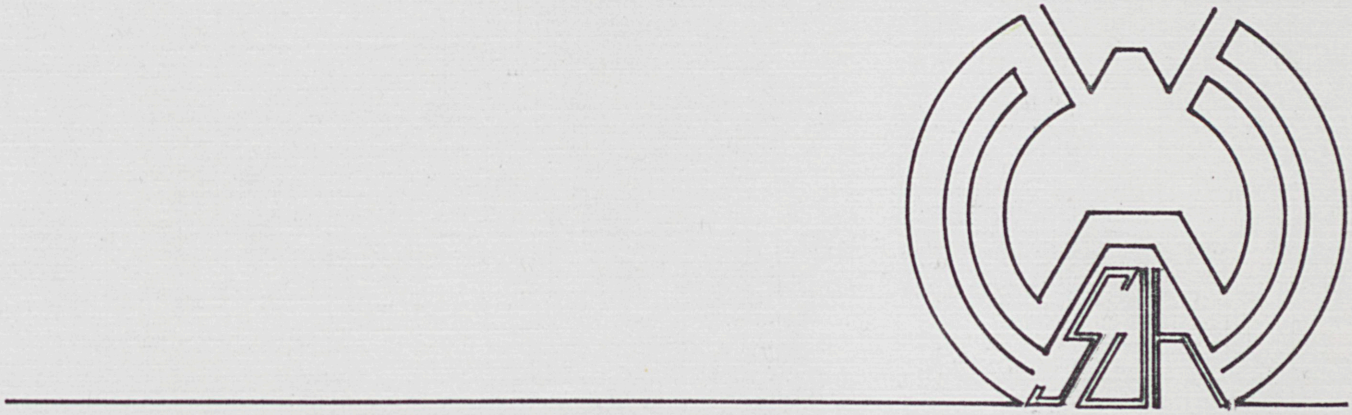
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Understanding my Culture

by

Seyed Jaffar Hejazi

An undergraduate thesis submitted in partial fulfillment of the requirements for the degree

of

Bachelor of Architecture

Approved by:

James Mitchell, Thesis Advisor

Robert Utzinger, Director

Montana State University
Bozeman, Montana

December, 1981

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Signed: _____

Date: _____

To each and everyone in my family

and

To all of my Moslem Brothers and Sisters of my country who gave their lives for our freedom.

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To accomplish the search for understanding my culture and transforming it into a design of human shelter; my needs were: nourishment of spirit, support, direction and guidance. The creator of the world and universe, ALLAH, gave me the spirit; My wonderful family gave me the support and patience; Dr. Mohsen Hourmanesh, a Persian Scholar, gave me the direction; Mr. Jim Mitchell and Robert Utzinger provided the necessary guidance. I would like to thank all those mentioned above and many close friends.

THESIS STATEMENT:

An analysis of solar energy application in terms of sociological, environmental, and technological variables, based on indigeneous materials.

THESIS PROJECT:

Development and planning of medium density housing for lower middle class income which were destroyed during the war in Shushtar located in Southwestern Iran.

PHOTO CREDITS:

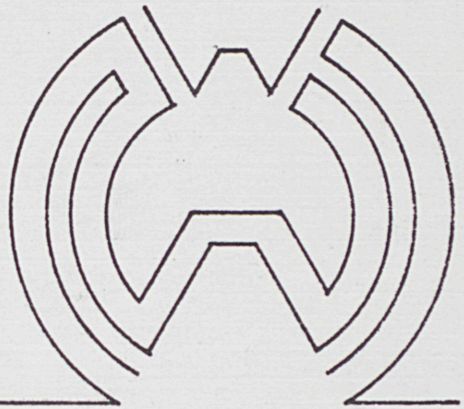
a *"The Sense of Unity"*

b *"City and Village in Iran"*

c *"National Geographic"*

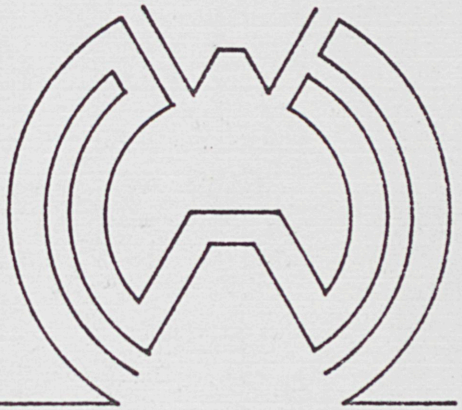
d *"Design and Color in Islamic Architecture"*

