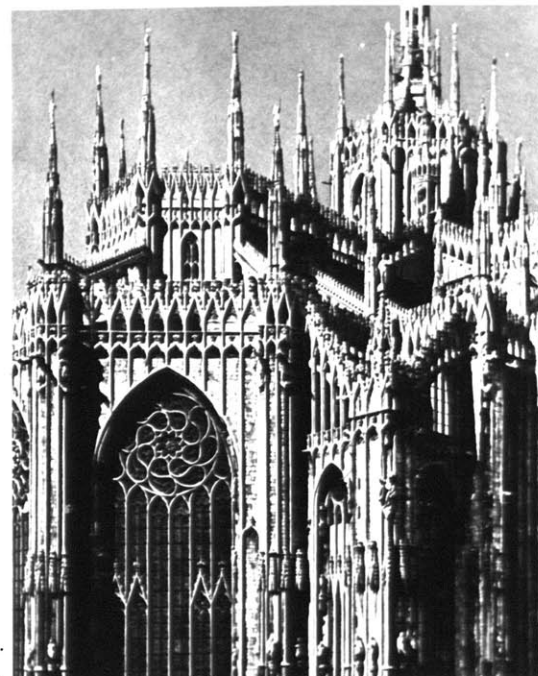
A PLANAR ASSEMBLAGE --
WOODSTOCK, N.Y.



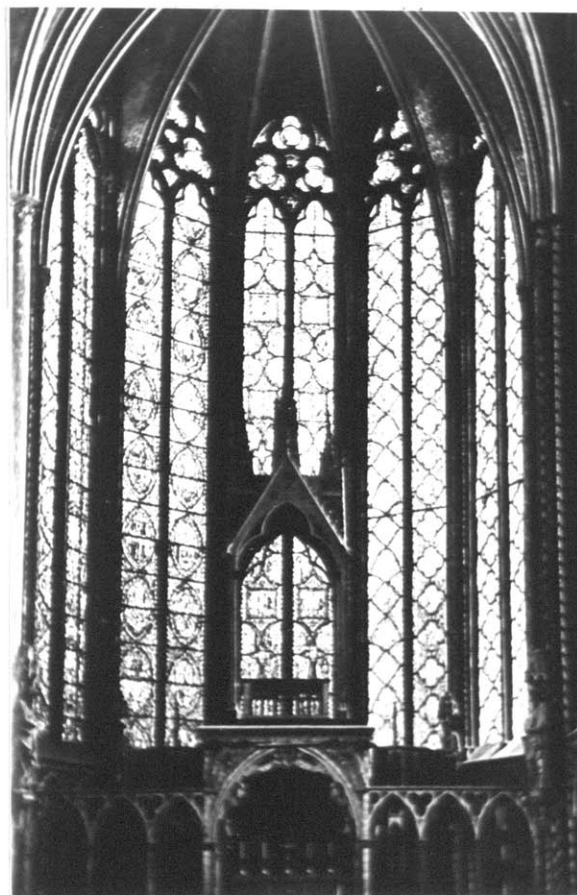
A LINEAR FIELD...
RIFTEL TOWER



SCREEN / SURFACE ASSEMBLAGE..
ENGLAND



FRANCE



FRANCE



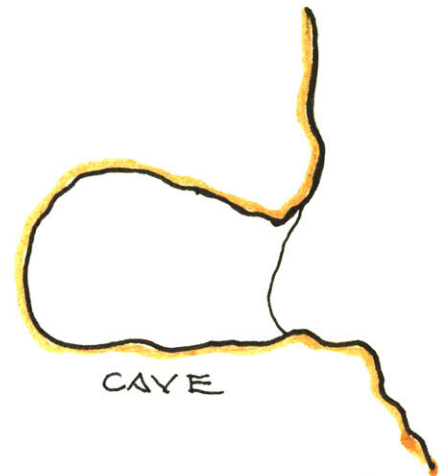
STANDARD OIL, N.J.

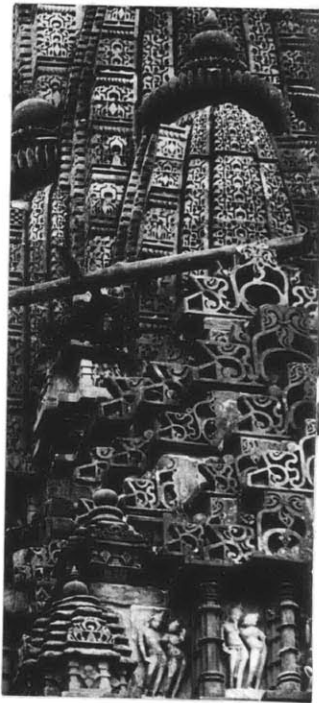
CONTINUOUS SURFACE

Continuous surface definitions consist of three basic building methods: ground form, poured concrete, and unit masonry. Other common building methods used to make continuous surface definitions are frame and panel stud walls, wet plastered stud walls and shingle siding. A continuous surface is a "ground like" definition which is only single sided by use and perception. The two sides of a concrete wall may move independently of each other forming concavities and convexities varying the thickness of the wall.

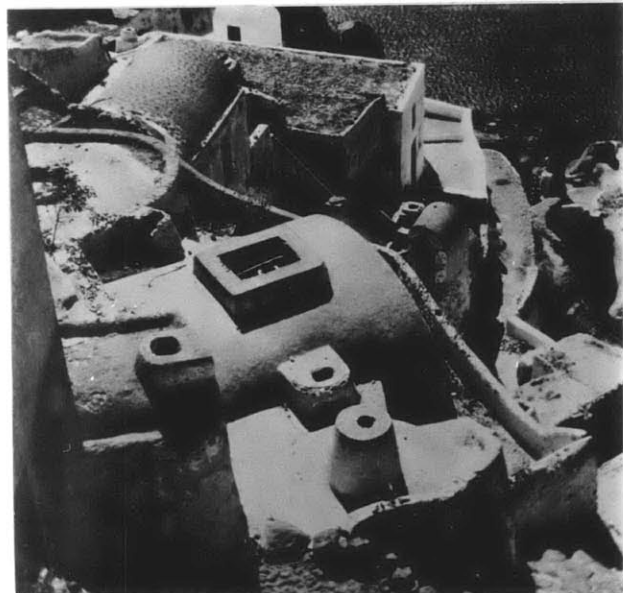
Ground Form:

Ground form definitions are single sided, continuous definitions built in and by the actual ground. Since the surface is formed by the actual ground it is impenetrable. A cave is a natural example of such a definition, and a retaining wall is





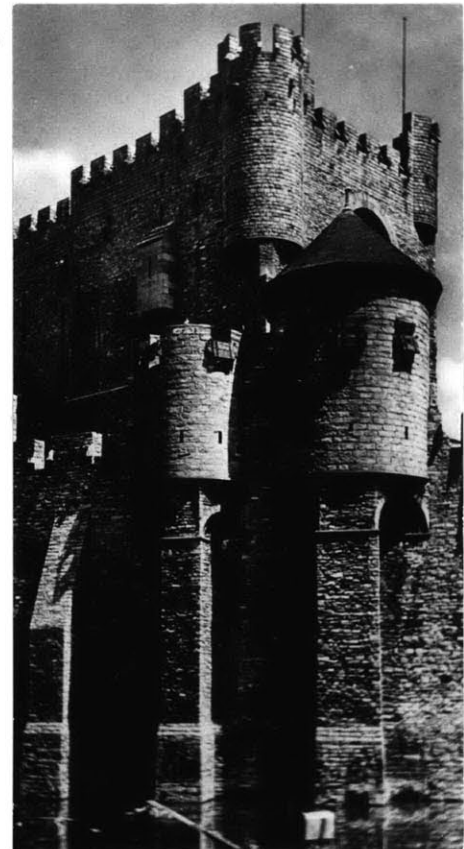
HABITABLE SURFACES...



a built example. The defining surface may be inhabitable for a limited depth. Since the defining surface is actual ground, it is possible to do such things as grow plants and trees easily anywhere on the surface, or change the surface by digging out almost indefinitely.

