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Self-Help Housing in Egypt:

A Student Design Competition

Ömer Akin

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SELF-HELP HOUSING IN EGYPT:
A Student Design Competition

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July 1980

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Layout was done by Oruc Cakmakli.

Omer Akin, June, 1980.

1. Introduction

This is a documentation of a student competition on a self-help, expandable, housing development near Cairo, Egypt. The housing project is funded by the Government of Egypt (GOE) and the United States Agency for International Development. Presently, the Foundation for Cooperative Housing (FCH), a Washington based firm, is undertaking the planning and design of the project for USAID. The student competition was sponsored among the students of architecture at C-MU due to a collaboration between Charles Dean of FCH and Louis Sauer of Carnegie-Mellon University (C-MU), Pittsburgh. Pa. The student proposals included in this document represent a sample of their response to a real-world problem in a context that is culturally remote, for most of us.

The problem and its immediacy for the North-American architect, however, is very real. Increasingly experts of the western world, knowledgeable about the problems facing the housing sector, are getting involved in design problems in the Middle East and the Third World. The reasons for this involvement are many and complex.

A primary force in the picture is that most of these nations are facing very urgent and acute problems of housing shortage. Often this shortage is linked to societal forces that influence the demand side of the problem; i.e., pseudo-urbanization, population increase, as well as the supply side; i.e., shortage of funds, technology and other resources. Even in those cases where the financial circumstances are not a hindrance, i.e., Saudi Arabia, Iran; the technical, industrial and even the cultural make-up of these nations prohibit the finding of remedies without international cooperation.

There is clearly a demand for western expertise in finding technological and managerial solutions to housing problems in Egypt, India and countries with similar difficulties. The problem is one of long-term consequences and cannot be solved by simply importing technology or foreign aid. The permanent cure lies in developing technologies that will utilize local resources (human as well as material) efficiently, maximally, and at a level of output that will reverse the tide of increasing demand. This work is a small part of a much greater effort by GOE, USAID and FCH to find such a cure.

The competition was intended to serve several purposes. On one hand, it was a device for exploring a real-world problem in an academic context. We expected this to simplify some of the complex real-world constraints of the problem and lead to its innovative reformulations. We also hoped that the competition would bring the real-world context of housing into the design studio, allowing students to view design in an entirely different light; to see that housing is as much a human, technical,

financial and management problem as it is a formal one. The most valuable contribution of this effort has been to impress young minds with this notion.

A brief description of the problem objectives, its site and its program will be provided in the next section entitled "Problem Objectives." The section following this, entitled "The Competition," contains three projects that were awarded by a jury of teachers, planners, and architects. In the final section, entitled "Learning from a Competition," a description of the jury proceedings and the pedagogic value of the exercise are included.

2. Problem Objectives: Housing for the Poor in Egypt[1]

The need for housing in urban Egypt is one of the more pressing of the developing world. Growth is estimated at 4% for urban areas as opposed to 2.5% for the country as a whole--much of it attributable to rural migration. Over 1000 new migrants crowd into Cairo each day. Reports indicate that demand will double over the next 10 years. In addition, much of the existing housing is substandard, over-crowded and lacking in elementary water and sanitary facilities.

There have been a number of reasons for the shortage of housing and the substandard quality of much of the existing housing. Perhaps one of the most important factors has been an unfavorable investment climate owing to GOE rent controls, regulatory and bureaucratic procedures, as well as a lack of financial assistance for low income groups. Other important factors have been the destruction of housing in the Suez Canal area as a result of the 1973 war, the drain on the GOE budget of large defense expenditures, and the unavailability of land, construction materials and labor (the last factor due in good part to migration of skilled Egyptian labor to nearby Arab countries).

Up to the present, Egyptian housing has been provided through largely uncoordinated efforts of public and private sectors. The GOE approach to housing has been concentrated on the construction of large, five-storey walk-up apartment buildings, designed in size essentially to middle-class needs, but (owing to rent control and resulting tendency of occupants to sub-let) densely crowded with middle-class and lower income people. Little attention has been given to vital social services such as schools and health facilities. In addition, little or no maintenance has been provided, with adverse effects on health and sanitation. Most importantly, however, because of heavily-subsidized nature of public housing and continually rising construction costs, the GOE budgetary resources devoted to housing, even though increasing, are clearly inadequate to the needs of Egypt's poor.

Much less is known of private sector efforts. As previously noted, due to a lack of financial incentives and restrictive government controls, private sector construction was limited for years but has recently revived. This activity has manifested itself in two ways: first, in construction of luxury apartments which are in growing evidence throughout Cairo, funded in large part by expatriate worker earnings and; second, through the so-called "informal" or non-regulated sector. The latter sector provides for the housing needs of much of Egypt's urban poor but, for the most part, under substandard conditions

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[1]This section is an extract from the "Project Papers" prepared by the Foundation for Cooperative Housing

which lack adequate urban facilities such as water, sewage and often electricity. As evidence that private sector housing is frequently inadequate, each year over 12,000 units collapse in Cairo, many of these recently constructed.

The GOE continues to place high priority on meeting the housing needs of its population--particularly the poor. She also recognizes that a new approach is required which combines the resources of the public and private sector in a coordinated fashion. In response to a request from the GOE, USAID financed a series of studies of the housing market in 1976 and 1977. Growing out of these studies was a series of policy changes on the part of the Government and a number of jointly-agreed-upon working objectives between the GOE and USAID. Paramount among these were:

- An agreement that the GOE's emphasis in its housing program would be switched from middle to low income families.

- Public sector housing subsidies should be reduced by reducing the size of housing, land and supporting facilities to accommodate lower income groups, as well as recovery of costs from the target population.

- Subsidies should be distributed as to the ability of beneficiaries to pay in a manner which clearly demonstrates the cost and extent of subsidization.

- A housing finance system with a rationalized interest structure would be extended to the lower income groups.

- Encouragement would be given to mobilize private savings to be invested in the private sector.

- The private sector would be encouraged to participate in all aspects of the housing program.

- Lower and flexible planning and building standards would be developed to accommodate housing for target groups.

The purpose of the GOE-USAID Housing Project is to demonstrate the premise of a proposed new housing policy. This policy states that basic housing and community facilities, which are socially acceptable, can be provided for low-income families at a price they are willing to pay and that results in a substantial recovery of GOE's investments. The success of the project should enhance the ability of the entire Egyptian housing sector, both public and private, to respond to the

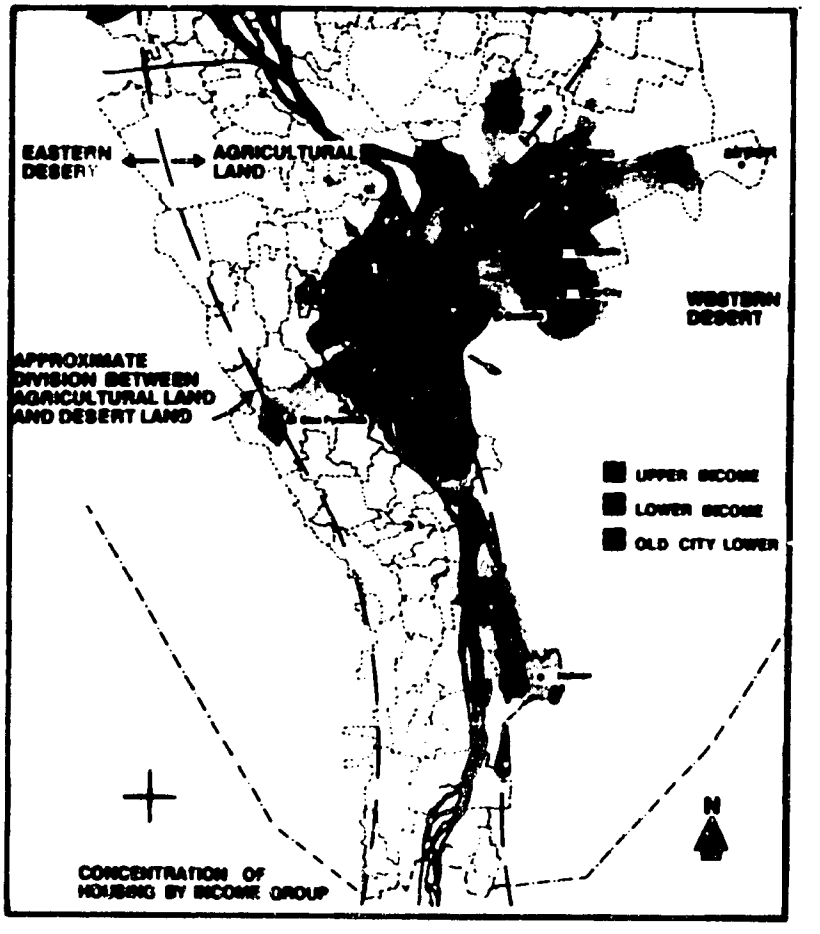


Figure 1: Cairo Metropolitan Area

shelter and community development needs of the urban population, particularly low-income households.

Drawing upon a combination of pubiic and private resources, the GOE-USAID project will attempt, through an integrated, comprehensive program, to demonstrate the viability of this new approach to housing policy in Egypt. The primary project element we are studying here is a new housing program which should present a viable alternative to the five-storey walk-up.

2.1. Site Location

The site of the target development is located in Helwan, which is an industrial center 27km. south of the Cairo metropolitan area (figure 1). A master plan for the Helwan area is available and is used to guide the proposed landuse, settlement and urban movement patterns (figure 2).A more detailed topographic parcel map shows Parcel A, the location targeted for the new development (figure 3).

New urbanized land in the desert is to be developed, utilizing

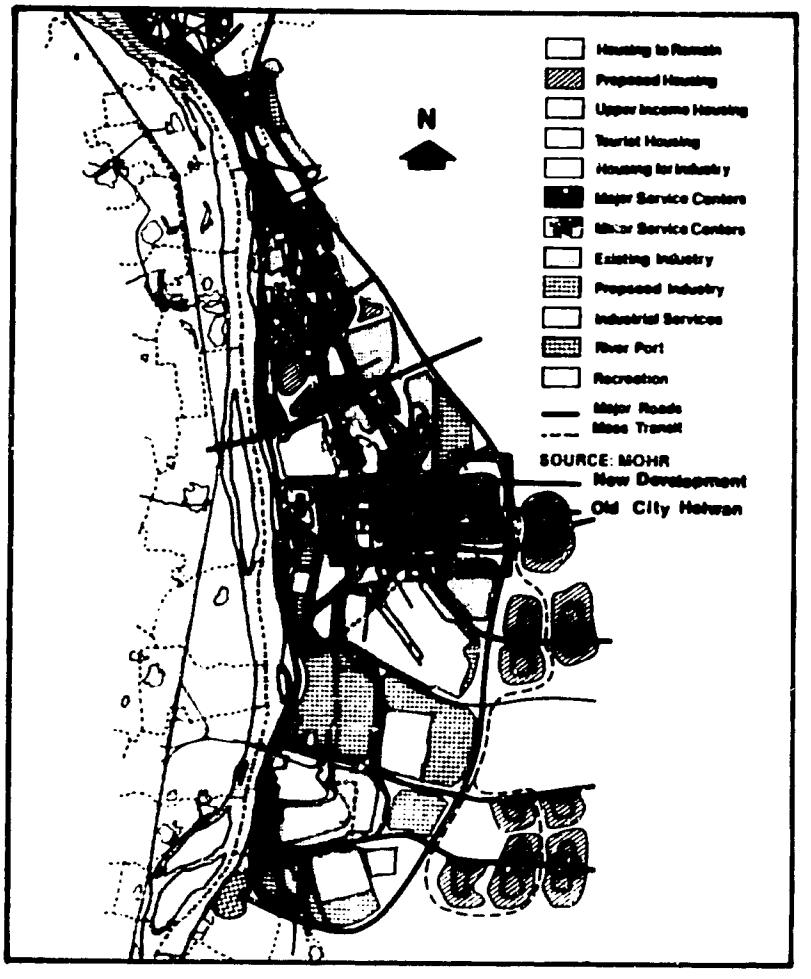


Figure 2: Helwan Area Master Plan

appropriate site planning concepts to provide an individual lot or unit to each beneficiary family. The program of the GOE will be carried out on 160 hectares in Helwan. New housing in this location has a high priority to reduce the commuter load of 80,000 workers who travel each day to Helwan from Cairo.

2.2. Site

The site of the project was selected based on several criteria; a) suitable size for the proposed development, b) topography that minimizes site operations, c) clean air quality, d) accessibility to places of employment, e) soil conditions suitable for informal sector construction, f) exploitation of desert land. The site selected for the development meets all criteria. It is adjacent to existing informal housing developments to the west, a major highway (King Khalid Highway) to the east, new industry to the north and recreation facilities to the south (figure 2). The proposed site will have two major traffic arteries going through the center connecting to the old city Helwan and the King Khalid Highway, with communal facilities and major commercial establishments located around them.