e *"Progressive Architecture"*



PART 1

INTRODUCTION



INTRODUCTION:

"THESE PRIMITIVE-LIKE BUILDINGS MUST BE DEMOLISHED AND REPLACED BY THE BUILDINGS OF MODERN SOCIETY".[1] *Soon after these words were said by the deposed Monarch, many energy efficient, low cost, organic, and structurally sound residential buildings in Iran were demolished and replaced with structures of cinderblock with no insulation--which were energy inefficient, costly due to transportation of the material to the site, and not in harmony with the existing landscape, context, and evnironmental setting. This action taken by the deposed Monarch, whose ambition was for everything to be like western culture, including Architecture - was destroying the many physical and spiritual qualities that Persian Architecture had to offer.*

Prior to 1978, my reaction was different to the above statement made by the deposed Monarch, due to lack of understanding my culture, as I departed my country at a young age. After 1978, during intense moments of the greatest experience in my life - the Islamic people's revolution - my thoughts and values began searching for better understanding of the centuries old culture that I had taken for granted and never fully understood. Also, having the good fortune to meet one of the Iranian scholars, Dr. Moshen Hourmanesh, who has spent many years in the areas of Islamic Architecture and passive solar energy technology, I received an introduction to appropriate Persian Islamic Architecture. These two issues gave me the direction to seek an insight into the Architecture of Iran in terms of SOCIOLOGICAL, ENVIRONMENTAL, and TECHNOLOGICAL variables, as well as in terms of Iran's topography which influences the regional Architecture and indigeneous material.

It is necessary to clarify and understand some terms about Architecture, often used by critics yet not fully understood. I feel the reader needs to know the meaning behind the word "PRIMITIVE" used by the deposed Monarch. The word is defined in the English dictionary as "BEING FIRST OR EARLIEST OF THE KIND", but most people of "MODERN" world perceive "PRIMITIVE" as old, unfuctional, obsolete, and unacceptable by their standards. The definition of the word does not mean obsolete, unpleasant, and unpractical as perceived by the critics of these Architectural types. The observer of does not try to analyze, explore, and study unique qualities and purpose often the structure, which could help him to use the practical technology to improve upon it. When the observer becomes only concerned with the appearance of the building or the materials used (i.e. adobe as being primitive material), he often does not know the purpose of the building and Architecture.

Perhaps this is one possible reason for limited success of Passive Solar Energy buildings in Western countries, especially U.S., even when non-renewable energy is in short supply and at a high cost. People are more conscious of the appearance of the building, yet most Architects who have designed passive buildings have not provided a building that is energy effecient with appealing appearance.

According to AMOS RAPOPORT, author of HOUSE FORM AND CULTURE, "PRIMITIVE" building is defined as "THAT PRODUCED BY SOCIETIES DEFINED AS PRIMITIVE BY ANTHROPOLIGISTS. IT REFERS LARGELY TO CERTAIN TECHNOLOGICAL AS WELL AS ECONOMIC LEVELS OF DEVELOPMENT, BUT ALSO INCLUDES ASPECTS OF SOCIAL ORGANIZATION, WHILE THE DWELLING PRODUCED IN SUCH A CULTURE MAY, AT FIRST GLANCE AND BY OUR TECHNOLOGICAL STANDARDS APPEAR ELEMENTARY, THEY ARE IN FACT, BUILT BY PEOPLE USING THEIR INTELLIGENCE, ABILITY NO DIFFERENT FROM OURS AND RESOURCES TO THEIR FULLEST EXTENT."[2]