Walls:

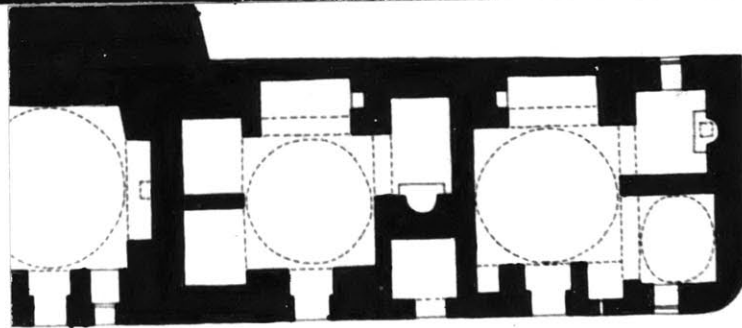
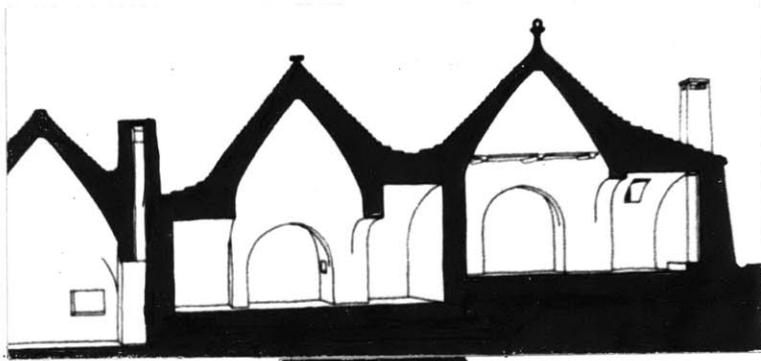
Walls are built, continuous surface, single sided definitions. They are continuous through corners and joints forming a containing surface. Since the side of the wall is a surface, the other side may move independently; the wall varying in thickness. Continuous surface wall definitions are generally associated with local containment qualities whether partial or complete, which may or may not reflect a larger directional context. A wall definition will certainly have a local directional characteristic. Wall materials are generally "wet" construction systems like



poured concrete and unit masonry.
These systems have great compressive strength and naturally give rise to compressive arcuated forms like vaults, domes, corbels, and arches.



PROCIDA , ITALY

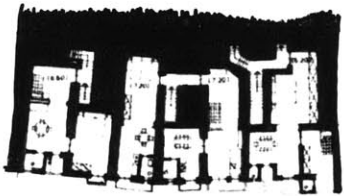


TRULLI HOUSE , ITALY

KRAK DES CHEVALIERS

A CRUSADER CASTLE
IN TURKEY.





PROCIDA

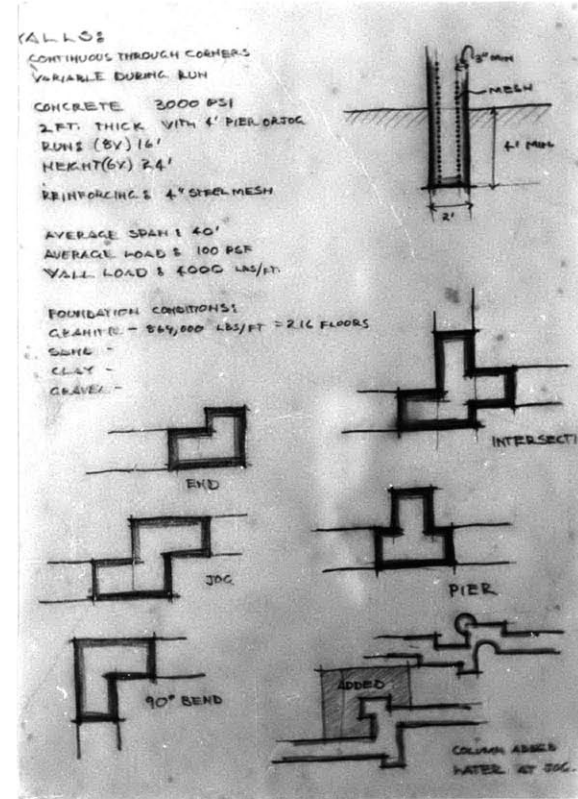
CONTINUOUS SURFACES ...

SINGLE SIDED GROUND --

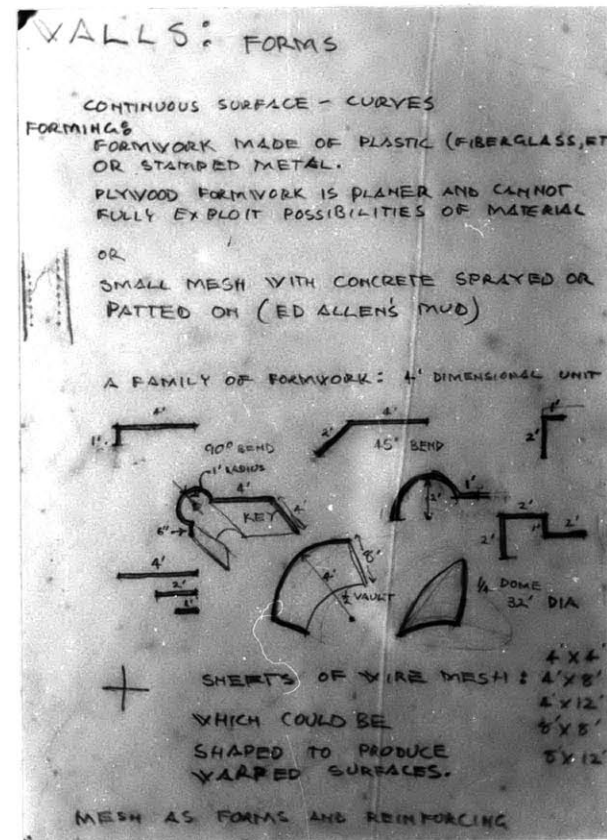




WALLS MADE WITH MODULAR FORMWORK...



A CONTINUOUS SURFACE...
...WITH CONCAVITIES



A MODERN WALL SYSTEM USED IN SENNOTT MEMORIAL PARK CAMBRIDGE, MASSACHUSETTS. DESIGNED BY BRUCE SILVERMAN



MOROCCO

PARTIAL DEFINITIONS IN
CONTINUOUS SPACE....

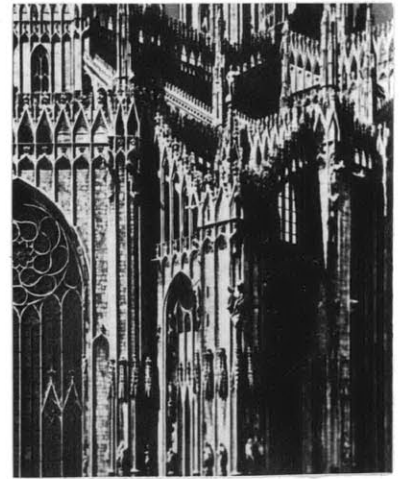
MULTIPLE USE OF STRUCTURE,
SURFACE, LIGHT & SHADOW TO
CREATE PLACE WITHIN PLACE
AND SPACIAL SEQUENCES....



INDIA



MOROCCO



TWO-SIDED...

LINEAR BUILT-UP SURFACE

SINGLE SIDED...