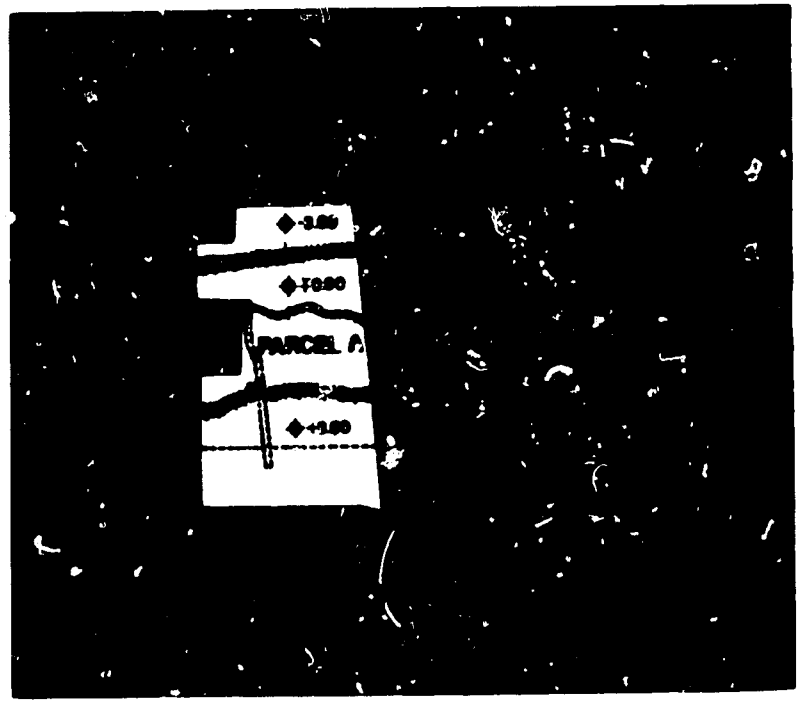


Figure 3: Site: Parcel A on the Parcel Map of Helwan

2.3. Climate

The critical climatic factors in the Helwan area are high temperatures, direct radiation of the sun, counter cyclical dust-bearing winds from the south-west for 50 days a year and scarcity of vegetation. Indigenous architectural solutions provide some answers for these issues; such as natural cooling, solar orientation, court-atrium layouts (i.e., the "RABAA"), fenestration and shading devices.

2.4. Program

A community of approximately 7,000 lots will be developed in Parcel A, indicated in figure 3. We shall call this the target community in the remainer of this document. Each lot will range from 900 to 1,100 square feet and will eventually house 2-3 families in a maximum of three storeys. The community will support schools, health and social welfare centers, places of worship, places of public recreation and numerous small commercial establishments. The development will materialize in 5-7 years.

2.5. Unit

In the Helwan area, on the average, two households occupy each lot. The average size unit is 700 square feet. Half of the existing dwellings support single households and the average number of persons per room in each household is 2.5.

2.5.1. Flexibility and Adaptability

Due to the nature of the family composition, cultural ties and the informal building sector, "flexibility of use" and

"adaptability of the construction process" to changing market conditions are central to the housing problem. High density necessitates the multi-purpose use of rooms. Extended-family structure, coupled with the use of rental income for expansion of the dwelling unit requires the change of room use over time. Temporal changes in the building material, finances and skilled labor for construction requires that the building system be adaptable to these changes.

2.5.2. Family Structure

The average household size in Egypt is 4.8. However, the family structure among migrant communities, such as Helwan and rural Egypt, is of the extended-family type with 5.8 members per family on the average. Most families include members of three generations under the same roof.

The median income of the low-income urban family in Egypt is $812/yr. A minority of the country's population participate in the labor force (31.5%). 52.9% of the male and 9.2% of the female population belong to the labor force. Almost all of the married female population is unemployed and attend domestic and child-rearing activities. On the average, 10% of the total earnings are expended towards housing needs.

Privacy is a critical issue, underlying life styles and taboos in the daily routine. Some critical needs are:

1. Screening visitors at the outside, or front door, from interior domestic activities.

2. Separation of husband's guests from the rest of the domestic activities.

3. Screening the toilet from living areas.

4. Visual control of the front street with maximum privacy from street.

5. Separation of backyards and parts of the units used for raising domesticated animals; i.e., chicken, goat, donkey, etc.

2.5.3. Unit Design

Dwellings have to reflect the financial limitations of the population. Within this framework, workers with higher income will be able to afford "higher cost and more comprehensive" solutions than the minimal dwelling unit. Planning for post-occupancy expansion, privacy and climate is imperative. Provisions for commercial functions on ground level should be made. A small lot in the back must be provided for outdoor functions, such as keeping animals, laundry, child-care, etc.

2.6. Informal Housing Sector

Presently, the informal sector accounts for over half the

current construction in Egypt. It accounts for virtually all of the construction activity for the urban poor. The land is usually illegally obtained or provided by land speculators. Construction means are primitive and partially undertaken by un-skilled labor. Many ingredients of self-help housing are a part of the present informal housing sector in Egypt.

2.7. Ownership

Half of the lots developed will be managed through a cooperative system. Owners will participate in building, financing and maintenance programs developed by the government. The other half of the lots will be equipped with minimal cores --kitchen, bathroom, and room-- and will be sold to individual families. Construction cost of the cores (or equivalent) of both developments will not be greater than $5,000/unit.

Design guidelines will be provided for future expansion of these units into 2-3 storey structures, with added capacity for a commercial function and/or two family units. Half of the additional units (7,000 units) will be rentals and the other half will house other members of the extended family.

2.8. Culturally Compatible Housing

Indigenous housing in Egypt represents solutions to the housing problem which have been tested and refined over time. These traditional solutions fail to accommodate new developments and needs of the society; i.e., rate of increase of population, modes of transportation, division of labor, availability of materials, etc. This is why there is a housing problem in Egypt.

New solutions, on the other hand, have often provided "minimal-shelters" and have fallen short in terms of compatibility with the cultural and climatic needs of the area. Hence, solutions must respond to socio-cultural patterns incorporating indigenous design notions in the context of innovative and technologically superior applications.

2.9. Public Life

The public domain is truly public in the Arabic cultures. One is not to expect nor respect private and personal use of public areas. The main social life of the male is to attend "coffee-houses " Children of ages 8 and up expend most of their free time for games and sports; i.e., soccer. In the process of transition from rural to urban life, women have lost their social gathering place, the "public fountain," to plumbing technology and poor site design. Although no new mechanism has developed to replace it, some candidates exist -- i.e., community centers, health clinics, child-care centers, etc. Younger children also have no medium for social interaction and daily care in the community.

The new development in Helwan is expected to support the

following public facilities: Community Health Center (3,000 m^2); two Preparatory (Junior High) Schools (2,000 m^2 each); ten Elementary Schools (2,000 m^2 each); Social Center (1,200 m^2); Cooperative Administration and Community Development Office (600 m^2); Vocational Training Center for Construction Trades (5,000 m^2); Post Office and Fire Station (800 m^2); Open Market Plaza and Covered Bazaar (8,000 m^2); twelve places of worship (500 m^2 each); 20 playgrounds and parks (3,000 m^2 each) and 100 small commercial establishments (20-30 m^2 each). Most small commercial establishments consist of one room on the ground floor of residential structures facing main access ways.

2.10. Neighborhood Layout

The new development is being planned by FCH, using the super-block principle. Either of the two ownership systems; a) Cooperative housing or b) Self-help, expandable housing on individuals lots, can be selected for detailed development. In either case, the overall gross density of 75 units/hectare will be observed. The overall layout will conform to figure 2. A portion of this layout, including 300 lots, 1 playground and park, 5 shops, 1 kindergarten, minor access arteries, pedestrian ways, and utility distribution layouts must be developed as proposed in the detailed solution. The relation of this area to all main access arteries must be shown.

2.10.1. Block Layout

Some recent applications in low-cost housing in Egypt are hi-rise; attached, row, walk-ups; and clusters. The first one is regarded as a culturally incompatible model in Egypt, based on the experience of the GOE. The second solution is considered ineffective in creating a culturally acceptable sense of community, based on the informal sector's recent applications. Consequently, new forms of block design are expected to be developed as part of the proposed solution.

"Best and the most appropriate elements of traditional Egyptian commodities for shade, privacy, land-use efficiency, reflection of national, cultural values, safety from vehicles and modern hygiene have to be demonstrated by the proposed design." [2]

2.10.2. Movement

Public transportation --trolleys and busses-- form the bulk of daily trips. Most of the population's place of employment is in Helwan, within 1-2 kilometers of their place of residence. Hence, the pedestrians constitute the majority of local traffic in the neighborhood. Vehicular and pedestrian traffic must be clearly separated. Private car is rarely the mode of travel. Since small commercial is mixed in with residential, daily grocery and shopping trips are also made on foot.

2.10.3. Infra Structure

Water, sewer, electric and solid waste disposal systems will be brought to each lot. Distribution of these services to various

parts of the dwelling is a function of cost, use and design. The community will have its own network of major and minor arteries connected to King Khalid Highway on the one hand and pedestrian ways leading to each lot on the other hand.

2.11. Building Systems and Materials

Although the load bearing, masonry and slab construction is the most common form; reinforced concrete frame construction is also a frequently used building system. With the government interest in mobilizing the housing industry, prefabricated building components using local materials, labor and simple technology would be acceptable for the proposed development.

The conventional building materials can be categorized under three classes: masonry wall, slab and doors-and-windows. Masonry wall types are: concrete block, shale brick, sand-lime brick and cut lime stone, in order of decreasing availability. By far, the most common permanent slab material used is reinforced concrete.

Availability of concrete is contingent upon market conditions. Doors and windows are made from imported wood and are costly. Salvage and reuse of these components from demolished building is not uncommon. [3]

2.12. References

1. Housing and Community Upgrading for Low-Income Egyptians. Joint Housing and Community Upgrading Team, pp. 17-26

2. "Project Papers" prepared by the Foundation for Cooperative Housing, Washington, D.C.

3. "Building Materials Survey" prepared by the Foundation for Cooperative Housing, Washington, D.C.

3. Competition

The program as outlined above was the basis of the work done by the students. Most of the concerns outlined above are equally significant in developing successful solution(s) for this very complex design problem. For students to respond to all of the criteria with equal emphasis, in the allocated time frame of two months, was very difficult, if not impossible. Therefore, the contestants were required to select at least one of eight criteria described below as their main focus. The focus of each student proposal is stated in the texts included with each project.

This is not to imply that the criteria not focused upon by each student were ignored. All students were expected to develop solutions which violated none of the criteria and demonstrated in-depth understanding of fundamental issues in the area of at least one criterion. A criterion was considered violated if the proposed solution could not be refined to respond to that criterion with reasonable resources and/or minor modifications.

The following were adopted by the jury as the criteria of evaluation for the student competition:

3.1. Criteria of Evaluation

- Site Planning: Is there a proposed physical order that supports and enhances: social interaction, informal outdoor life, pedestrian movement, distribution of services, and commercial functions?

- Ownership: Are the hierarchies of ownership and use reflected in the ordering of the environment? Are units identifiable through entry, form and territory definition? Is the hierarchy of residential - commercial and owner - rental expressed?

- Adaptation: Adaptation can be dealt with in three different levels: the block, the unit and the system. Is the proposed solution able to meet the changes needed in size of units, adaptation of existing facilities to different members of the extended family or different uses? Is the building system adaptable to fluctuations in the building sector, i.e., labor and materials?

- Climate: Does the proposed solution recognize and make use of walls, vegetation, orientation, and so on, in creating micro-climates and "comfort" conditions in the units? Are excessive temperature eliminated without the use of costly mechanical devices?

- Indigenous Systems: The present culture provides a wealth of techniques and images which are

proven to be effective in coping with parts of the housing problem. Is the proposed overall solution making effective use of these indigenous means through direct application, analogy or modified application? Are physical patterns of volume, plane and public elements -- i.e., streets, atriums, open areas -- effectively used? Are indigenous building components -- i.e., threshold, entry, windows, textures, furnishings -- effectively used? Are indigenous construction systems developed by the informal sector effectively used?

- Economy of Means: It is desirable to achieve maximum economy in means proposed for construction, use, site planning adaptation, climate-control, design for ownership, design with indigenous systems. On the other hand, fiscal economy is of prime importance. The average user is financially deprived. The only means of serving the user is to minimize cost, use of scarce materials and skilled labor. Is the block, the unit and the system proposed economically feasible?

- Functional Make-Up: Does the unit design respond to different family sizes and compositions? Is it responsive to needs of adaptation and functional change? Is it responsive to norms of use embedded in the cultural pattern?

- Construction: Are the proposed solutions buildable, given the present levels of skill, informal building industry, and availability of materials in Egypt? Are the materials used readily available, or available through labor intensive, cost-effective means of production? Can construction be carried out through self-help techniques?

3.2. Jury and Awards

Final proposals were presented on 20x30 illustration boards. The medium of presentation was not limited.

The competition was sponsored by the Foundation for Cooperative Housing (FCH), Washington, D.C. The jurors were Dr.Omer Akin, architect and teacher, Carnegie-Mellon University (C-MU); Juan Casasco, architect and planner, FCH; Louis Sauer, architect and teacher, C-MU; and Dr. Mona Serageldin, planner, Vigier-Nash Associates, Boston. The jury was chaired by Louis Sauer. The jury met on January 16, 1980 and awarded 1st, 2nd, 3rd places and two mensions to projects from a total of twelve entries.

The five students whose projects were found to be worthy of acknowledgement are: Gregg Clawson, first prize; Paul

DeCourt, second prize; William Walker (work not included in this volume), third prize; and mentions to Bob Bailey (work not included in this volume) and Stuart Suna. In the following pages three of the projects are illustrated. Each project is organized in three parts; a) community; b) cluster and c) dwelling unit. Each part is further broken down into text, diagram and architectural drawings. The texts are provided to reflect the intentions of each proposal.

3.3. First Prize: Gregg Clawson

3.3.1. Community

The community was planned using two models indigeneous to the Egyptian culture. The first is a macro-scale model taken from the bazaar route idea; an axis of commercial and public nodes. The second is a cluster type planning model, based on the desert-culture's traditional view of neighborhood or town; an inward facing group of dwellings shielded from the desert and facing an inner sanctum of plants and water.