Man can not dominate nature, but must adapt to it. The climatic impact depends on its severity and forcefulness. The humans that aproach nature by trying to be clever, and by beating it into submission would stand a better chance for survival if they accomodated themselves to this planet and viewed it appropriately instead of attacking it by force. The attitude of "PRIMITIVE" builders was that of working with climate, as they did not have the technology to ignore the climatical factors in their shelter design. "PRIMITIVE" man often built more wisely than "MODERN" man and also followed the principles of design and nature which modern man tends to ignore at great cost.[3]

Primitive man used REASON and INTELLECT to make up for the lack in Technology in providing his needs -- from Architecture to transportation. As complementary aspects of knowledge, reason deals with the sensible world, intellect with the metaphysical world. Reason is the outward manifestation of knowledge in human domain. If reason's complementary relation to intellect is realized it can become the guide which ultimately leads man to the highest form of "KNOWLEDGE" possible.[4]

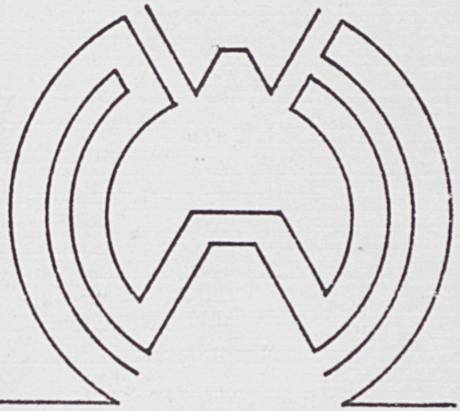
In order to further understand the basis on which a specific culture functions, one must be aware of the difference in meaning and usage of the terms "MODERNIZATION" and "CIVILIZATION". Many people do not distinguish between the two and think they have the same meaning. The English dictionary defines "CIVILIZATION" as "AN ADVANCED STATE OF HUMAN SOCIETY, IN WHICH A HIGH LEVEL CULTURE AND SCIENCE HAS BEEN REACHED"; and "MODERNIZATION" is defined as: "OF

OR CHARACTERISTICS OF PRESENT AND RECENT TIME". The difference does exist and I will elaborate on each term to better understand the context in which each is used.

The Iranian culture is one of CIVILIZATION, where ideas and technologies of the time period are developed to their fullest extent over the vast number of years. Civilization produces little failure as man has used his experience and knowledge as foundation for future development. MODERNIZATION on the other hand deals with the development of new ideas, often without regard to the past experience. Therefore man begins with little foundation and tends to ignore the past mistakes. The time spent in the modernization process often is too short and thorough research is not conducted; this results either in failure and waste or obsolete design within a short period. As in Civilization, man designs and creates for future generations and leaves behind a strong foundation for his children. Modernization creates short term design due to the need for material rewards and he is only concerned for present benefits with little regard for future generations. He feels that if he solves his problems then his children can solve theirs when they reach their designing age.

To understand and comprehend the final design of Iranian building, the information that effects them must be clearly defined and presented. There is a necessity to present history, regions of Iran, sociological information that affects Architecture and planning, technilogical background, and environmental data in order to understand the context in which the design will be placed.

HISTORY



HISTORY :

Iran is situated in the north temperate zone, between 44 and 63 degrees longitude; 25 and 40 degrees latitude. It has an area of 628,000 square miles and a population of approximately 35 million people. The size of Iran equals the area of Texas, New Mexico, Arizona and California.[1]

The country is rimmed by mountains on all sides, circling a central plateau which ranges in altitude from 1,000-2,000 meters (3,300-6,600 ft.) above sea level. The most common altitude in Iran is 1000 meters (3300 feet). There are two famous mountain ranges; one to the west and the other to the north, which when combined cover 50% of the country's total area. One third of Iran's total area is desert sand. The temperature in low lands varies as much 100°F in the course of the year ranging from 32° to 131°F. The region that measures the highest temperature is Khuzistan, which is located in south western Iran. The average of four months does not fall below 113°F.