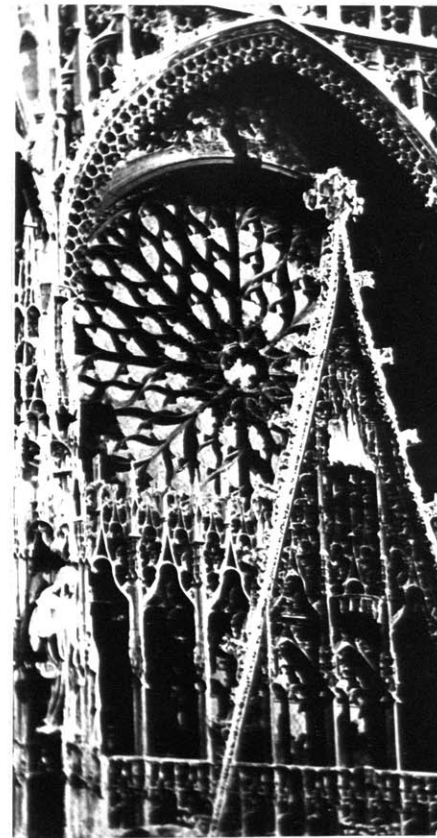
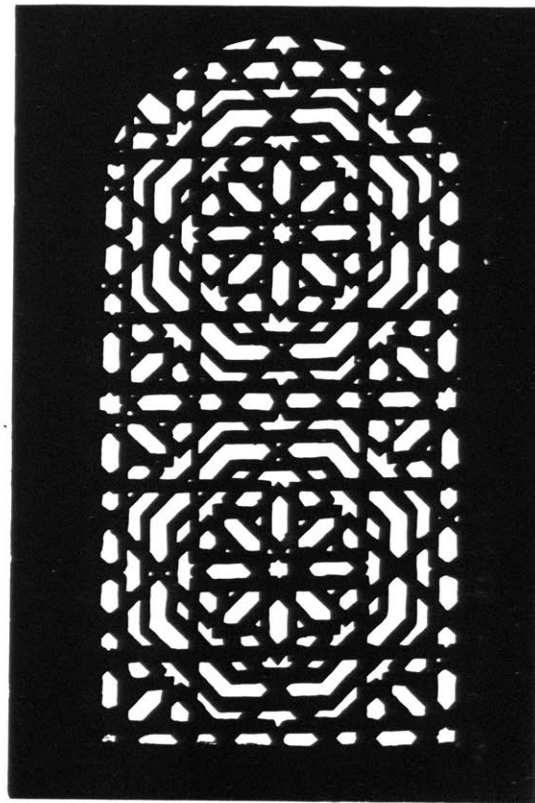


A SEQUENCE OF SURFACE TYPES, FROM LOCALLY CONTINUOUS AND PARTIALLY HABITABLE SURFACES THRU PARTIAL TRANSPARENCY AND THREE-DIMENSIONAL LINEAR/SURFACE ASSEMBLAGES



IMPLIED/VIRTUAL SURFACE DEPTH/TRANSPARENCY MOROCCO

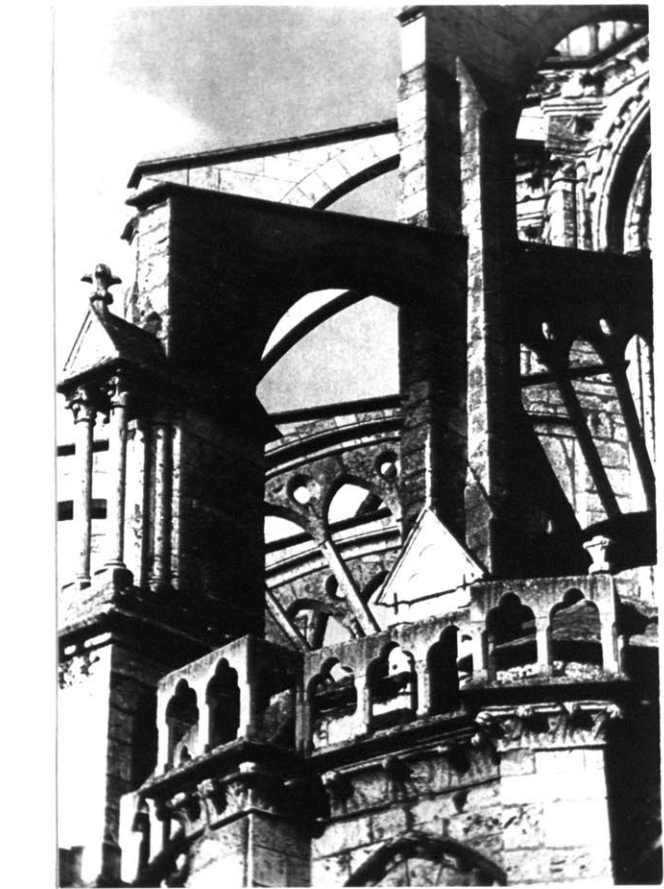
SURFACE-SCREEN TRANSITION, SURFACE DEPTH TO ACTUAL 2-SIDED PARTIAL TRANSPARENCY... MOROCCO



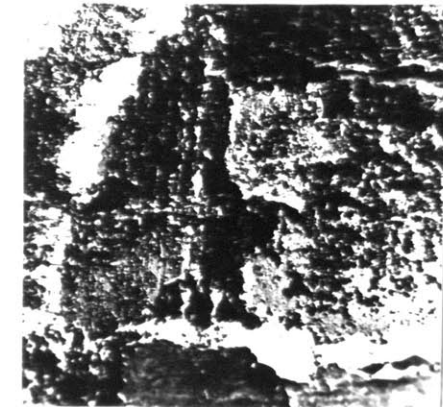
HABITABLE SCREEN FRANCE



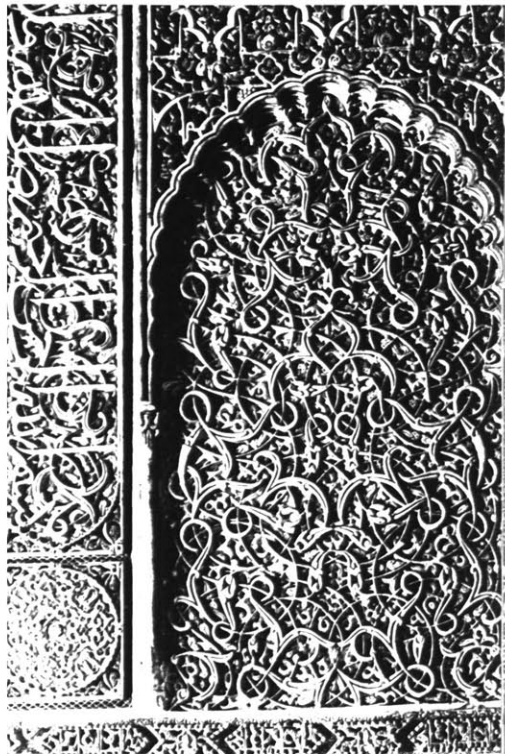
TRANSITION FROM DEEP SURFACE DEPTH TO ACTUAL 2-SIDED SURFACE WITH INSIDE/OUTSIDE CONTINUITY... INDIA



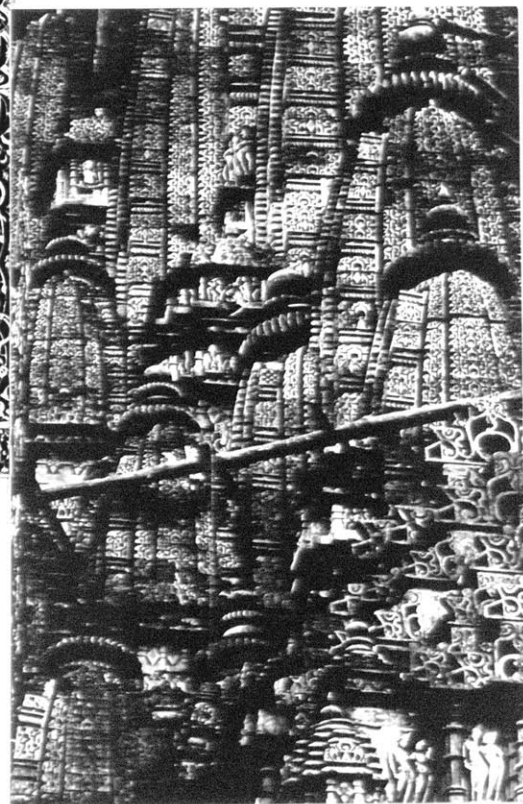
LINEAR/SURFACE ASSEMBLAGES A RANGE OF PARTIAL ENCLOSURES WHICH ACTUALLY CONSTITUTE A HABITABLE SURFACE... FRANCE INDIA