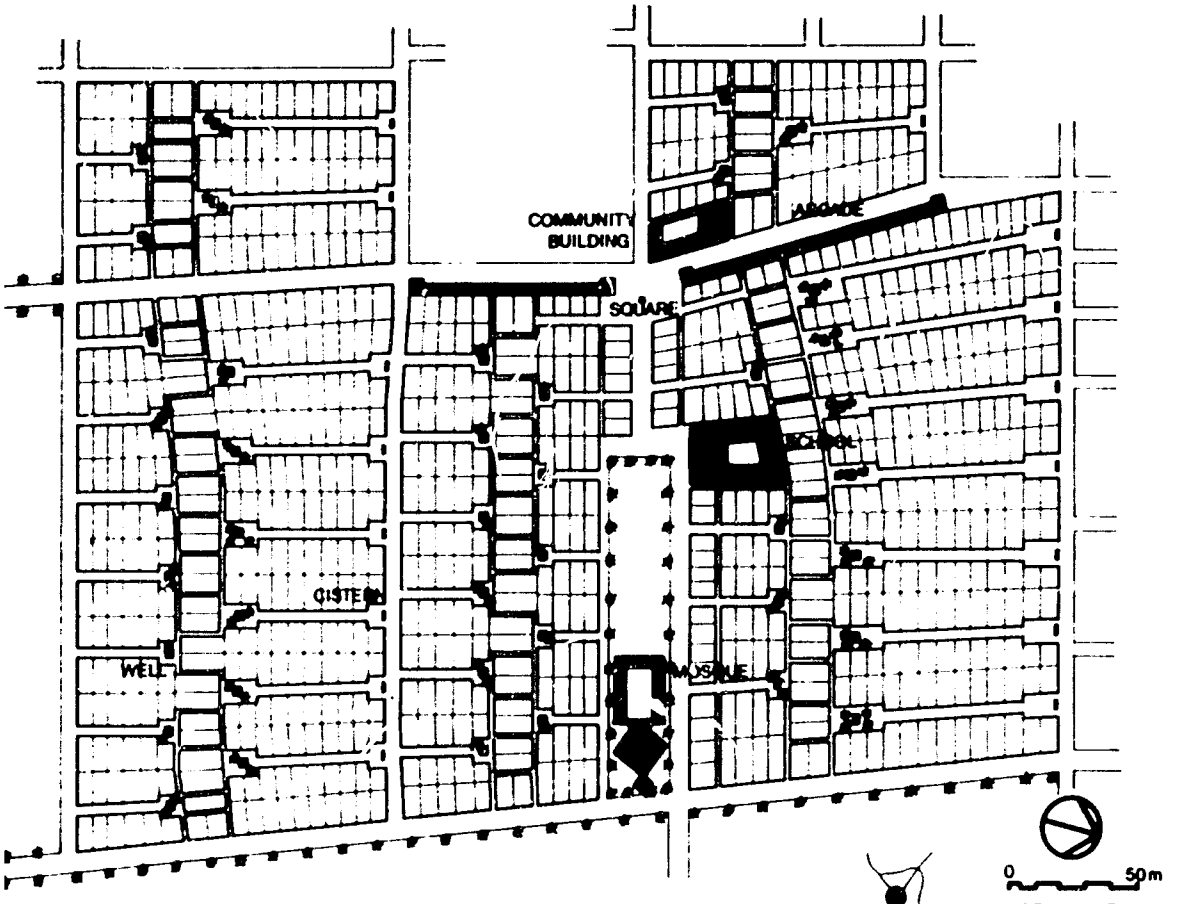
The net effect of the established lot pattern and size is high density with the advantages of the cluster form. The average lot size is $84m^2$ (a total site coverage of 60-70%). The smallest lot is $66m^2$ and the largest is $102m^2$. There are 849 lots. The density is 85.9 lots/hectare with 24% of the site as public space.

In diagram 1, the black lines and dots indicate places where people gather. The most important ones are the square, mosque and school, arranged along the bazaar route. The bazaar route is positioned to support current circulation patterns, to provide a major east-west link, to make the public places easily accessible, and to establish a visible community "core". The arrows show how the bazaar route idea can be expanded to other parcels. The smallest dots represent the neighborhood courtyards, smaller scale applications of the cluster model. The triangles are landmarks; such as, wind towers, communal buildings, and mosque minarets. The arrows indicate views from the tops of the slopes. The tree symbols show the proposed rows of trees.

The black zone on the lot and land use diagrams indicate public places; such as, the mosque, square, play field. This area, 6% of the total site, is the core of the community. The shaded areas in the diagram are designated shops, probably rented out by absentee landlords, or owned and operated by the shopkeeper with upper floors rented. These lots were made purposely small since their relative cost would be high. Six percent of the lots are shops. Maximum capacity for shops, including "shop possibilities" located on secondary circulation ways, is 19% of the lots. The uncolored areas are exclusively residential.

The black tone on the traffic diagram represents vehicular and pedestrian routes. Much of this traffic is generated outside this community. All traffic is planned to be outside the residential areas and conforms to existing traffic paths. These routes are primarily pedestrian ways connecting the local routes to the mosque and other public grounds.

Services take advantage of the north-south street pattern and slope down to minimize the total length of mains and connect to each lot in the front. The total main and tap length is 13m/lot.


COMMUNITY BUILDING
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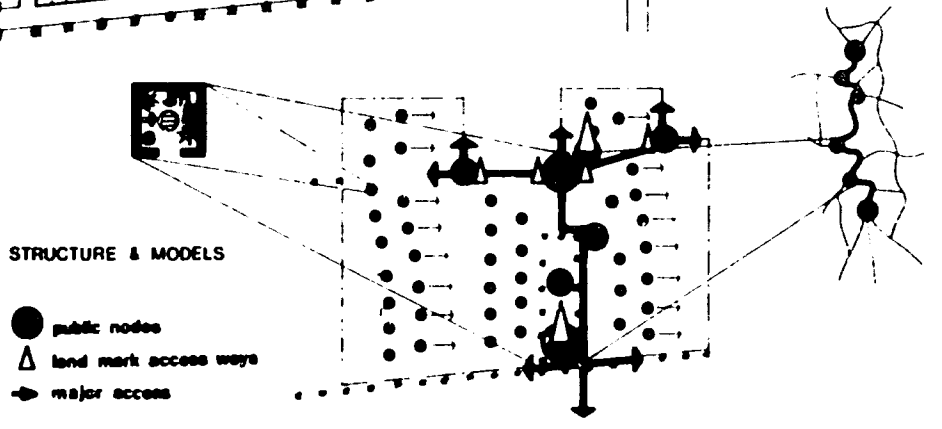
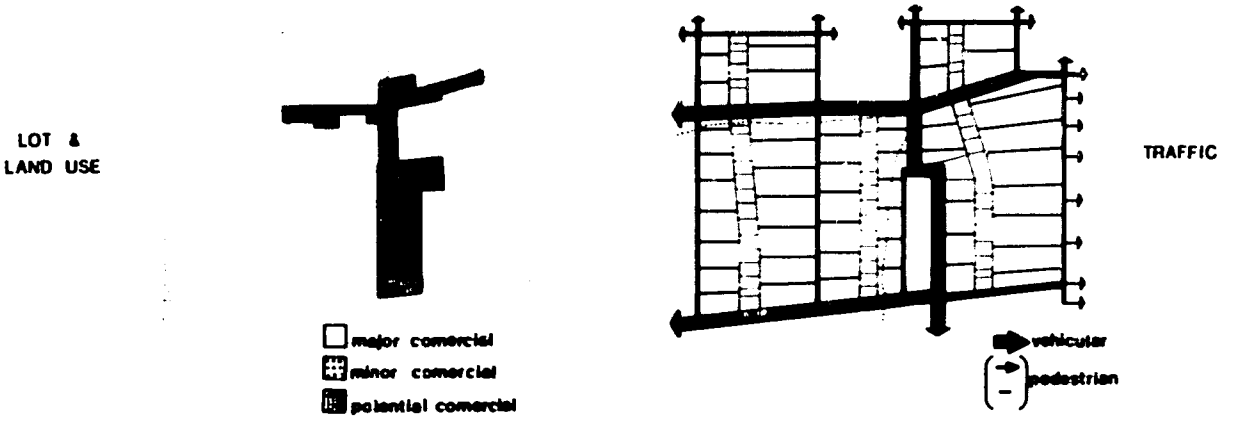

STRUCTURE & MODELS
public nodes
land mark access ways
major access


LOT & LAND USE
major comercial
minor comercial
potential comercial
TRAFFIC
vehicular
pedestrian

3.3. First Prize: Gregg Clawson

3.3.2. Cluster

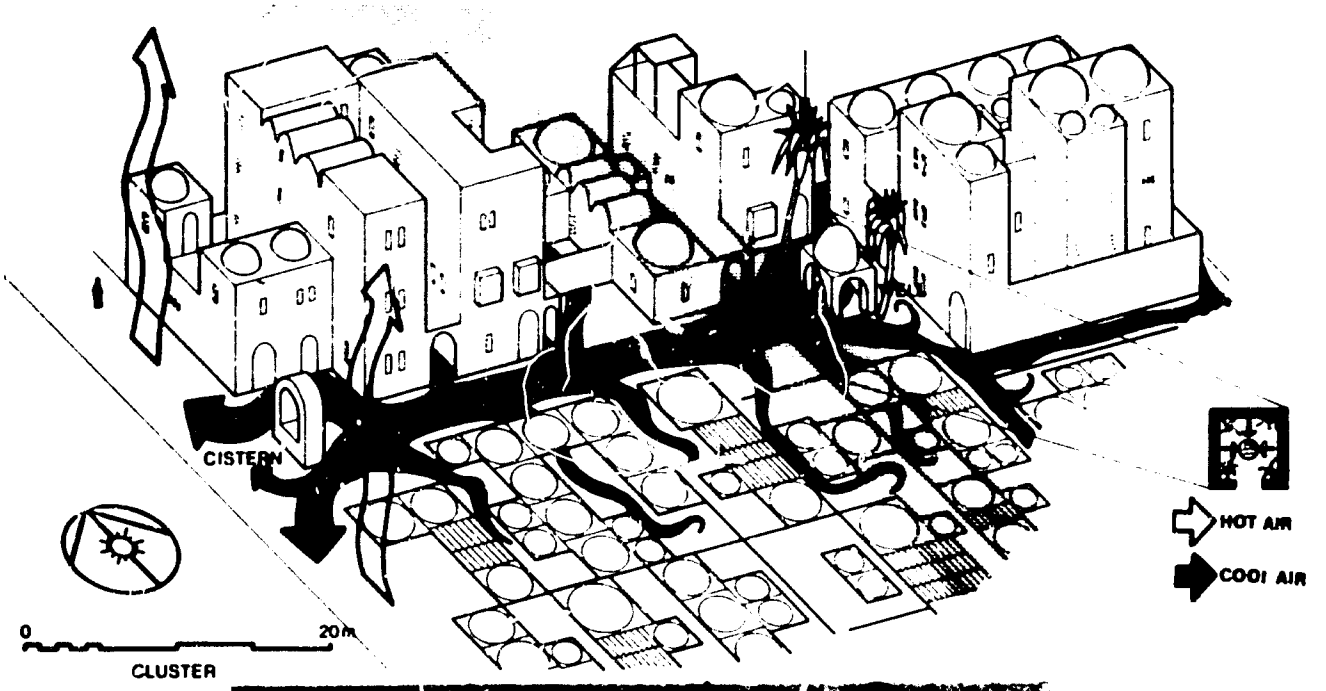
The cluster plan is based on a settlement typology found in desert cultures. An inward facing group of houses or tents look into a court of plants and water. In this case the water is the neighborhood well. The well, which has been neglected in recent housing attempts, was a major social gathering place for the women and would remain so even with running water in the units. Trees, in the courtyard, make use of the water, provide a landmark for the cluster, and keep it shady and cooler.

At the opposite ends of the longer instances of these streets are open spaces with cisterns which act as men's gathering places. Small coffee houses would develop here. From this point the men can watch the activity on their own street as well as on the larger and busier one beyond. Because of utility taps the units are pushed apart and border backyards instead of solid walls in the back. This arrangement not only eliminates the need for party walls and forced neighborly cooperation but it increases privacy and, most importantly, it allows air to circulate around each unit. The street passing through the cluster is wide enough to have cars parked along it while still leaving room for emergency vehicle access.

In planning this community, climate was a crucial factor. In order to combat the high solar gain throughout most of the year, to shield the local streets from dusty winds, to maintain maximum air circulation and keep the natural force of convection currents from working against the inhabitants, four ideas were adapted from indigeneous sources and from recent literature.

The first is to make the buildings as narrow as possible with an east-west axis: this exposes the smallest building surface area to direct solar gain. Secondly the local streets were directed perpendicular to the southwest winds so that the dust would ride up over the buildings and not blow down the streets. Third is to leave space between and to the rear of every unit, allowing maximum air circulation. This space was used to accommodate the service lines. Fourth is to cause natural convection around main streets. The main streets are expected to heat up considerably until midday, due to direct solar gain. This causes a large temperature differential between the hot street and the "cooler" local streets, and alleys, and units. The hot air rises drawing the "cooler" air out and replacing it with clean, unbaked air above the city about the time of day when the units are beginning to get warm. This movement of air also prevents air stagnation in the back streets.

The unshaded open areas at the head of the longer cluster streets are imtended to enhance this ancient circulation method.