For many years, both Iran and Persia have been referred to as the same country. When Aryan culture migrated down to the south of the Caspian sea, the country was named Iran, which means "HOME OF THE ARYANS". Later in time, the country expanded southward into Pars area and the name changed to Persia (PEOPLE OF PARS). In 1935, the ruling government, due to its Aryan background, changed the name back to Iran to re-establish a nationalistic ego. The official language of Iran has always been Farsi (Persian); nevertheless other tribal languages exist in different regions of Iran.[3]

Since before recorded history, the earliest people of the Iranian world settled in villages, cultivated crops, and raised domestic animals. Hunters often took shelter in mountain caves.

The geographical location of Iran, which is a land bridge between east and west, offered positive advantages to the growth of civilization culture, while at the same time inviting disaster. Irans was the point of convergence from travelers, traders, intellectuals and artist, which allowed it to be in full contact with the powerful civilizations in the east and west. This plateau region was attractive to migratory groups, as well as a rich goal for conquerers who devastated it many times beyond any apparent possibility of recovery -- yet its culture managed to re-emerge each time.[4]

In the fields of artistic expression, of social organization, of religion, and of philosophy, foreign elements that were admired were never copied, but rather restudied, reworked, and re-expressed in a characteristic fashion.[5]

The history of Iranian culture exhibits a remarkable resistance and continuity. This is not peculiar to Iran, but the manner in which it is expressed is distinctive: pride in the past; type of social culture; character of artistic expression; the search for the meaning and purpose of life; and the Iranian outlook and attitude toward the surrounding world.[6]

As late as 630 A.D., Iran had yet to establish its own style of architecture. At this period, Iran was conquered by the Moslem Arabs and as the religion was accepted by the people, the Islamic architecture using the talents of Persian architects and artists flourished throughout Iran and surrounding countries. Persian culture and Islamic beliefs led to the centuries of development and progress in architectural elements, such as COLOR, DETAIL, SPACE RELATIONSHIPS, FORM and other aspects that make architecture a positive act of man.[7]

ISLAMIC MYSTICISM has its highest development in Iran. Since Islam plays a major role on the daily life or Iranians, they have a natural predilection for spiritual intuition. "MODERN" observers have stated for many years that Persians are mystic at heart which is strengthened by the appeal of fine intellects. The mystical doctrine of SUFISM (Islamic belief), which was so popular in Iran, ranked as an established donctrine of Islam until it was brought into the breast of the orthodox Moslem faith by transforming it from a doctrine to an attitude of humble faith, boundless love, and pure morals. A major belief is that the material attachment of man to the material things of this world prevents man from ascending to that highest level of moral and spiritual perfection which is the goal of life.[8]

In Persian culture, TRADITION is not custom or habit, or temporary style of passing age. Tradition, whose most essential element is religion in its universal sense, continues as long as the civilization which it has brought into being and the people for whom it is the guiding principle survive. Tradition is a presiding idea of a normal society and the animating principle of the whole life of a people. The arts are amoung the most important and direct manifestation of the principles of the tradition, as men live in forms. In order to reach the ultimate, they must be surrounded by forms that represent a transcendent archetype.

Islamic civilization presents a good example of a tranditional civilization. This can be observed through the presence of certain immutable principles that have dominated the whole civilization in both space and time.[9]

Islamic architecture, like all traditional architecture, is intimately related to universe. Traditional man lives in a universe that is of great significance. "THE COSMOS REFLECTS DIVIVE PRINCIPLE, AND SO DOES MAN." Therefore, man is himself intimately related to the universe. Only those that become blind to the higher level of its existence would fail to "see" the higher level of the universal reality and thus reduce the universe to its quantitive and material aspect, rather than qualitative sense.[10]