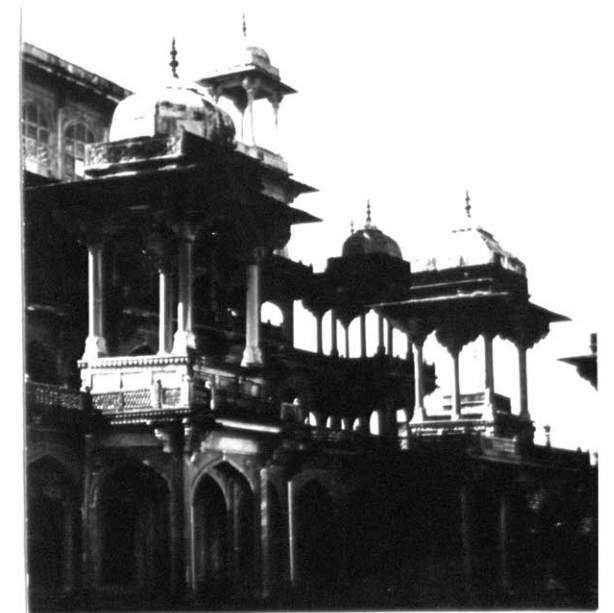
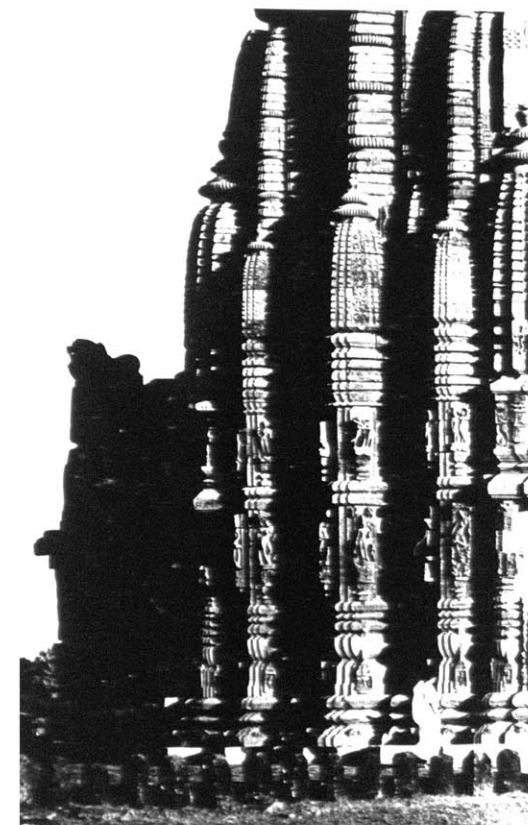
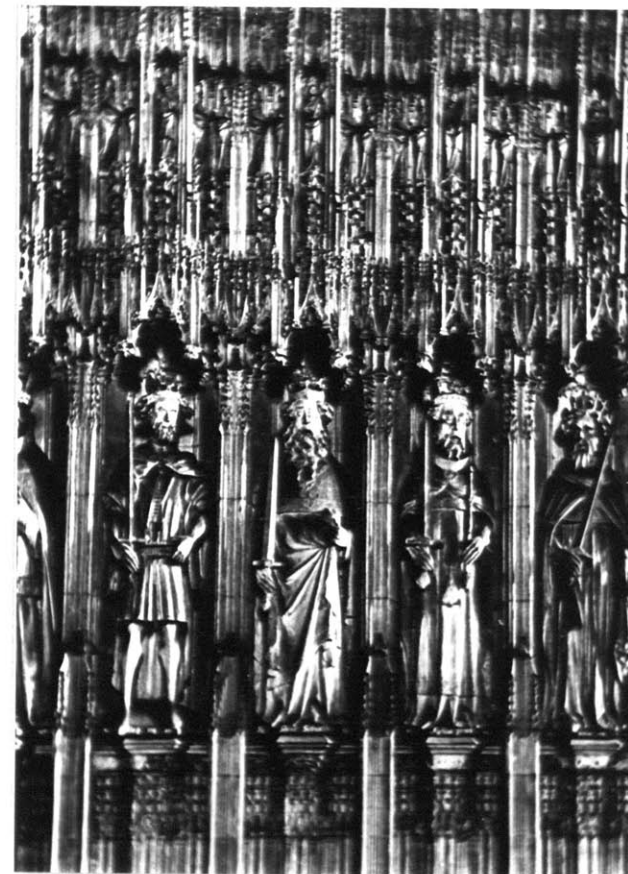
NATURAL SURFACE EROSION



SURFACE RELIEF TO POTENTIALLY HABITABLE SINGLE SIDED SURFACE... MOROCCO INDIA



HABITABLE SURFACE ENGLAND



RELIEF SURFACE MOROCCO

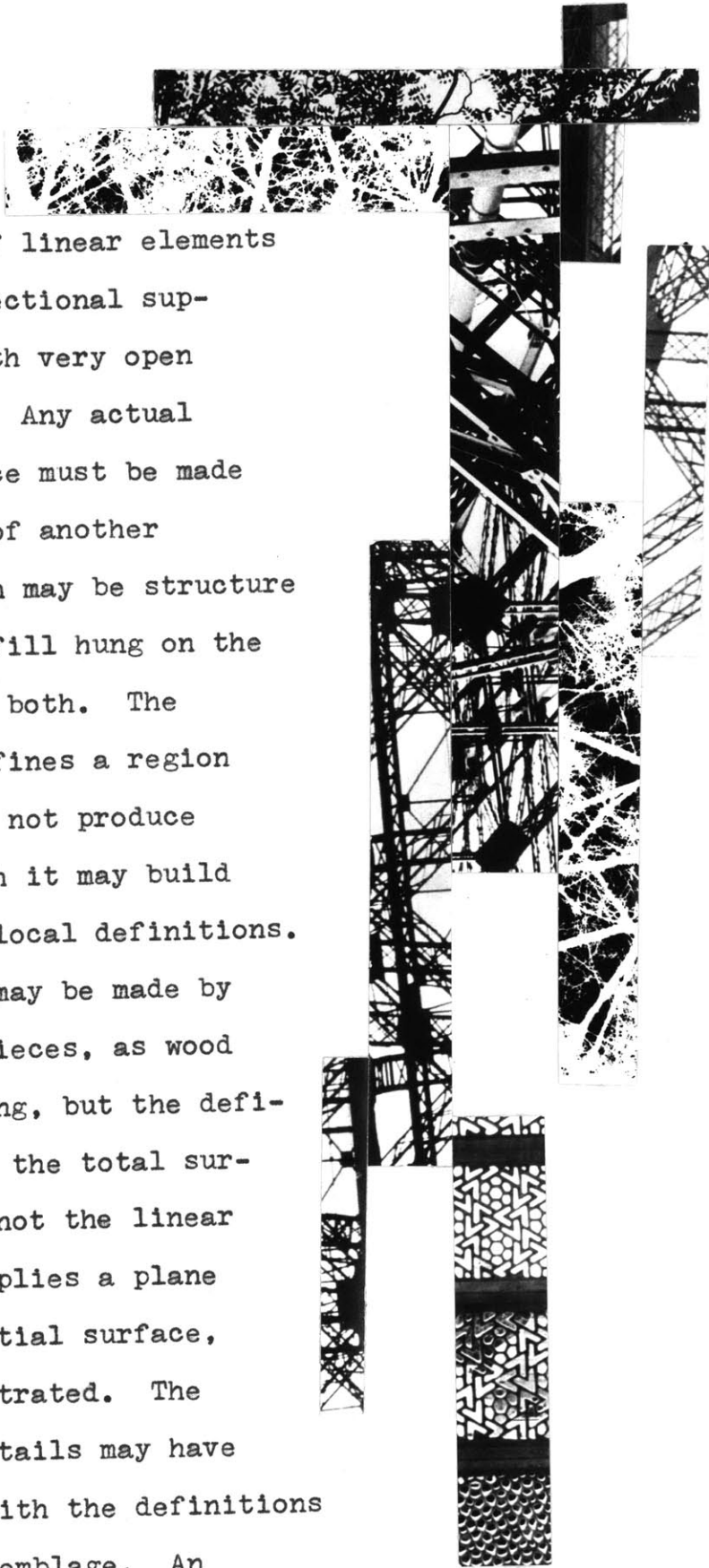


LINEAR & SURFACE
RECIPROCAL DEFINITIONS...
A SENSE OF PLACE WITHOUT
A SENSE OF ISOLATION...
A CONTINUOUS FIELD...