CISTERN
HOT AIR
COOI AIR
0
20m
CLUSTER

3.3. First Prize: Gregg Clawson

3.3.3. Unit

The unit design in a self-help housing situation is the result of applying constraints in key places to create a framework that is affordable and simple in construction but also flexible. Models and construction methods used by Dr. Hassan Fathy were adapted for this design.

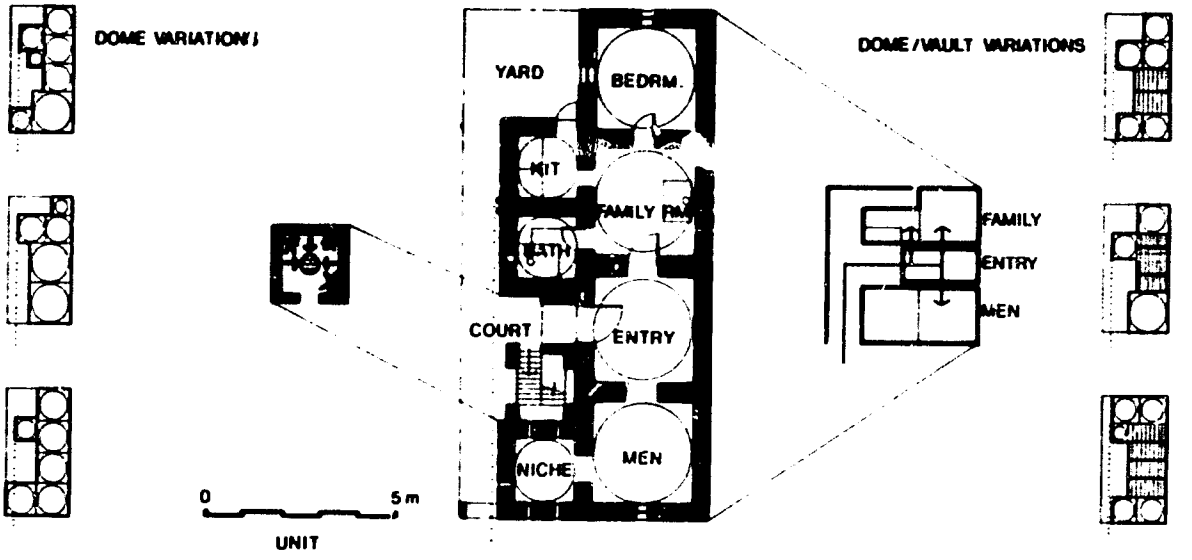
Brick is the main building material. The reason for this decision is cost, flexibility and availability of material, and high thermal mass of material.

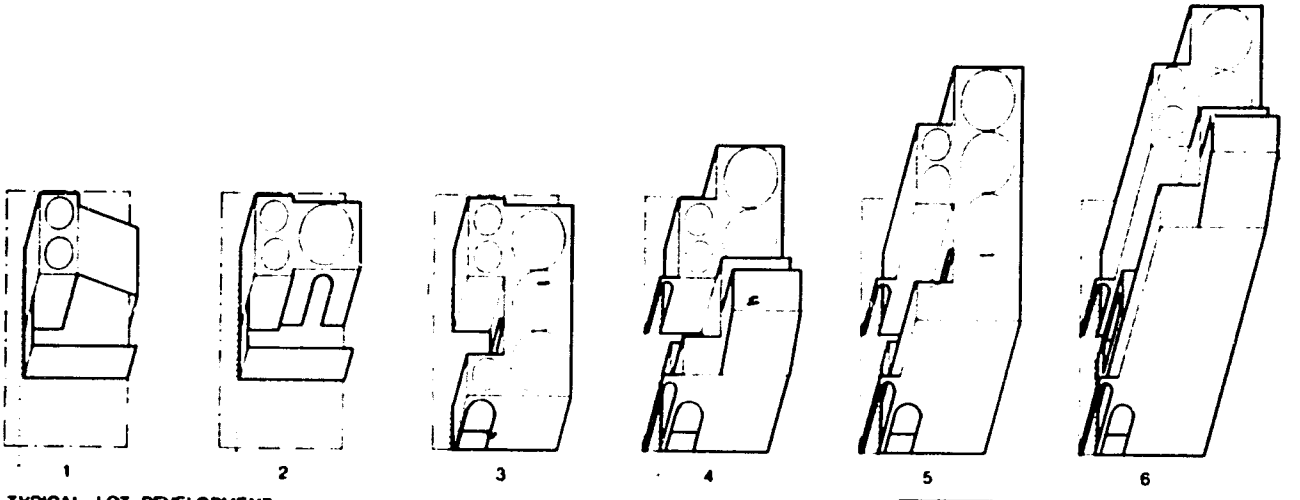
Another major decision is the placement of the utility taps into each lot. Their location dictates where the wet core will develop and therefore the yard/building pattern that assures air circulation.

A third major decision is the use of the dome with square bays in tandem with rectangular spaces as the method of construction. In this system, a large combination of room sizes and arrangements can be produced. The "Low Dome" design of Dr. Fathy is structurally stable without lateral supports provided that the room dimensions do not exceed 4m. Small doors and windows can be placed in any of the walls. Other advantages are preferred high ceilings, culturally appropriate interior spaces, and massive wall and roof construction to absorb heat. The diagrammatic plan of a typical Egyptian house developed by Fathy was used in the design of the unit (variations shown in the drawings).

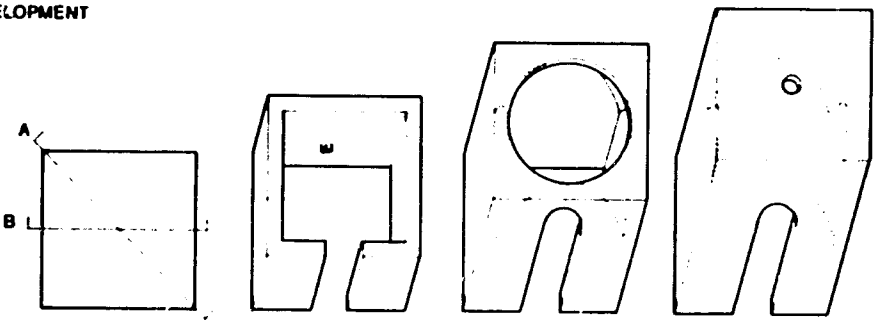
The typical development of a lot is expected to take place in the following fashion. During the first year, a family buys the lot, builds a wet core and erects a temporary shelter. Then the family builds a multi purpose room. Next, other rooms, entry, living room, and shop, are built out toward the street. Later, a bedroom is added in the back. Stairway is built and floor slabs are added. A temporary shelter is erected for the children. Subsequently, renting enables the shell of the second floor to be built. Supplementary rent from this addition will finance the third floor construction.

The four step development of a typical square module is shown in the diagram. The dome is built "igloo" fashion by spiralling bricks toward the center, with slope of the dome not to exceed 75 degrees. The massive construction provides an excellent thermal mass and structural strength. The mass of the walls and 30-40% mortar shrinkage will act to solidify a poor job. The subfloor is made up of 100cm deep sand with a concrete coating, covered by sand and layed with clay tile. On top of each dome a new floor can be started by filling its top with sand, and then laying tile.

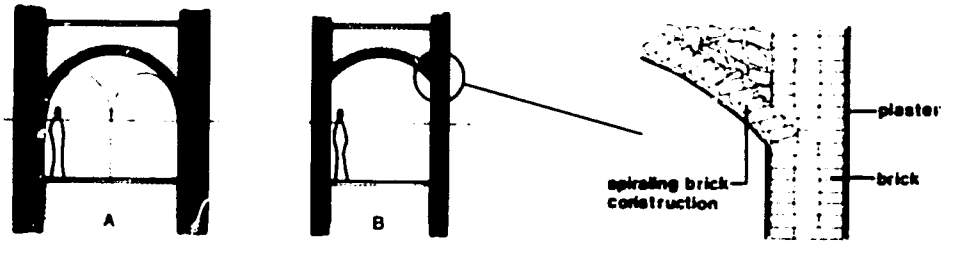




TYPICAL LOT DEVELOPMENT



CONSTRUCTION



3.4. Second Prize: Paul DeCourt

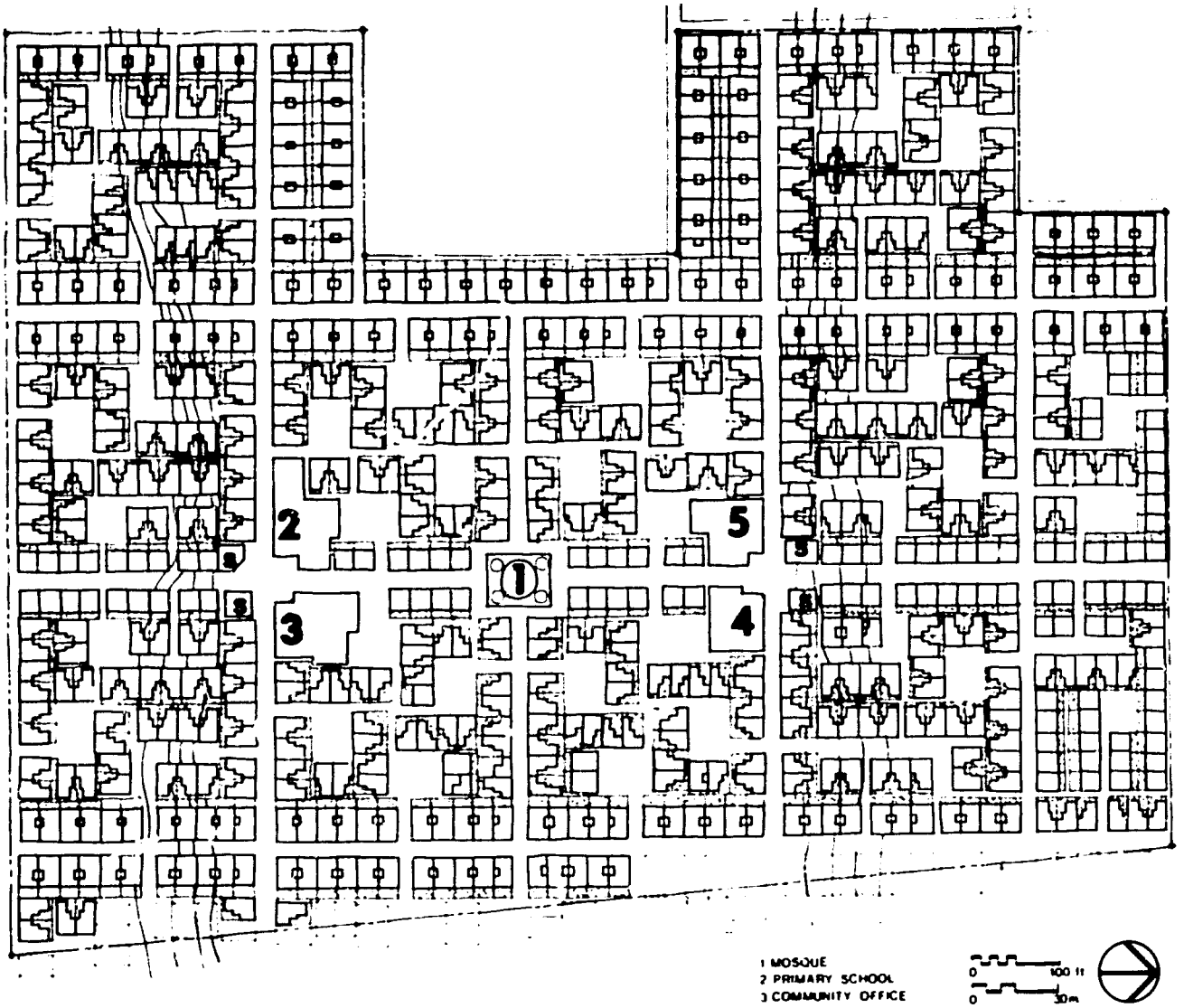
3.4.1. Community

The informal sector's practice of self-help construction in housing is an indication of inventiveness and adaptability and as such is made as much a part of the project planning considerations as, for example, is the economics of establishing a utility infrastructure. Other village and neighborhood customs are also sought out as criteria for design. The result reflects the demands of housing for a rapidly changing population for whom solutions have often fallen short in terms of compatibility with the cultural and climatic needs of the area.

Main streets run north-south connecting existing communities with the new development. Secondary roads form the links to informal sector housing to the west and land that is to be developed to the east. Vehicular traffic can service neighborhood blocks while generally being limited to the periphery of each block.

As Amos Rapoport in his book *Human Aspects of Urban Form*, pp. 36., has noted, the physical framework of the grid pattern is strong enough to "accommodate and guide change and a great number of variations while retaining a unifying system... a wide variety of urban forms can be evaluated as successful in terms of possessing certain framework elements, which have lasted and provided continuity, and within and around which changes, infill and variability have occurred, allowing people to influence the environment and express themselves without loss of the larger organizing scheme." There are many examples of such infill patterns within grids in traditional Moslem cities. An example of the contemporary use of a grid organization is Hassan Fathy's village of New Gourna. The development of clustered, high density dwellings grouped around outdoor spaces has been encouraged by the Foundation for Cooperative Housing, which has reported that "... site planners around the world are returning to "clustered" high density dwellings are grouped around usable outdoor open spaces." The organizational features of the grid and the social advantages of cluster planning are combined in this scheme. The result is that land utilization and utility distribution cost estimates are quite competitive with other schemes such as those based on linear planning concepts.