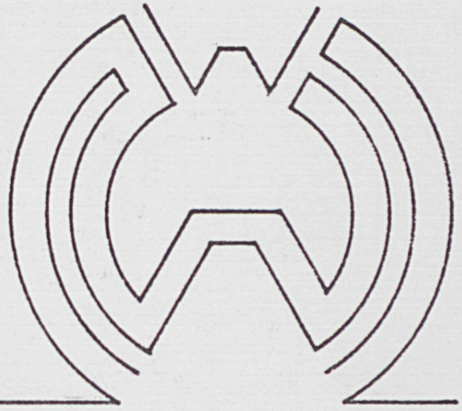
As the SPIRIT (RŪH) resides in the universe, it also resides in the body of man. A MOSQUE, HOUSE, and PALACE is also a replica of universe and man, and therefore spirit resides within it. As the house is the extension of mosque, it must be like the work of God and must remind man of the creator. The basis for understanding traditional architecture from the mosque to practically every other architectural unit and finally to town, city planning itself, is the relation existing between the universe, man, and architecture.[11]

The unitary point of view of tradition embraces architecture and its totality and all the elements that together create an architectural form, such as SPACE, SHAPE, LIGHT, COLOR and MATTER. This unitary point in Islam leaves nothing outside its scope and therefore all traditional architecture, whether house or mosque is seen in the same light and value.[12]

All physical bodies have an inner and outer meaning. Every external form is complemented by an inner reality which is its hidden internal essence. The ZÂHIR (external) is the sensible form, which emphasizes the quantitative aspect, such as the shape of a building or the form of a pool or the body of a man. The BÂTIN (internal) is the essential or qualatavitve aspect which is its courtyard and inner reality, where the external beauty of every object resides.

Iranians have always been deply concerned with the aim and purpose of life. In the most general terms, the constant ideal has been that of human conduct according to the principle of "GOOD THOUGHTS, GOOD WORKS, and GOOD DEEDS." The inherent virtues and qualities of Iranian people can be seen through their quick natural intelligence, ready sense of humor, and lively interest in the world in which they live. They are extremely hospitable and friendly, and will place all their resources at the disposal of their honored guests.[14]