LINEAR ASSEMBLAGES:

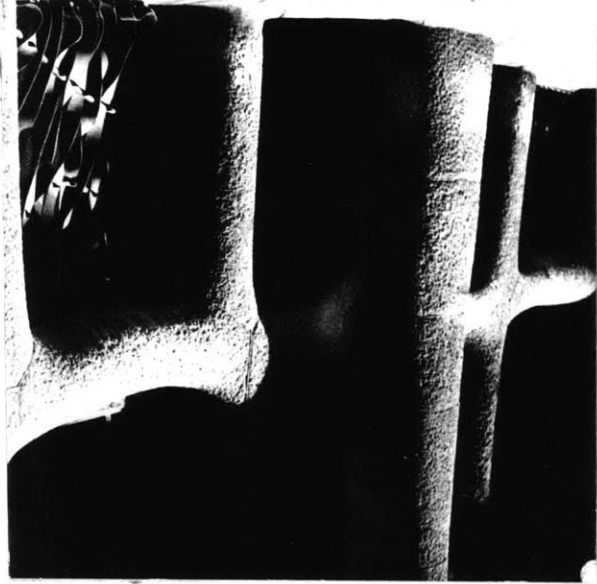
An assemblage of linear elements is essentially a directional supporting structure with very open spatial definitions. Any actual closure or use surface must be made by the introduction of another building system which may be structure in its own right, infill hung on the linear framework, or both. The linear assemblage defines a region of space but it does not produce enclosure even though it may build up into very strong local definitions. Actual use surfaces may be made by building up linear pieces, as wood decking or wood siding, but the definitions then made by the total surface as a plane and not the linear pieces. A screen implies a plane but it is only a partial surface, being spatially penetrated. The actual connection details may have a great deal to do with the definitions made by a linear assemblage. An



NEW JERSEY



INDIA



INDIA



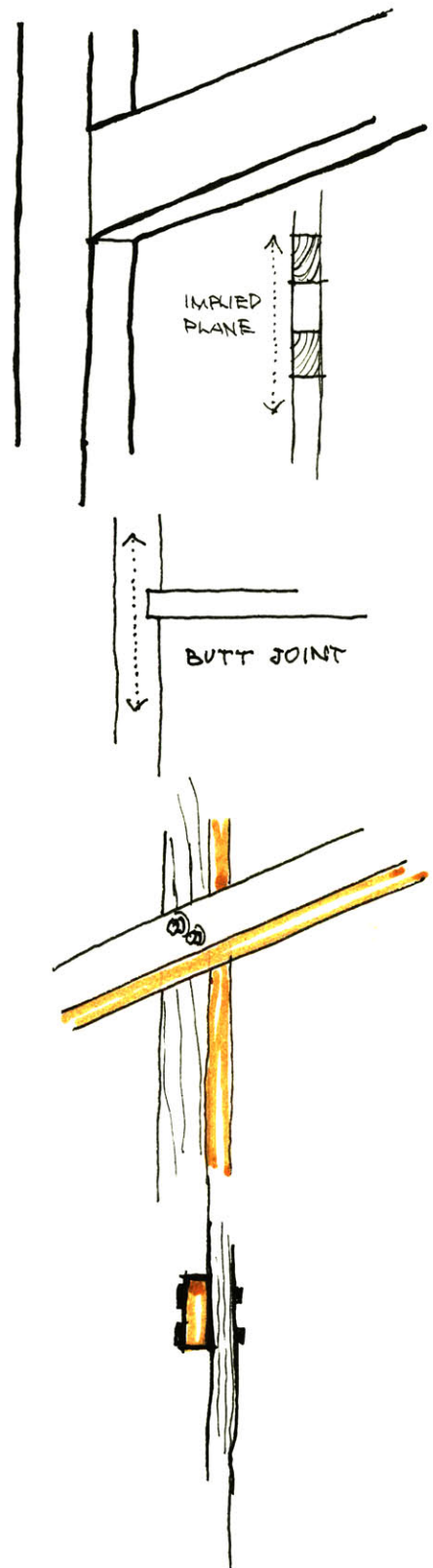
RECIPROCAL LINEAR/SURFACE DEFINITIONS...

NEW JERSEY



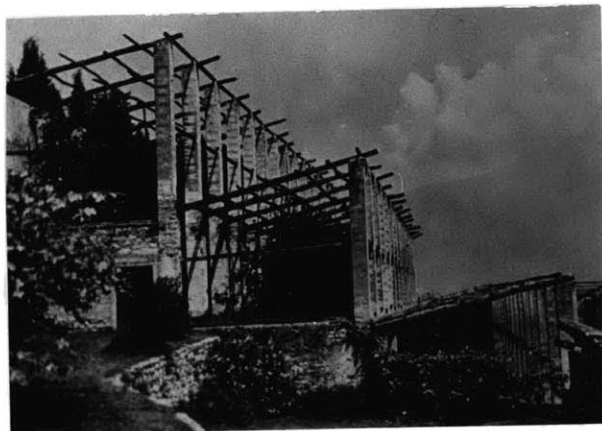
in-plane connection with the edges in the same plane imply a planar surface. The only spatial definition results from the thickness of the pieces, and this trapped space is contained within the planes established by the common edges of the pieces. A butt joint always implies a major direction because one piece is continuous. The introduction of a third piece to provide continuity through the joint is necessary to make a good butt joint unless one is able to weld which makes a physically continuous joint.

Out-of-plane connections allow each piece to be continuous through the joint, not emphasizing any direction. The actual connection is made through a large shear surface to give great continuity, and depending on the shape of the section, additional pieces are not necessary. Formally a local concavity is produced which may be of a use dimension if the members are large enough. Off setting a column may help decrease the moment as well

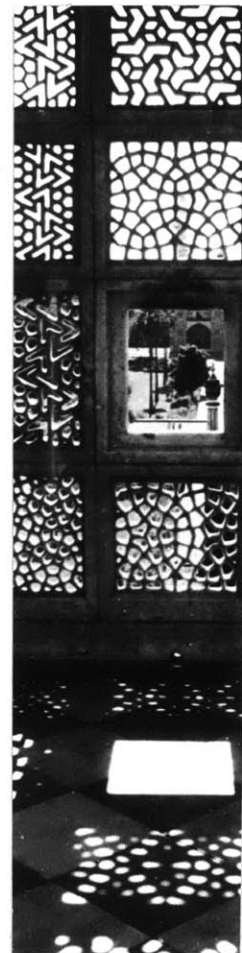


as making a useful concavity in the structure. Generally the out-of-plane connection is much more spatial because it potentially effects a larger region of space which is not defined by implied planes.

A screen is an open partial definition built up of linear members. The total assemblage usually defines a plane or a planar region of space. The openings in the screen are often filled with glass or an opaque material to produce varying degrees of enclosure. A screen can be built up into a three dimensional spatial framework which could be habitable if infilled with other systems. A large truss is an example of a screen with habitable dimensions.