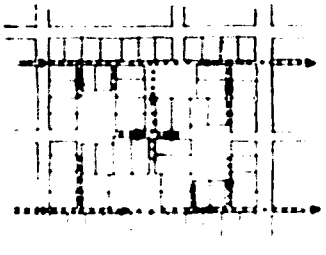
The organization of the site plan is based on the principles represented by the works of the experts knowledgeable about indigeneous and self-help housing. In other words a grid-iron based, cluster layout was developed to respond to the economics as well as the cultural context of the problem A hierarchy of public places is used to accommodate the many levels of community life found in the typical Egyptian neighborhood.



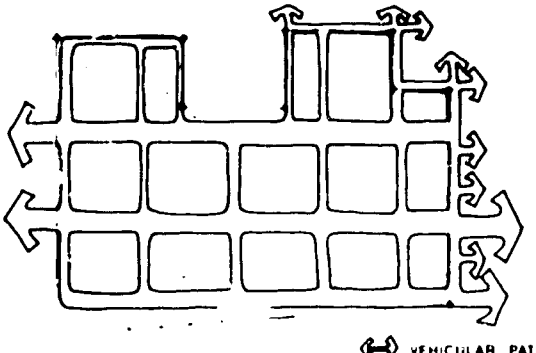
1 MOSQUE
2 PRIMARY SCHOOL
3 COMMUNITY OFFICE
4 KINDERGARTEN
5 HEALTH CENTER
s SMALL SHOP
· PRIVATE OPEN SPACE

0 100 ft
0 30m

SITE PLAN



UTILITY DISTRIBUTION
(WATER AND SEWER)



TRAFFIC PATTERN

VEHICULAR PATH
PEDESTRIAN AREA

3.4. Second Prize: Paul DeCourt

3.4.2. Cluster

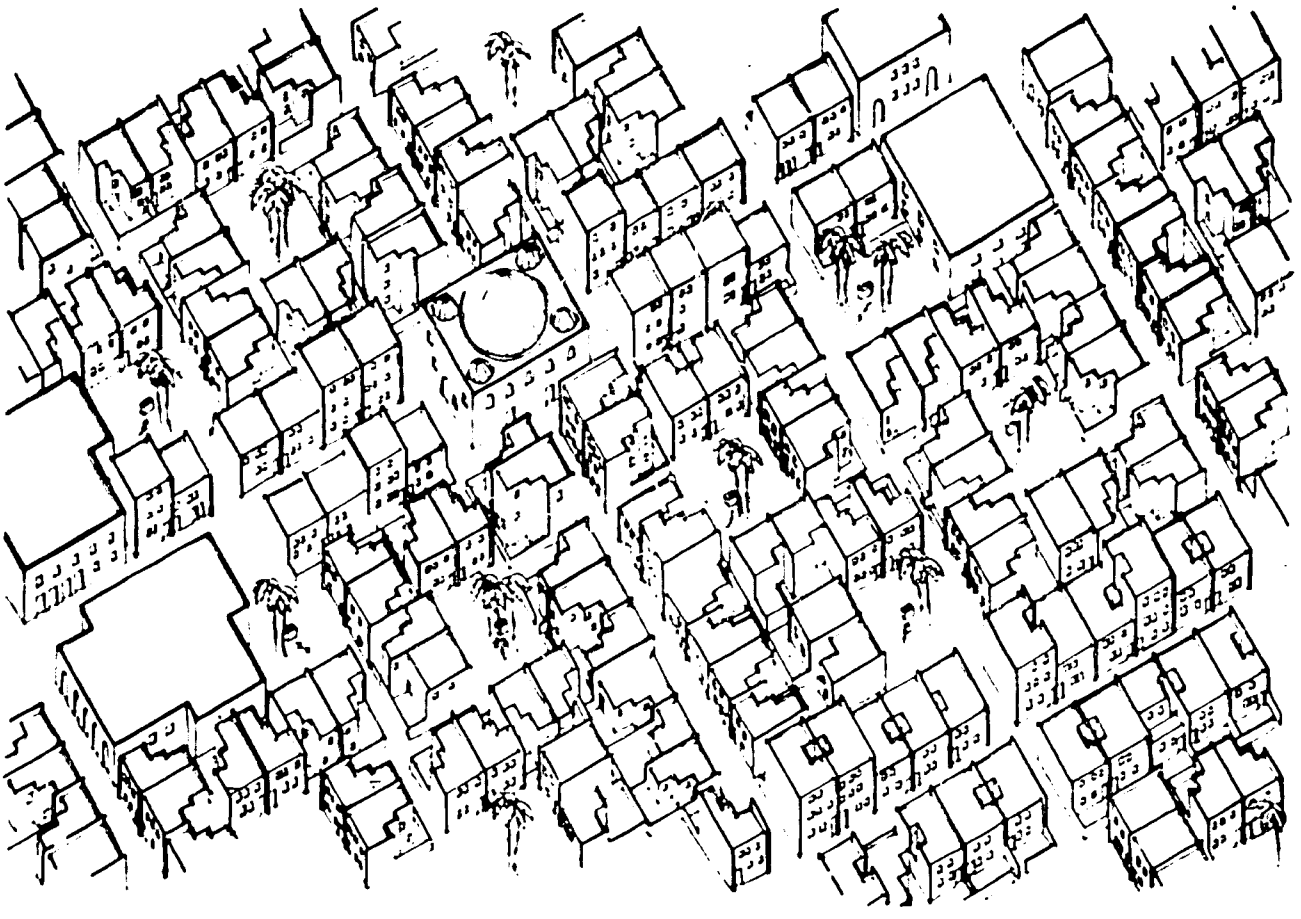
The grouping of houses around plazas incorporates elements of traditional Egyptian responses to climatic and social needs as well as modern site planning techniques. Cluster grouping is seen as a way of lessening the effects of the strong winds by minimizing long stretches of open road. They also provide a controlled setting for the propagation of vegetation used to screen and cool air. Narrow pathways and streets between buildings respond to the needs of pedestrians by limiting vehicular movement and minimizing pedestrian vehicular conflict.

Clustering has been used to reflect neighborhood groupings of the old city. The main streets around the large neighborhood blocks are the widest, while the side streets which connect with the cluster courtyards are more narrow, though still wide enough to provide access for refuse collection, fire protection and ambulance service. Connection between clusters is made through narrow and private paths. Most private are the alley ways which provide access to the rear yards of the units. There is a clear distinction between circulation outside and inside clusters. Vehicular circulation is limited mostly to main streets separating neighborhood blocks, outside the clusters.

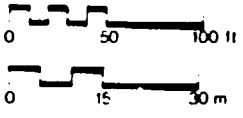
The cluster squares are places where children can play and where adults can share news. In the early stage of project development wells will be constructed in the squares through neighborhood effort, and serve the new house owners until they are ready to purchase private water hookups. Since the well served for so many centuries as the traditional meeting place for the women, even after the need for a shared water supply has disappeared, a neighborhood well would remain as a visual link with the past.

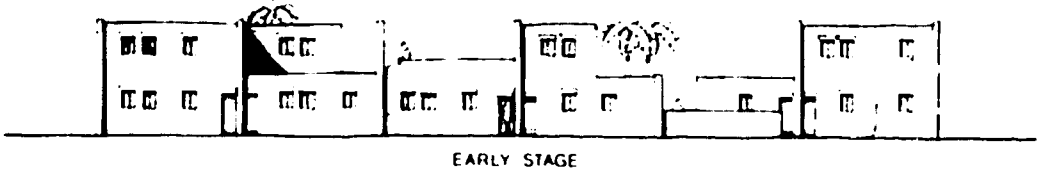
The control of use of open land presents a difficult management problem. For example, experience has shown that unoccupied land will be either claimed by private individuals or used for refuse disposal. Because cluster squares are focal points or "front yards" for housing units, and because there is a limited number of families in close contact, it is hoped that the care and use of the squares will be effectively controlled by the influence of neighbor on neighbor.

Houses along the larger through streets obviously do not enjoy direct use of the cluster squares. Their relationships are reinforced through the streets along which they lie. Activities which take place on the main streets, such as the establishment of shops, are possible in the squares also. However, it is expected that most commercial development will occur along the busier, more public main streets.

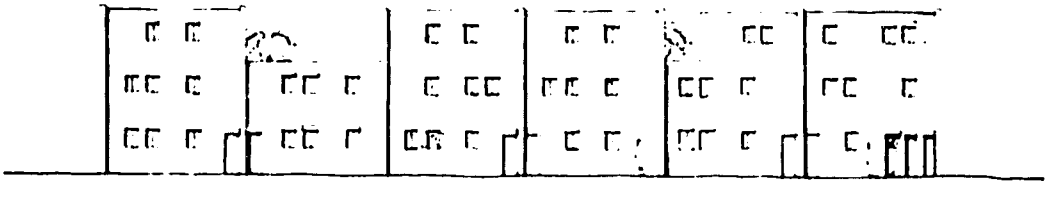


AXONOMETRIC VIEW OF
AREA AROUND MOSQUE



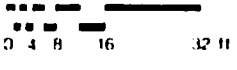


EARLY STAGE



LATER STAGE

STREET ELEVATIONS



3.4. Second Prize: Paul DeCourt

3.4.3. Unit

Units were designed to accommodate the average household of six, with two households per lot. Multi-purpose use of rooms is necessary because of the high density. Privacy is especially important due to strong distinctions between male and female activities. The units respond to this by controlling circulation and room divisions. Bathrooms and kitchens are located to the rear of units to remove cooking heat and odors, for visual separation, privacy, convenience in performing household tasks, and so on.

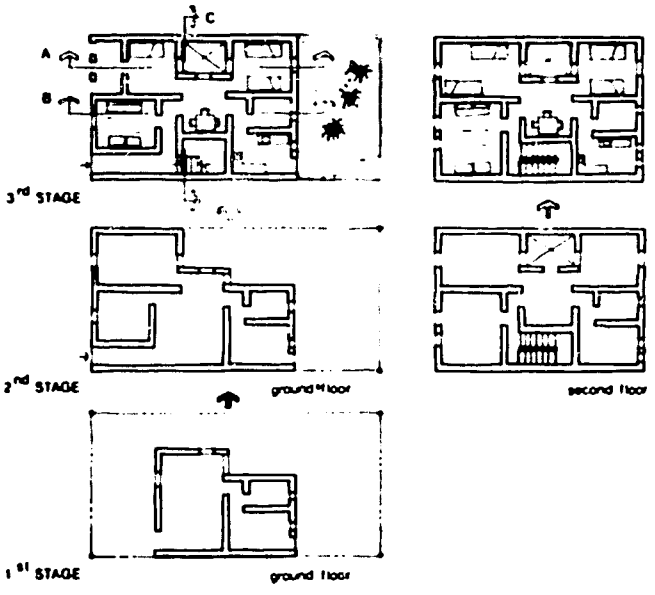
Units may be added onto over time as the family's financial position permits. Starting with a wet core and one large multi-purpose room, other rooms are added until an optimum space utilization is achieved within a maximum of three levels. The basic unit plan adapts to lot sizes of 700, 900, and 1100 square feet.

Twenty five percent of each lot type is open space. Circulation accounts for less than 13% of the total area. Provisions for small lots are made in the rear for outdoor functions such as keeping animals, laundering and child care. Lots also provide ventilation and natural light. Rooms facing the streets at ground level can be converted into commercial store-fronts.

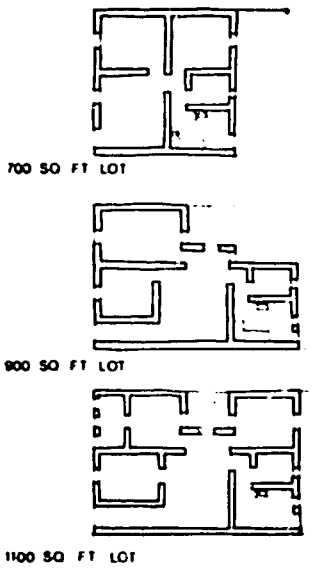
Ownership will be mostly by families. In order to use resources efficiently, part of the project is to be a limited, cooperative venture. For example, the owners of units siding streets are expected to bear the cost of construction of the side-walks. Shared walls, however present another problem. The construction of adjacent units can not be expected to occur simultaneously. Therefore, party walls initiated by one owner will be financed by that owner. In some way this cost will have to be shared by the neighbor who decides to expand his unit such that the party wall is used in the construction. Doubly thick bearing walls are avoided by providing a corbelled ledge connecting the new construction to the unused side of the wall.

The construction of units will be carried out by small private builders and the residents themselves. Because of familiarity with the methods, masonry bearing wall construction is appropriate here. Also, one type of material, i.e., shale brick, sand, lime brick, cut limestone or concrete block, can be substituted for another, i.e., brick, without major design modifications.

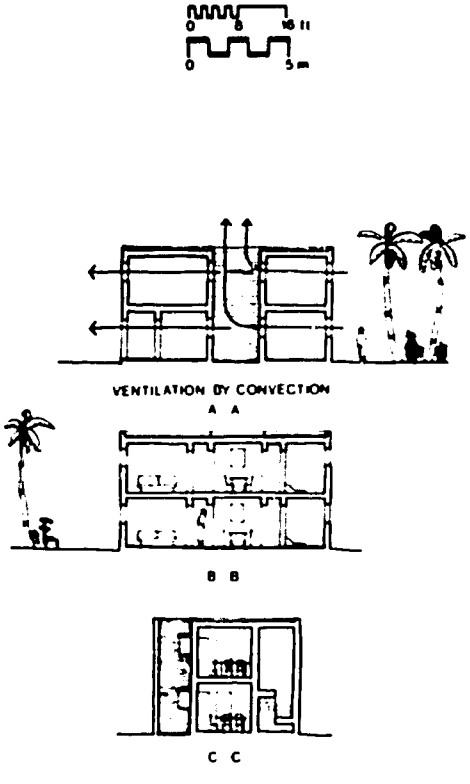
Concrete lintels will be used to span short distances. Longer spans are avoided due to high costs of reinforcement and cement. A ferro-cement floor/roof system which incorporates lower cost wire mesh, ferro-cement paste and the plastering skill of local workers is used. The use of short-span bearing members and ferro-cement floor/roof planks makes it possible for a small number of workmen to lift all building components into place.