REGIONAL ANALYSIS

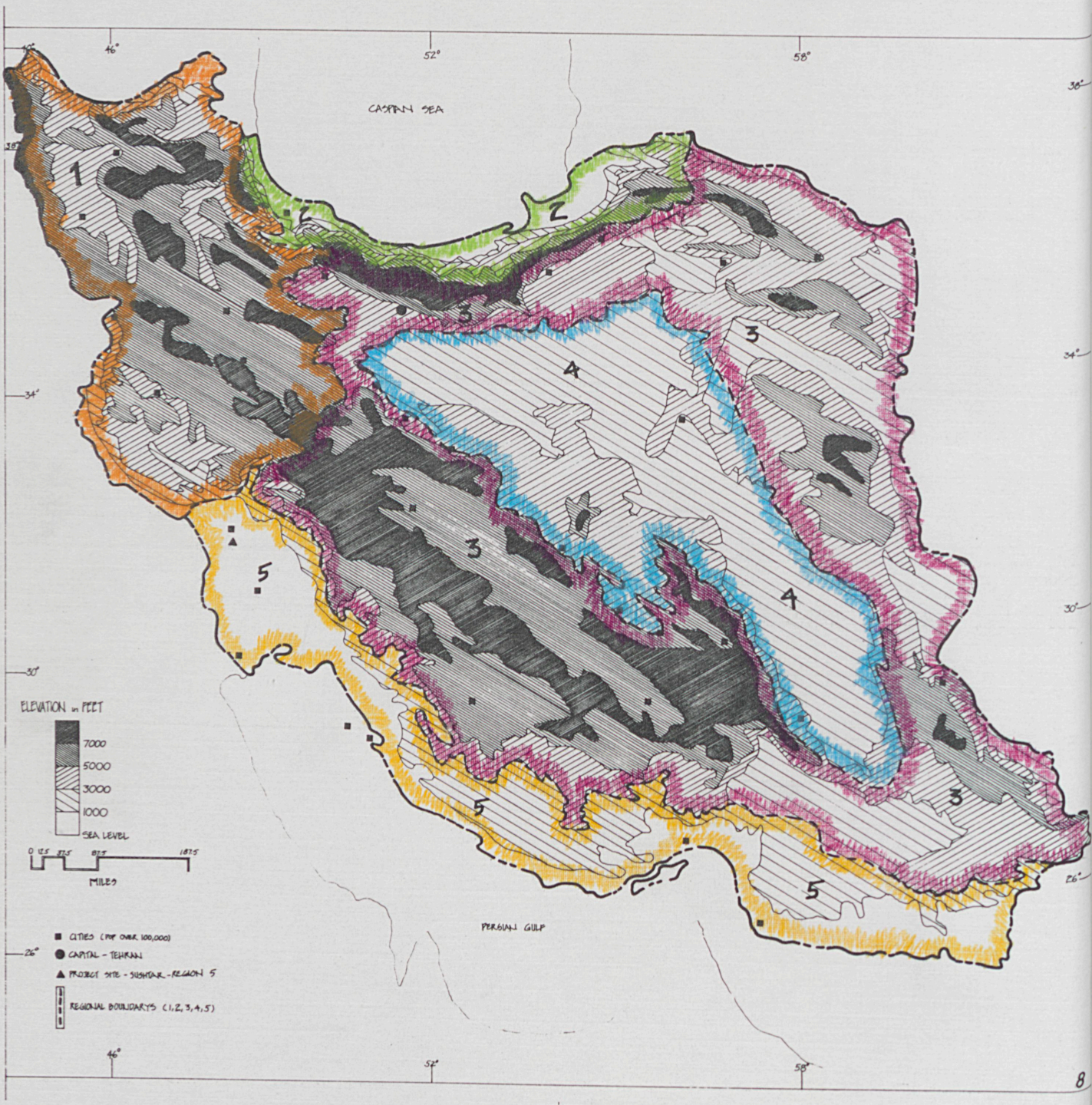


REGIONAL ANALYSIS:

The distribution and diversity of settlements in Iran are the result of ENVIRONMENTAL FACTORS, INDIGENOUS MATERIAL, TOPOGRAPHY, VEGETATION, SOURCES OF WATER, and the existence of VARIED SUBCULTURES. All subcultures share many things, such as the adaptation to their regional resources and environmental factors, yet social and planning organization and patterns vary as to their cultural background. For those reasons, I feel it is necesary to look briefly at the four regions before focusing on the region where my client's site is located.

One must observe the manner in which each culture adapted to its existing physical environment and resources to better understand the architecture that was created. By the use of the bioclimatical chart, one can analyze and suggest the alternative technology and solution to provide human comfort. For example, if in a particular region, humidity is higher than that allowed for "HUMAN COMFORT" on the chart and temperature is within the comfort range, one can suggest solutions in the building design process to correct this situation.

Through analysis, if a society has achieved this human comfort criteria, then one can learn from past design processes and attempt to strengthen any weaknesses by application of a new technology without reducing its cultural richness. The issues that I will deal with in each region will consist of PHYSICAL ENVIRONMENT, CLIMATE, VEGETATION, SOILS, SOCIO-ECONOMICS, AND THE ARCHITECTURE OF THE REGION.


46°
52°
58°
38°
34°
30°
26°
CASPIAN SEA
PERSIAN GULF
1
2
3
4
5
ELEVATION in FEET
7000
5000
3000
1000
SEA LEVEL
0 125 375 875 1875
MILES
CITIES (POP OVER 100,000)
CAPITAL - TEHRAN
PROJECT SITE - SUSHTAR - REGION 5
REGIONAL BOUNDARYS (1,2,3,4,5)

REGION 1:

The climate of this region is perhaps the coldest in the country. The temperature varies from below zero in the winter months to pleasant warm days in spring and fall, and to moderately hot weather during the summer period.