AN INDIAN
SCREEN
OF STONE

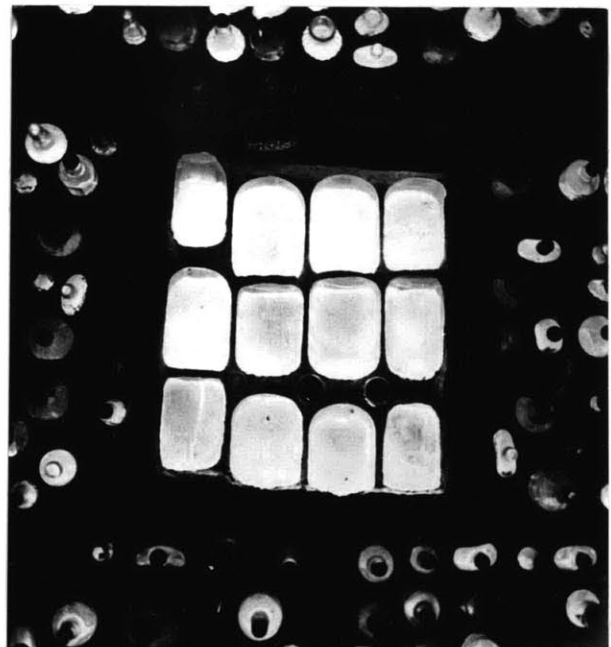




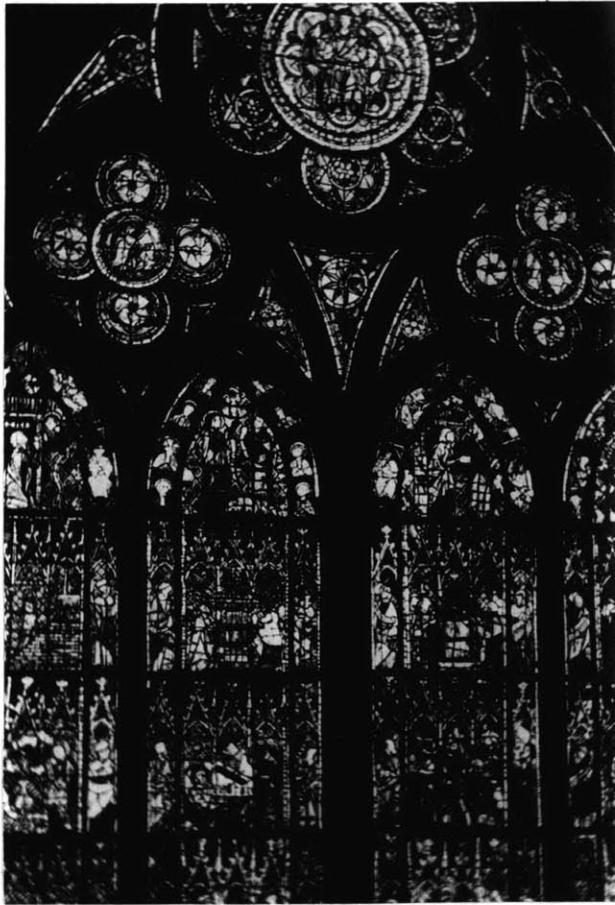
SPAIN

SCREEN DEFINITIONS ...

ACTUAL & IMPLIED SURFACES;
DEGREES OF CONTAINMENT;
WALL - SCREEN & SCREEN-WALL ...



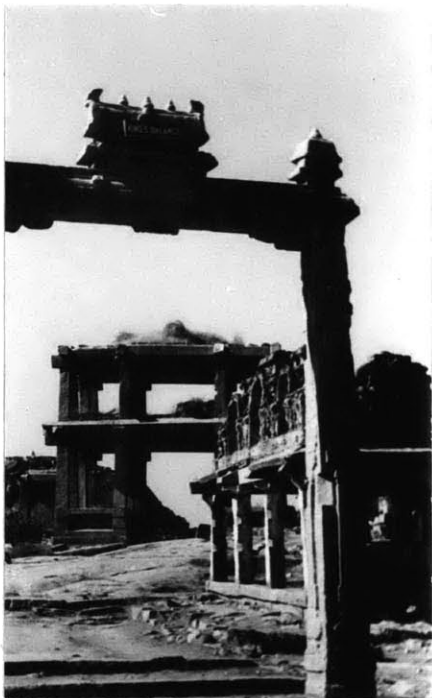
USA.



FRANCE

SCREEN SURFACE; QUALITY OF
LIGHT/DARK, LARGE/SMALL DEPENDS
ON DIRECTIONALITY AND RANGE OF
SIZE OF INDIVIDUAL PIECE AS WELL
AS OVERALL ORGANIZATION....
10,000 LOCAL DECISIONS.....





INDIA



JAPAN

LINEAR ASSEMBLAGES..
HABITABLE SCREENS....



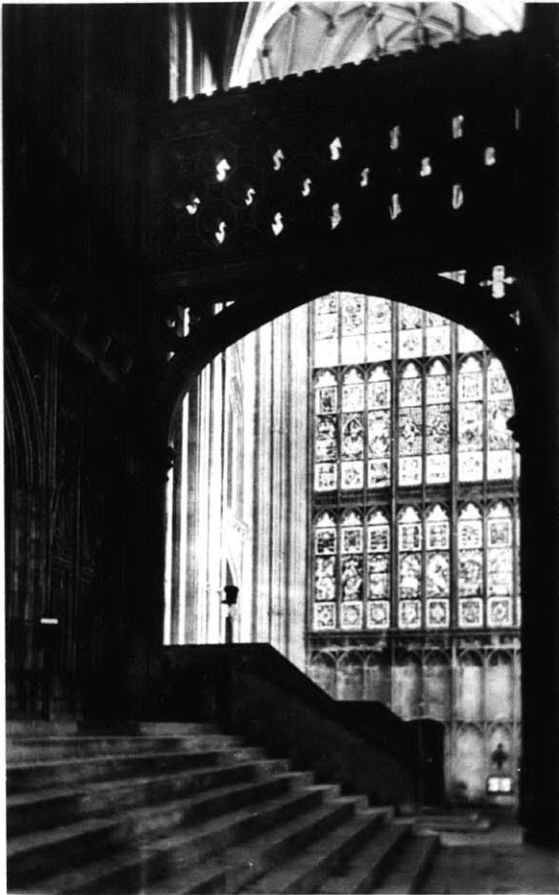
PARIS



SCREEN-STRUCTURE
PARTIAL DEFINITIONS



FRANCE



ENGLAND

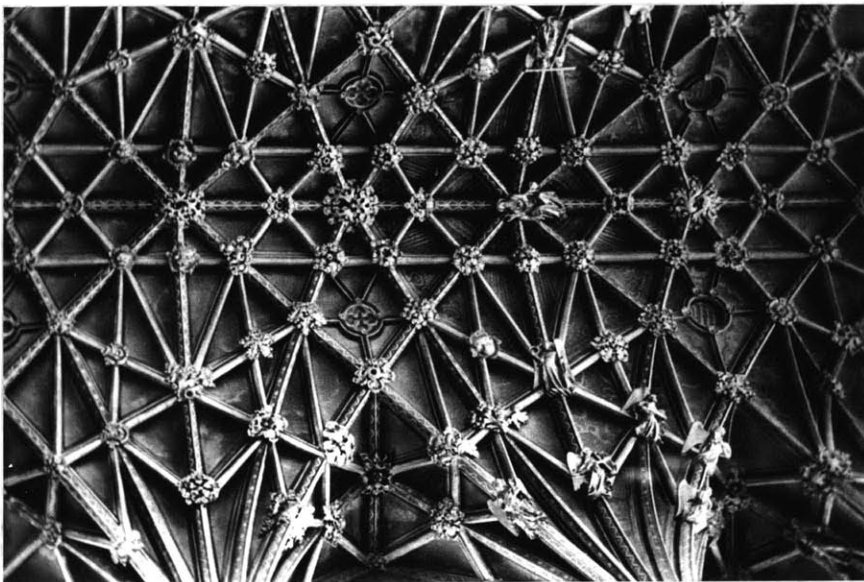
SPACIAL SEQUENCE CREATED
BY DIFFERENT LIGHT QUALITIES
OF INTERCHANGEABLE
BUILDING MATERIALS & METHODS. -
SPACIAL CONTINUITY OF
INSIDE & OUTSIDE ...