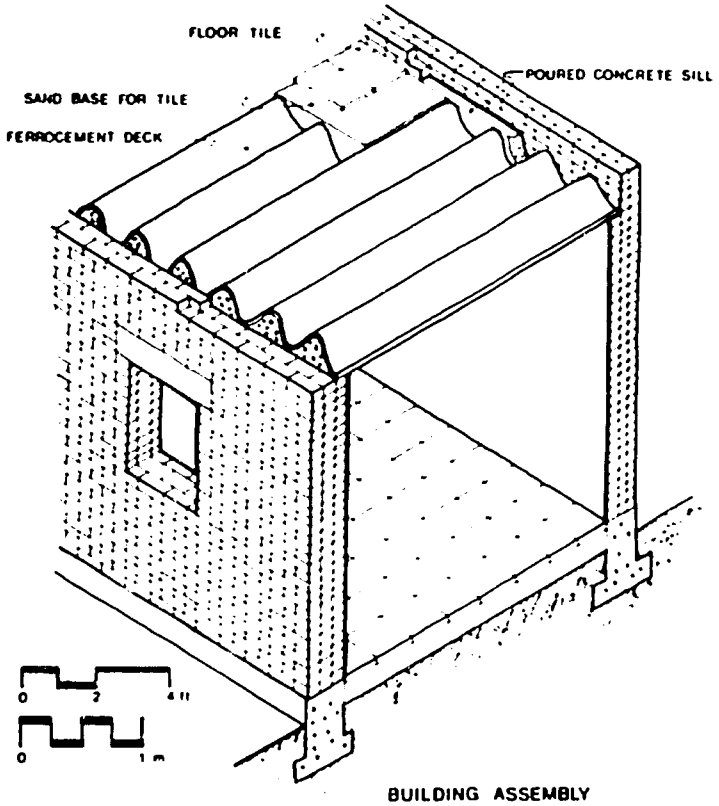
UNIT PLANS



BUILDING COVERAGE



UNIT SECTIONS



BUILDING ASSEMBLY

3.5. Mention: Stuart Suna

3.5.1. Community

The most significant design parameter throughout this project has been to provide a traditional fabric woven into the urban environment which recalls and re-establishes proven and accepted patterns of physical and social interactions. Since this is a self-help community project, site planning is viewed as a significant input of the designer towards the actual development of the community.

Through the "planting of seeds", it is hoped to "germinate" an organized and healthy structure for this new development. Such a seed is water, one of the most primary of all human needs. Just as a town grows around an oasis. housing clusters will focus around public fountains.

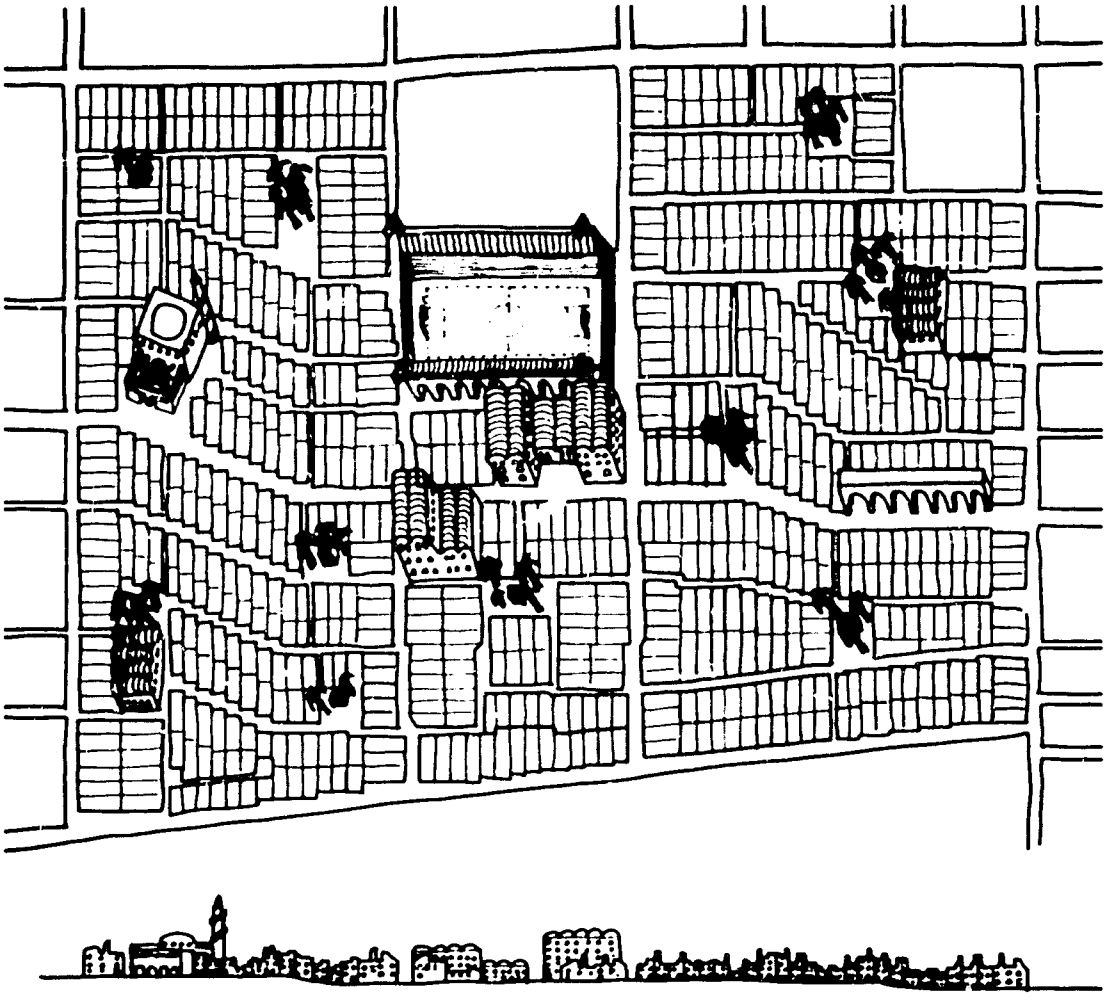
Streets will follow the grid of utilities. The main road, which runs downhill, south to north, will connect existing roads and utility lines to the southern and northern boundaries of the new development. This main road enables access to both mass transit and the nearby industrial complex to the south.

It will also provide a major spine from which the community can branch out. The activity along this spine formed by the neighborhood mosque, health care center, public schools and community bazaar will most likely prompt the development of many local shops.

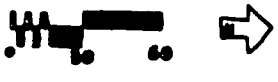
Secondary roads, which run east to west, provide a connection with the informal housing sector to the west and land that is to be developed to the east. Predominantly narrow with frequent turns, these roads will dissuade strangers (Hassan Fathy, *Architecture for the Poor*), provide comfortable shade for the pedestrians of the local community and enable limited access of emergency vehicles. These turns and bends will produce both visual relief and distinct physical characteristics from which the experienced eye of a local pedestrian can find his way and weave the urban fabric of streets and clusters into a neighborhood.

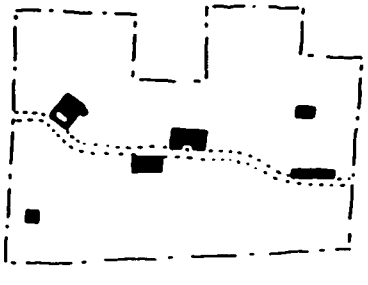
The lots are approximately twenty feet wide. The various lot sizes, 1100 sq.ft., 900 sq.ft., and 700 sq.ft. are accomplished by varying the depth of the lot while maintaining the economical twenty foot wide street frontages. This provides an economical use of utility lines, thus trimming substantial costs.

Interspersed throughout the development are a variety of public spaces designed to relieve the congestion of the dense urban life styles and environment. The open field and spectation areas act as loci of activity. Located on the secondary roads just off the main roads are a series of urban oases. Small plazas protecting the public fountain from the harsh desert winds are the seed which will germinate and grow the clusters around themselves.

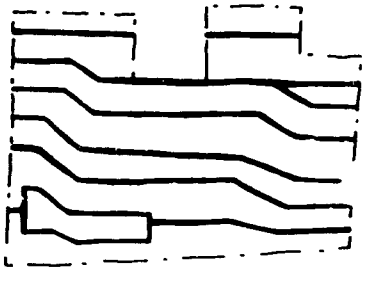


SITE PLAN AND SECTION





PUBLIC BUILDINGS



WATER & SEWAGE MAINS

3.5. Mention: Stuart Suna

3.5.2. Cluster

The neighborhood is planned as a series of sectors containing "streets" which are identifiable by their physical boundaries, and "clusters" which are small groups of buildings with a common focus, such as, plaza, fountain.

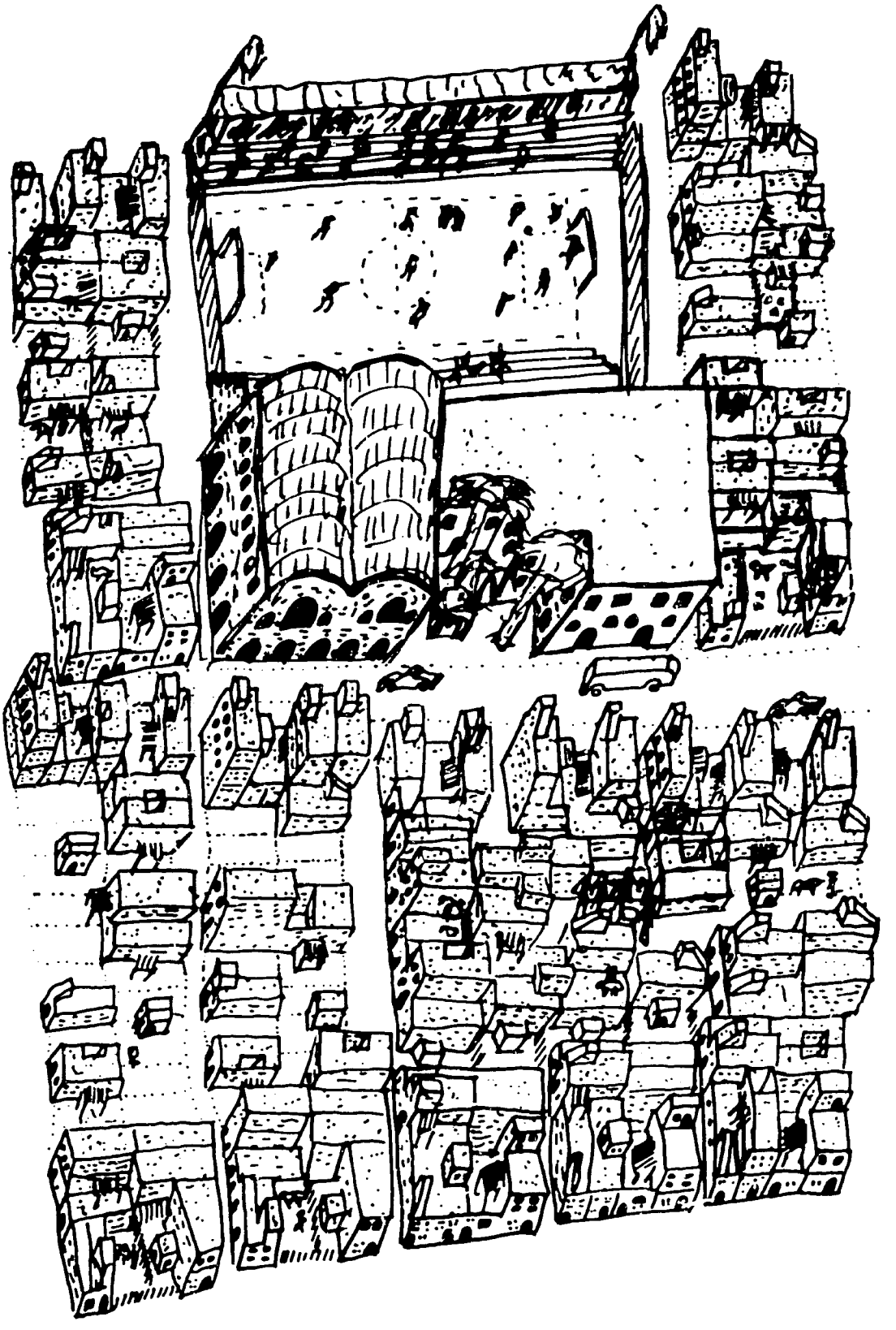
The streets are narrow pedestrian links between the primary roads and clusters. They refer to the physical and social development of secondary roads. They provide a welcome shade to the local inhabitants, while a few fountains with their cherished greenery just off the primary roads offer relief to weary travelers and shoppers.

At the same time, these narrow, bending streets will dissuade strangers from using them as thoroughfares. In the traditional manner, it is expected that many first floor multi-story units, at points of intersection or along more major streets, will be converted into small commercial establishments serving the local community.