The humidity ranges from 30% to 80% depending on the distance from Caspian Sea to the northeast. The rain in the valleys and snow high on the mountains average annually from 15 to 35 inches. The climate in this region can be compared to that of Montana. The average elevation is 5,000 feet above sea level; with 1/3 of the total area covered by virgin forest containing; oak, ash, elm, beech, cypress, maple, and honey locust. Due to higher moisture than most of the country, dry farming, and unirrigated crops are primarily produced.[1]

The topography above 9,000 feet elevation is limestone. There is a mixture of GRAVEL, SAND, CLAY, and LIME available in this region.[2]

The population density is approximately 120 persons per square mile. The languages are Persian, Turkish, and Kurdish. The majority of the population is middle class and lower middle class, as thier major source of income is agriculture, Persian carpets, textiles, farming equipment production and forestry.[3]

The impact of the indigeneous material is apparent in the architecture of this region, as lumber is the major building material. Although flat roofed houses exist in cities and highly dense areas, the climate dictates the sloped roof stuctures that are placed within plantations. The dwellers live within their farmlands due to limited accessibility and transportation, and family members are the total workforce of each farm.



The typical residence consists of two levels: one level is the basement, which is constructed of materials which include sundried brick, fired and glazed brick,

plaster, and massive rocks for foundation with tile floors. The upper level is of wood frame with adobe brick for walls and rafters for the ceiling. The interior space is generally open to the rafters, as in summer months an opening is provided on the roof to allow cool air to penetrate to the deck below rafters. The roof is of thatch and beams are tied with straw to reinforce the nails and rods used.

REGION 2:

This region is the most diverse of all regions in Iran in terms of its physical environment and topography. Its climate and elevation vary to such an extent that most observers cannot perceive this region to be in the same country as the others. This region is located along the Caspian Sea and receives the largest amount of moisture in Iran. The annual rainfall is about 40 to 60 inches and rain falls thoughout the year, creating the extensive marshes and the dark jungle foliage. The humidity is between 73% and 90% due to rainfall and it borders with the Caspian Sea. The temperature in this region ranges from 11°F to 99°F, with an average of 60° for most of the year.[1]

The largest portion of forest land in the country is located here and agricultural products are rice and tea, which grows in marshy lands. The Aryan culture migrated and settled in this area. Persian language is the main source of communication, although local dialects exist. The majority of the population is middle and lower class, with a very small group of wealthy citizens. A large number of the population is middle and lower class, with a very small group of wealthy citizens. A large number of the population are farmers, who harvest rice and tea, with some wheat on less moist lands. The limited form of transportation and accessability necessitate the farmer and his family living among its cultivated land. Only the city dwellers live in clustered buildings of the same architectural style.[2]

The houses are constructed of lumber, tied and reinforced with straws. The roof is the main element; as the source of protection against rain and wind, the umbrella-like thatched roof defines the boundary of space. The walls lose their visual boundary, therefore space can easily flow to give it a PAVILION-LIKE arrangement. Often these houses are placed 6-8 feet above ground for protection from the constantly moist ground.[3]



a

REGION 3:

For many centuries in Iranian history, all governments have chosen their capitol cities in this region. Not only is the majority of the population settled here, but also much of the elegant architecture of the country is found thoughout this area. The climate is arid and dry and most communities begin their development along RIVERS, LAKES, and QANATS (water wells) - as water is of great value and need for the people.[1]



c

Typically the Iranian culture seems to have achieved better solutions in shelter design, as the climate has been more sever and resources limited. Most of the river and streams flow in to the vast interior plateau. The relationship of water to the economic life of the people is of great significance.

Although this region extends from north to south, the climatical variations are minor., but not insignificant. In both areas the winters are cold and summers are hot and arid. The northern section registers temperatures of 10°F to 115°F while the south ranges from zero to 110°F. The humidity is between 20% and 70% with 30% average during the course of the year.[2]



a

The annual rainfall is between 12 and 18 inches in the north and less than 12 inches in the south. The snowfall is limited to mountains and small amounts in the the lower plains. The changes in the season are fairly abrupt. By March 21st, the fruit trees are in full bud and fresh green wheat covers the

fields, and later while the orchards are in bloom, wild flowers carpet the hills. There is also a rapid transition from summer to winter.[3]