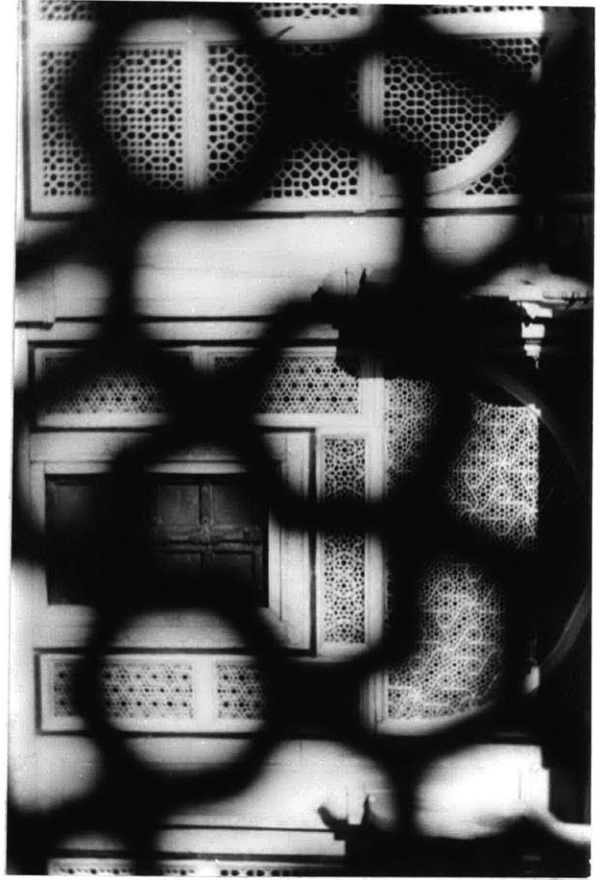


MOROCCO



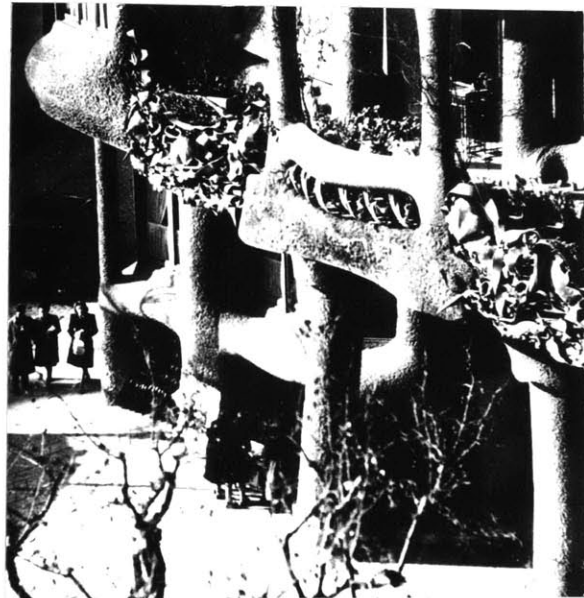
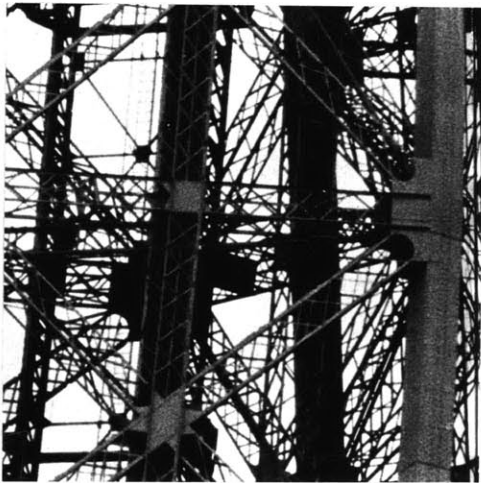
LOCALLY CONTINUOUS SURFACE
& INFILLED LINEAR SCREEN....
ZONES OF ENCLOSURE RATHER THAN A HARD EDGE...





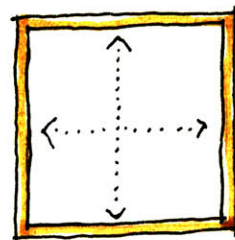
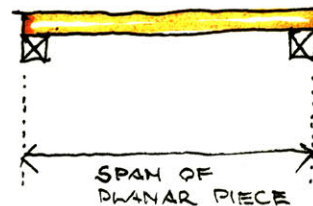
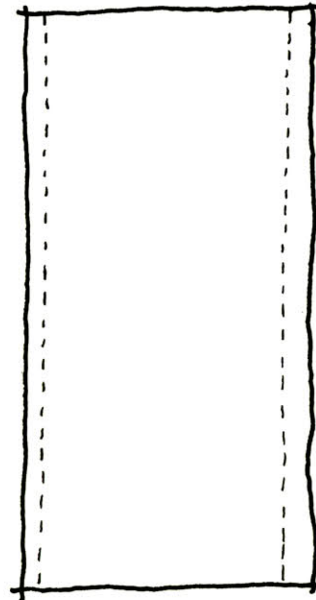
HABITABLE SCREENS & FRAMEWORKS

MULTIPLE SENSE OF SPACE & STRUCTURE,
RATHER THAN SINGULAR... ALWAYS SEEMS
TO BE MORE THAN THE MINIMUM...
NICE...
WHERE DO YOU WANT TO LIVE?



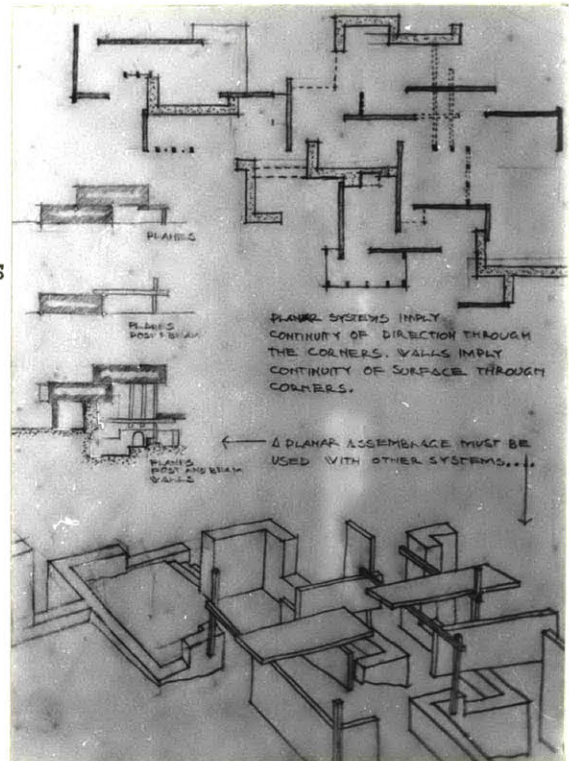
PLANAR ASSEMBLAGES

A planar piece has a constant thickness which is not of usable depth and has a two sided reference since one always knows where the other side is. A planar piece is a directional piece due to its inherent structural uses. Its thinness relative to its extent means that it has to span short distances, but its nature as a surface leads it to making large surfaces. Consequently it has to be reinforced or supported in a long direction. This one way support gives the piece a directional shape because a square shape is most efficient for a two way structure. A two way structure is best made in a continuous material like concrete. A planar assemblage must be used with another system to make complete definitions. A panel is a planar piece of specific dimension, and panel infill



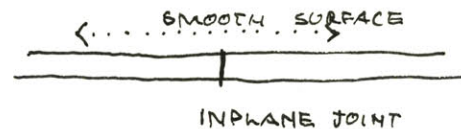
2-WAY PANEL

systems have been widely used. The characteristics of a panel become clear if one considers the methods of joining or adding panels to form definitions. It is clear that planar systems imply continuity of direction through corners as contrasted to walls which imply continuity of surface around corners. A typical planar piece is plywood.

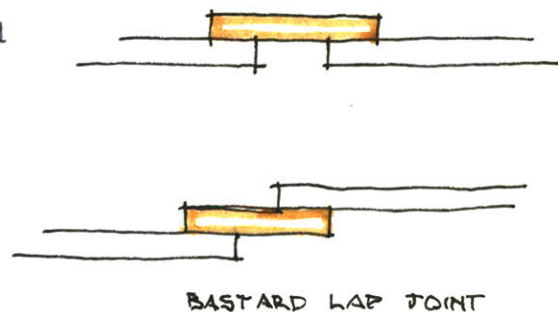


PANEL JOINTS

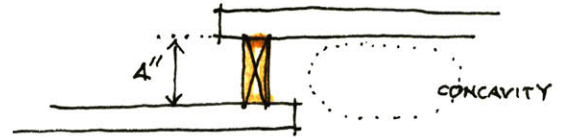
The in-plane joint creates a continuous surface. It is often a difficult joint to make which requires much hand finishing to the built up surface locally continuous.



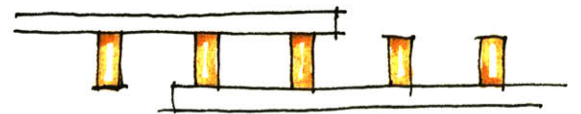
A lap joint is an out of plane joint which makes a continuous surface with a local discontinuity at the joint. The introduction of a third piece is necessary to make an in-plane lap joint. Lap joints are easier to make as exact fitting of the pieces is not critical.



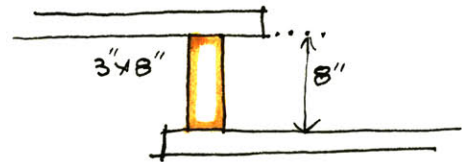
This lap joint makes use of the stiffening member needed by the panel. The four inch jog begins to be of a use dimension.