The clusters are small groups of public and private buildings built around the public water tap/fountain. They produce highly visible and manageable green oases. After the public water tap is installed, either the government or the local community will build a small structure to enclose the tap, provide shade, and reduce waste. This structure will act as a framework for the development and growth of a "place" as discussed by Amos Rapoport. Waste water spillage from the fountain will produce mud in which seeds can germinate and flourish into a blessed oasis of shade and refreshing greenery.

The re-establishment of the ancient public fountain will, hopefully, regenerate the indigeneous custom of a respectable place for women and children to gather outside their homes. Newly arrived families will be able to gather both water and important local news. Serving as a public forum, the fountain will help tie the people into a tight cooperative community.

Solid waste disposal is an essential function to ensure a respectable and healthy neighborhood. Strategically located along the streets and clusters are temporary facilities for solid waste. These facilities will be serviced by an agent of the government.



3.5. Mention: Stuart Suna

3.5.3. Unit

Design of the dwelling unit is based upon the ability of the individual owner to construct and make minor modifications to the dwelling space easily and inexpensively. Privacy is a very important design paramoter in middle eastern cultures. Both the kitchen and the bathroom are located in the rear half of the lot so as to prevent their odors and sight from reaching the front half of the dwelling.

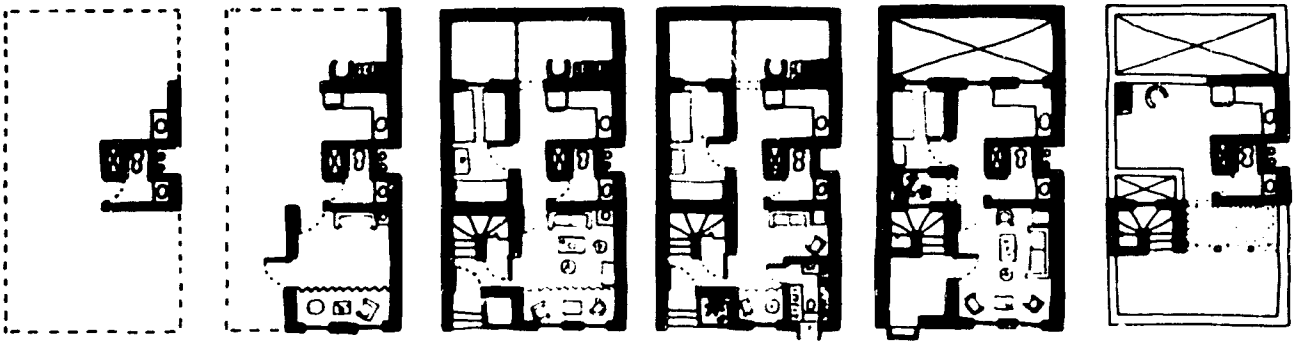
The building process begins with acquisition of a lot, including utility taps. Then the family builds a wet core, which includes a bathroom and kitchen. Next, the family builds a multi-purpose room for living and sleeping. As the family grows, they build a guest room and additional bedrooms. With the need to expand vertically, a staircase and more living spaces are added to the second floor. During the warmer months, the roof becomes the evening quarters. If the owners are trade-oriented, and their lot is within a potentially commercial zone, they will most likely open a small shop, with minor modifications.

The units are ventilated naturally. The three significant features in achieving healthy ventilation are: the narrow, shaded streets providing cooler air temperature; the backyard/courtyard illustrated in the plans; and the malkaf or "wind catch" (see diagram).

Windows in the dwelling unit must satisfy two conflicting parameters; block out heat and visual access as opposed to provide view to outside and ventilation. The indigeneous architectural forms, mushrabiya and oriel windows, are used to achieve these ends.

Small openings on walls, providing diffuse light and ventilation, are achieved by eliminating alternate bricks in the coursing. Larger openings, doors, and windows are accommodated by either a masonry arch or a concrete lintel. Stairs are constructed by the indigeneous system of using cut stones or bricks set in mortar with supporting vaults. The spanning system for roofs and floors will be ferro-cement panels as illustrated in the construction of the building unit. These panels will be made on site by the owner/builder. The panels are made of common "chicken wire" (wire mesh) shaped around a re-usable form and plaster on both sides.

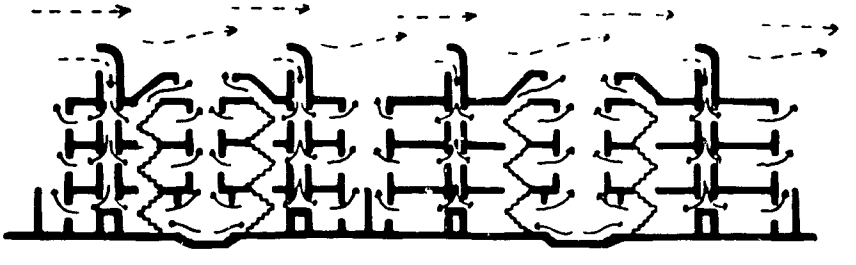
Floors will be glazed tiles laid in a bed of sand on top of ferro-cement panels. The glazed surface, easily cleaned, will raise the sanitary level of the wet core. This readily maintained surface will discourage the growth and spread of vermin. An added bonus will be the potential development of individual expression in the selection and application of various tiles.



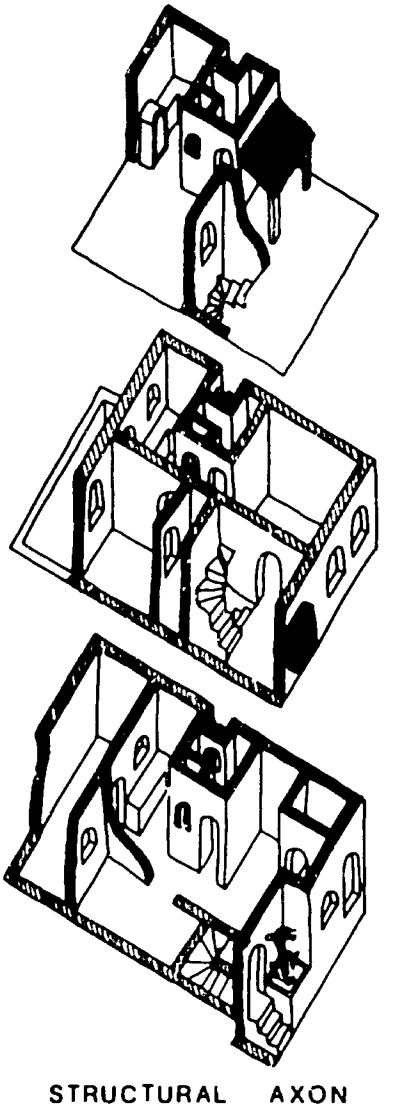
GROWTH AND DEVELOPMENT 700¢ UNIT

700¢ 900¢ 1100¢

TYPICAL UNITS



VENTILATION DIAGRAMS



STRUCTURAL AXON

4. Learning from The Competition: Theory through Practice of Design

This project was undertaken to help all parties involved: the students to benefit from the experience, the educators to develop a better pedagogic tools and FCH to expand the bounds of the problem domain through the examples of the solutions developed. In each case the aim is to bring together the resources of the many diverse interest groups and develop new expertise and opportunities for solving the type of housing problem at hand. In this section we shall review some of what we at C-MU have learned about the educational process undertaken, design issues tackled and the pedagogic value of the experience.

4.1. The Procedure Used in the Design Studio

Alongside its many advantages the real-world housing problem presented a number of difficulties. The primary difficulty was one of dealing with an entirely alien problem. This was as much due to the cultural distance between the Egyptian people and most of the students who were born and raised in the U.S., as it was due to the many constraints of the problem. This is a clearly an insurmountable problem for students and professionals alike. Many other problems stemming from financial, social, technological and occupancy constraints, discussed in earlier sections, are particularly difficult to deal with in the abstract world of design studio problems.

This problem was compounded by the fact that the site and its physical properties were unreachable and difficult to visualize. The visual repertory of the students did not encompass the peculiarities of the terrain as well as the urban and residential vocabulary of the region. In addition, the sets of cultural, aesthetic, economic and technologic concerns were all relevant to the problem and had to be dealt with directly and simultaneously. This also surpassed the range of design experiences familiar to the students.

To circumvent these problems two general strategies were adopted: a) supplement the studio with invited lecturers and extensive documentation of the context, and b) enforce an iterative design process through exercises and assignments throughout the semester.

Representatives of the "client," funding agencies, and consultants familiar with the problem type were invited to the studio to inform and interact with the students. Eric Dluhosh, MIT; Juan Casasco, FCH; Stefani Ledewitz, C-MU; David McVoy, USAID; Omer Akin, C-MU; Walter Boykowycz, C-MU; and Louis Sauer, Department Head, C-MU made presentations to the students about many diverse aspects of similar urban design problems in Egypt, India and the United States. David McVoy, Louis Sauer, Juan Casasco and Omer Akin advised and counselled students' progress during the course of the studio.

Sources included in the section entitled "Suggested Readings" were made available to the students.

The first two weeks of the studio dealt with review and discussion of documents, lectures and two exercises directed at conceptual development of the site and the expandable dwelling unit. During the second three weeks the site and units were re-examined in the context of one another and integrated solutions were developed. This interim product was reviewed and responded to by faculty and visiting critics. At this point, the students were required to select an area of emphasis on which their contribution had to focus. Based on this selection, during the next three weeks they were required to re-examine their solutions and develop a final solution. Finally, they were given detailed criticism of their work and four weeks to refine and re-present it.

4.2. Design Issues

The problem provided a rich and complex medium for discussing numerous issues central to architecture and the role of the architect in society. We don't have space to dwell on all of these issues here. However, we shall discuss some of the fundamental and interesting ones below.

Figure 4: Traditional Residential Fabric

4.2.1. Undesignated Public Space

In the western tradition of site planning "public space" is a generously used element. Among other things, it serves the accommodation of residual exterior space, roadways,

pathways and other designated urban "parks" or "social interaction" spaces. Well established community mechanisms allow this to work. Public space is invariably maintained by the municipal government, using tax dollars. Legal mechanisms protect public property from being claimed by individuals. Climate allows the upkeep of its landscape elements and its frequent use by the public.

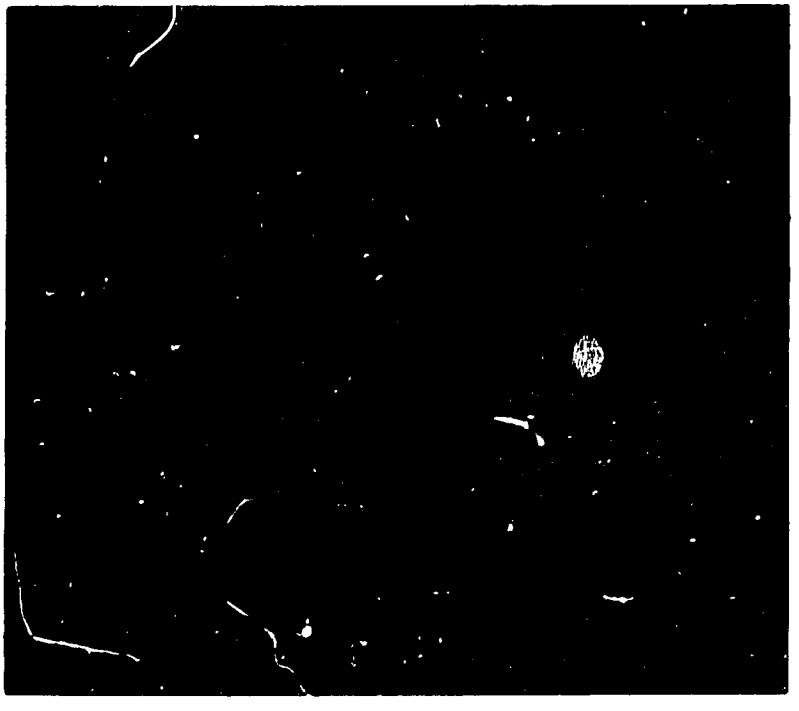


Figure 5: Grid-Iron Fabric of the New Informal Sector Developments

These are clearly not possible in the Egyptian context. No municipal or public institution is equipped to maintain public land, especially in the low income housing projects. The informal sector primarily builds on illegally claimed land and large expanses of land are unusable due to the severity of the climate and scarcity of outdoor cooling elements, i.e., water, vegetation. Consequently, all public zones have to be carefully designated to serve an appropriate functional end to justify maintenance and protection by the users themselves.

To design the public zone, size, scale, propinquity, protection from climate and confiscation by individuals are necessary considerations. This requires a fundamental understanding of the architecture and occupancy aspects of the public zone in the Egyptian culture. All the formal and informal "institutions" that support the patterns of use in the public zone which we take for granted in the western societies

are either non-existent, or exist in different forms in the Egyptian society. Hence, issues of privacy, social interaction, care of the infant, recreation, work, transportation, and so on need to be addressed along a continuum of many levels of abstraction; from the individual unit, all the way to the public spaces. As a result, many students, such as Gregg Clawson (page 16) and Paul DeCourt (page 22), took on the interest to integrate their design decisions about the public zones with those dealing with the composition of the individual units, using what they know about the Egyptian culture.

4.2.2. The Urban Fabric

The urban residential fabric in Egypt has moved from the traditional lattice-like pattern (figure 4) to the endless grid-iron (figure 5), to cluster layouts (figure 6), in the last part of this century. The forces driving these changes can be found in the new technological resources, the housing delivery system in the informal sector, modern aspirations, expediency and rate with which houses are built and neighborhoods grow. The effects of the changes have not been entirely positive. Passive climatic controls developed through hundreds of years of tradition are lost, hierarchies in public space sequences are distorted and urban monotony prevails in lieu of urban "identity."