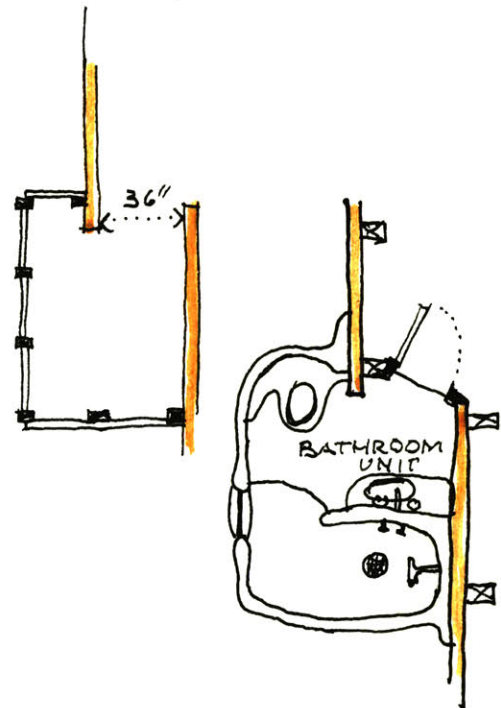
This common building method (wood frame) could be used to make panel definitions instead of a continuous surface by exposing the studs. The studs could then be used.



If the studs are spaced farther apart and made larger a real useable depth could result. Panels might be 2" thick.



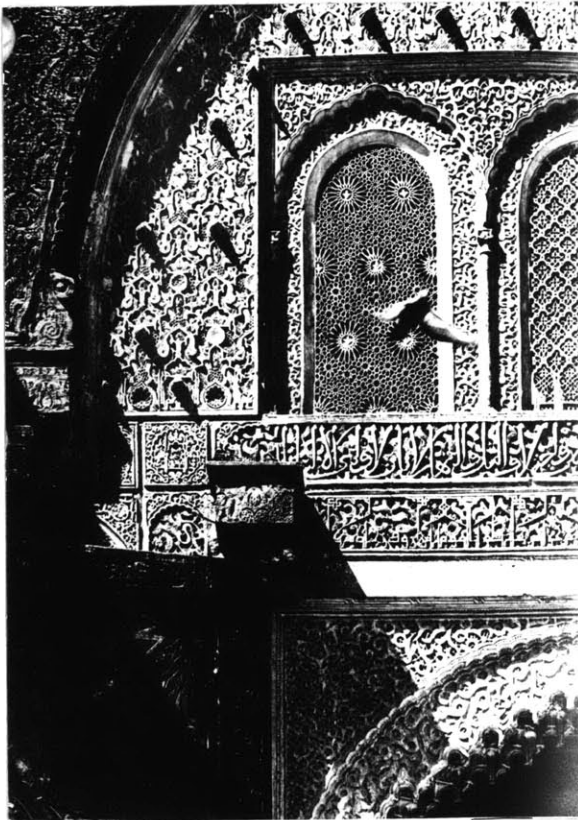
If the concavity is needed it may be increased and the third piece making the joint will become a built up space in its own right. It could be linear pieces or molded as a continuous piece.



Slipping the planar definitions is a way to get through.



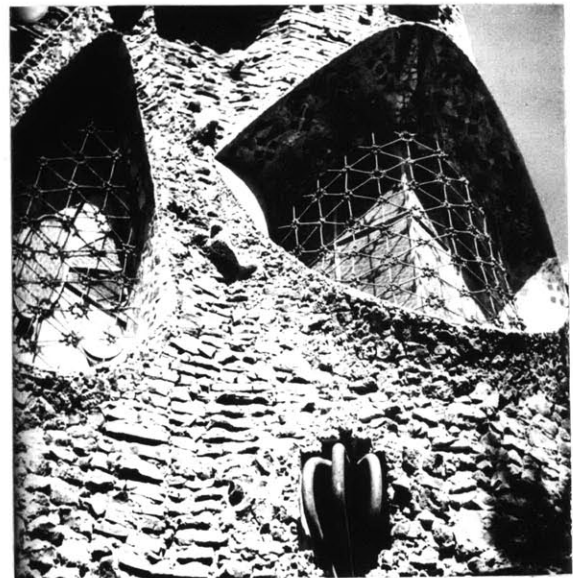
SCREEN - SURFACE
RELATIONSHIPS...



TANGENTIAL COMPLETION; MOVABLE
PORTION OF CONTINUOUS SURFACE...
MOROCCO



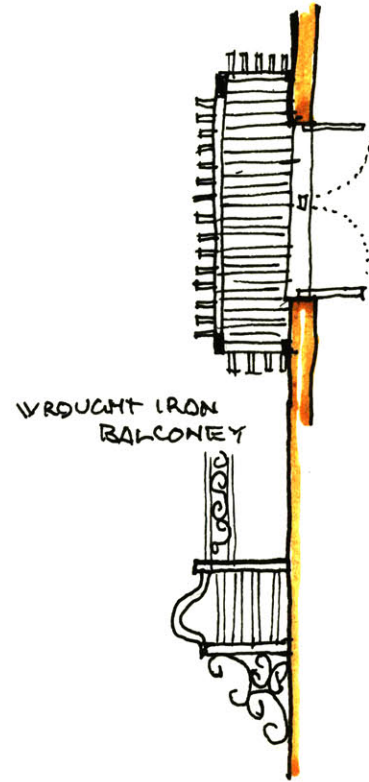
PARTIAL COMPLETION; PLACE DEFINITION IN
LARGER DIRECTIONAL ORDER...
MOROCCO



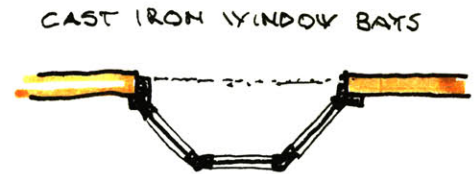
MULTIPLE COMPLETION; LOCALLY THICK
INSIDE/OUTSIDE CONTINUITY...
SPAIN

CAPSULES

Capsules are premade completed partial definitions which may be added to another system to complete closure. It is essential that the capsule not be a complete definition by itself because it would not add and become an isolated cell. An automobile is an example of a completed capsule. Critical to the usefulness of such a premade piece is ease of transportation. Presently this puts a physical limitation on the size of the piece of about 60' x 12', the size of a mobile home, but this limitation is variable as transportation methods change. The advantage of this building method lies in the production of the piece. As a premade partial definition, it is particularly adaptable to parts of buildings requiring highly skilled labor. For instance, parts of housing such as bathrooms and kitchens could be made in a factory and shipped to



WROUGHT IRON
BALCONY

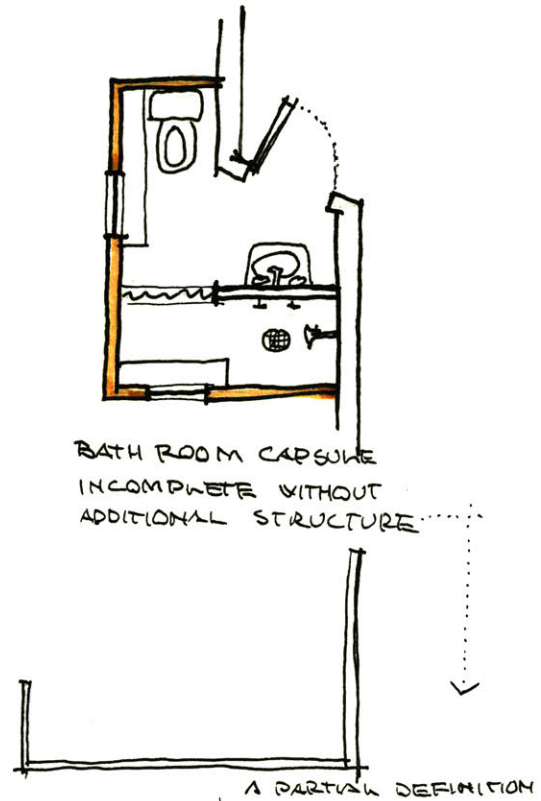


CAST IRON WINDOW BAYS



AIR STREAM TRAILER ~
ENCLOSED COMPLETE
CAPSULE.

a site where the rest of the structure is being built, or already built as in the case of a rehab project. Plumbing, fixtures, and much wiring could be installed in the factory on a production line basis (economical), with effective quality control. This technique may be particularly useful for reducing the cost of housing.





a
beginning...