Figure 6: A New Trend in Egyptian Planning: The Cluster Plan

Most schemes developed in the studio strove towards

creating urban fabrics that integrate rational orders, that optimize the per-unit cost of infrastructure, with traditional urban fabrics, such as, the one shown in figure 4. More specifically, the grid-iron system, which is efficient for the layout of streets and services, was used as the basis for developing cul-de-sac and "cluster" schemes. All projects receiving awards combined efficiency with traditional urban attributes successfully in the design of the site layouts.

4.2.3. Building Frontage

A recurring problem in housing projects where land and services (electric, water, sewer and road systems) are precious is the frontage to be allocated to each lot. There are three major issues:

- How to minimize valuable frontage and still maintain a reasonable unit layout with adequate natural light and ventilation?
- Whether to vary frontage for different size units, or not?
- What to do with frontage allocated to corner units?

The acceptable optimum frontage in most third world housing projects is about 20 ft. All awarded projects met that constraint. One project in particular, authored by Robert Bailey (not included here), reduced frontage to 16 ft. and responded to issues of occupancy successfully.

There were three unit sizes required in the project; 700, 900 and 1100 sq ft. To develop a scheme that keeps frontage variable and depth of unit constant implies that the smaller units would "subsidize" the services of the larger ones (figure 7). Since the purpose of the housing development was to aid the poor to be housed in the smaller units, this alternative was rejected by all designers. To keep frontage constant and depth of unit variable would mean that the larger units would "subsidize" the smaller ones. And, of course, layouts with proportional depth and frontage would mean absolute "equity." Although exceptions arose in corners and special portions of the site plans, in principle, all schemes adopted either or both of the former two principles.

In corner lots most schemes proposed units with extra commercial capability and/or units intended for large, relatively wealthy families. These families were expected to prefer these bigger lots at the onset. As a design decision, this sometimes coincided with and sometimes worked against the site-plans proposed. Turning the frontage of the units "inwards" to a cul-de-sac often eliminated this problem altogether, especially in Gregg Clawson's scheme (page 16), where these clusters are also interlocked to create a compact fabric (page 16).

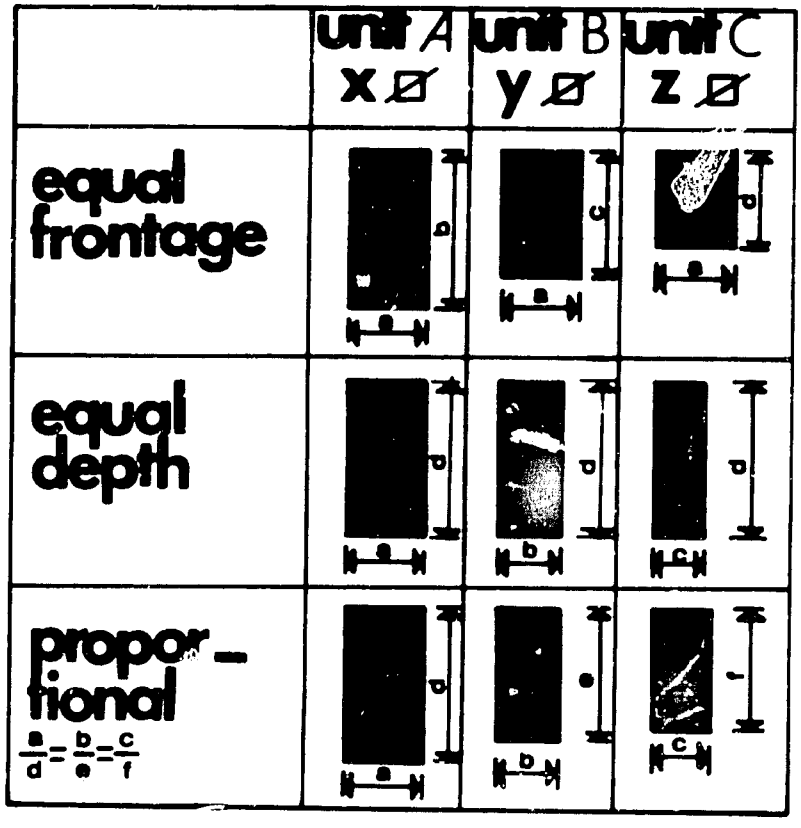


Figure 7: Relationship of frontage to depth of lot and cost of services

4.2.4. Integration of Technology and Design

The housing problem explicitly requires the integration of constraints pertaining to the construction technology within the design of the units. This is due to the scarcity of structural materials, the nature of piece-meal construction techniques, the self-help process and climatic constraints of the region.

The sole spanning materials available were concrete and specialized masonry construction. Masonry was limited to mud-brick, brick and expensive limestone. Some schemes developed pure masonry solutions using arched structures to span, to control building layouts and to provide insulation from heat (Gregg Clawson, page 16). Others explored new ways of integrating ferro-cement and reinforced concrete into masonry structures (Paul DeCourt's scheme, page 22 and Stuart Suna's scheme, page 28). Sand infill, in these cases, was proposed as insulation in horizontal elements. In all schemes, self-help construction technology with skilled assistance was seen adequate to carry out the construction process up to three storeys high.

4.2.5. Growth of units and Control of Layouts

Self-help housing implies that the owners move into their lots with minimum services and shelter, i.e., only the core of the unit

intact. For each lot, the core is kitchen, bathroom and living areas with water, electricity and sewer services. Although this can be considered "lavish" according to self-help standards, the GOE-USAID project is committed to upgrade the minimum standards presently applied. The critical question from the viewpoint of the architect is how much of the self-help building activity can he control, especially in the later stages of the growth? What assurance is there that the units will be built the way they are designed?

The answer adopted in class was: "the growth of a unit can be controlled to the extent that the initial phase in the self-help process determines what will be done later." Since all initial phases of units proposed (i.e., cores) did not dictate a single deterministic set of growth sequences, alternative layouts could develop from these cores. For example, the next room built could be placed, by the owner, in a number of different locations in a given lot. It was the contention of the students that through the location of the kitchen, bathroom, and the living areas in particular relations to each other and to the street, these alternatives would be confined to an acceptable set.

This kind of "control by design" is a powerful architectural exercise as well as a significant device for insuring that the housing development possesses certain qualities, despite the unpredictable growth pattern often observed in self-help projects. Some of these qualities are:

- Maintaining acceptable, formal street facade compositions compatible with the cultural and aesthetic values of the people (Gregg Clawson's scheme, page 16 and Stuart Suna's scheme, page 28).

- Achieving the right pattern of open spaces, courtyards and windows to enable natural light and ventilation for occupiable spaces (Gregg Clawson's scheme, page 16).

- Enabling the sharing of architectural elements, i.e., party walls, stairs and courtyards (DeCourt's scheme, page 22 and William Walker's scheme, not included here).

- Enabling access to service cores, main service lines and private courtyards directly from the street (Paul deCourt's scheme, page 22).

Although this list can be longer it provides, as is, a significant number of design criteria. It was clear that the design of the core alone was not sufficient to respond to all constraints.

Hence additional architectural means of control were developed. Gregg Clawson (page 16) established a modular system based on vaulted and domed structures for each room added to the core. In this way he could predict, and hence, control, the way in which each unit could grow.

Other schemes either used the "cooperative" alternative to impose fuller but more difficult to implement means of control (William Walker's scheme, not included here) or allowed a broader set of potential alternative layouts to take place, such as Stuart Suna's (page 28).

4.3. Conclusions

This exercise has been a useful tool in broadening students' design experiences and explicitly dealing with real-world design issues often difficult to address with the conventional design studio problem. The importance of these issues for the acquisition of design knowledge and skills is a subject which is beyond the scope of this discussion. However, we feel that the value of the numerous educational objectives served by the problem must be reviewed.

We feel that we were able to address the following pedagogic issues in the context of this problem with greater success than we would have in the context of a more conventional problem:

- Re-examination of implicit assumptions about the sources of design ideas: Due to the foreign context of the problem, students were forced to question basic values they carry in their heads about the causal roots of architectural ideas. The meanings of "public space," "living room," "kitchen," "frontage," and so on, had to be recreated using a new set of cultural norms and assumptions. This, in turn, lead to self examination of students' values and an awareness of the strong connections between value systems and the conventions of architectural design.

- Evolutionary nature of urban design: Most urban fabrics gradually transform themselves over many years, due to social, economical and cultural forces. This is exaggerated in the Egyptian urban scene, through the co-existence of the traditional and contemporary urban patterns, origins of which are separated by centuries. This emphasized the evolutionary nature of urban change as well as required the students to deal with contextual contrasts, often experienced in much less dramatic form in the western world.

- Many levels of abstraction in housing problems: Often a design decision relating to a specific

aspect of housing, for example, about the building frontage, may have far-reaching implications at all levels, (block size, movement pattern, infrastructure, bedroom size and so on). The interdependencies between many different aspects of the housing design problem were accentuated owing to the foreign context of this problem. Since students could not take things for granted, they were much more willing to trace the implications of individual decisions in different levels of their designs.

- Facing up to technological challenges: Viewing technological solutions as an integral part of their design solutions was unavoidable. Construction in this problem is an explicit and primary device of design, rather than a separate solution to be appended to the conceptual design solution. The notion of self-help includes construction in the basic set of design criteria.

- Using architecture as a device of future development: Again due to the self-help techniques, architectural decisions had to be used as mechanisms to control and influence building construction activity spread over a span of 5-10 years. Students had to understand the dependencies between the architect and society as well as use that understanding to influence future behaviors of the users, i.e., through the construction activity.

This modest list does not represent the full range of challenges and motivations this problem has provided for the students, professionals and teachers. However, the ones we acknowledged above are sufficient to illustrate the excellent learning experience provided for the students, for the faculty, and, we hope, for the various agencies involved in carrying this task through.

5. Suggested Readings

5.1. Context

1. Hall, E.T. Hidden Dimension, New York: Anchor, 1969

2. Fathy, Hassan. Architecture for the Poor, Chicago: The University of Chicago Press, 1973

3. Housing and Community Upgrading for Low Income Egyptians. The Joint Housing and Community Upgrading Teams. Foundation for Cooperative Housing Report, August, 1977

4. Cairo Symposium: Background Papers. Development of Popular Housing Co. of CAiro and SOM of Chicago, December 1977

5. Urban Land-Use in Egypt. Report of the Joint Land Policy Team, August 1977

6. Immediate Action Proposals for Housing in Egypt. Statistical Appendix, The Joint Housing Team, June, 1976

5.2. Economics and Housing

7. Carimes, O. F., Jr. Housing for Low-Income Urban Families. A World Book Research Publication, John Hopkins University Press, 1976

8. Summary Report: Housing Finance, Urban Land-Use Policy, Housing and Community Upgrading for Low-Income Egyptians. The Joint Housing Team, August, 1977

9. Housing Problems in Developing Countries, Vol. 1-2

10. Third World Urban Housing. Building Research Establishment. Department of the Environment, U.K.

11. Payne, G. K. Urban Housing in the Third World. London: Leonard Hill, 1977

12. The OSFAM/WORLD Neighbors Housing Reconstruction Program: Guatemala, Intertect, P.O. Box 10502, Dallas, Texas, 75207

5.3. Self-Help Housing

13. 'Colonia Managua' An Aided Self-Help Housing Project in Nicaragua. HUD report #58, September, 1962

14. Aided Self-Help Housing. Department of State, Agency for International Development, May, 1963

15. An Urban Aided Self-Help Housing Program in Guatemala City, Guatemala. HUD report "50, June, 1958

16. Special Report on Techniques of Aided Self-Help Housing. HUD Office of International Affairs

17. Aided Self-Help Housing in Africa. HUD Office of International Affairs

5.4. Building Techniques in Low-Cost Housing

18. Mud Brick Roofs. HUD Office of International Affairs

19. Soil-Cement, Its Use in Building. UN Doc. U.N. ESA 54, 1966

20. Relief Operations Guide-Book, Draft. Intertect, P.O. Box 10502, Dallas Texas 75207

21. Use of Bamboo and Reeds in Building Construction, U.N. ST/SOA/113

22. Production Techniques for the Use of Wood in Housing Under Conditions Prevailing in Developing Countries. Report of Study Group, Vienna, 17-21, Nov., 1969 (UN Report)

23. Caminos, H., Turner, J.F.C. and Steffian, J.A. Urban Dwelling Environments, MIT Press, 1969

24. Emergency Habitat, Project A. UIA International Competition for Unesco Prize, Department of Architecture, C-MU, 1975

5.5. Site Planning and Design

25. Planning Sites and Services Programs, HUD Office of International Affairs, April, 1976

26. Resident's Satisfaction in HUD-Assisted Housing: Design and Management Factors. Housing Research and Development Program, University of Illinois, March, 1979

27. Hot Weather Housing. Housing and Home Finance Agency, Office of International Housing, may, 1963

28. Basic Housing Case Studies. Design of Low-Cost Construction, HUD, Office of International Affairs, October, 1963

29. Industrialized Housing: Ideas and Methods Exchange #66, USAID & HUD, Washington, D.C., 1972, J.D. Ternel & J.F.D. Turner

30. Haxtable, A.L., "Safdie Logic Outdates," N.Y. News Service, Baltimore Sun, January 20, 1974

31. Habraken, N.J. Supports. New York: Proeger, 1972

32. Habraken, N.J., Boekholt, J.T., Thigssen, A.P. and Dinjens, P.J.M. Variations. Laboratory of Architecture and Planning, MIT, Cambridge, MA 02139