The vegetation is dense in the northeast and gradually gets sparse as you move southward. Most of the fine fruits grow here, as does wheat and barley. The extreme deficiency of timber on the plateau is met in part by the cultivation of water groves of poplar trees whose trunks are used in house construction. Willows and enourmous plane trees grow in villages and line the irrigation channels. Groves of fine black walnut trees are found thoughout the country, and both almond and pistachio are cultivated.[4]

The topography is a mixture of GRAVEL, SAND, CLAY, and LIME. These compose most portions of the constuction materials. The villages and settlements are of three basic plans depending on the location and context. The developments along the rivers and streams are linear plans to minimize the use of water. They become a clustered layout in an open landscape and are turned inward for protection from the harsh environment and high velocity wind. The cluster format is also used when located within a series of hills. The clusters are frontal oriented as a whole, yet inwardly oriented as individual units.[5]

Adobe is the major construction material used for both sundried brick and plastering. The foundation is laid out three feet below ground with large rocks and adobe as mortar. Immediately above the foundation is a one foot layer of adobe followed by sundried bricks, capped by timber in its log form and used as beams to span the space. For the encloser of large spaces vaulted domes are often used with brick inlaid in many patterns. Wooven straw is placed above the logs to prevent small objects from penetrating through. Buildings are topped with tree branches and leaves. Adobe is then poured over the top to cover the entire roof. These roofs have to be maintained regulary in more moist climates to prevent total errosion. The exterior walls are covered with adobe and sprayed with either light or dark wash, depending on the season, for absorption or reflection of sun's energy. Interior walls of spaces are often white plaster to reflect the light coming from sunlight and openings.

Primitive man used indigeneous materials not only because of lack of good transportation, but also for economic reasons of cost and time when transporting materials to the site from great distance. This practice can be compared to construction elsewhere in the modern world, where people use non-renewable energy to transport materials very long distances, thus wasting energy and greatly increasing the cost.

REGION 4·

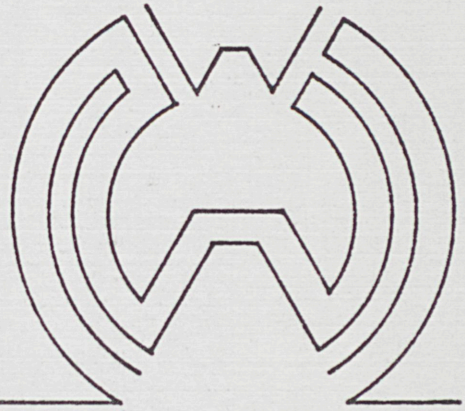
The two great deserts of Iran occupy this region and only few settlements exist on their perimeters. History has shown that a milder climate did exist here, and only after certuries has it become the region with harshest environment, perhaps beyond humans' ability to live in comfort. Spring and fall are non-existent, as part of the year is cold with subzero temperatures, and the remainder of the year has hot days with temperatures of 105°F. The humidity is registered at an average of 35% for the year.[1]

Vegetation does not grow for the most part, except along the rivers that flow from higher mountains into this desert. The soil is a sand layer over clay and limestone. The architecture on the edges of the desert is not unique but is well adopted to the physical environment. The settlements are totally closed off to the exterior to defend against the blowing sand by the sixty miles per hour winds.

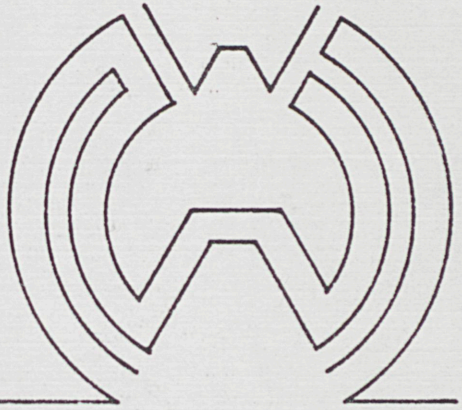
The only life here depends on the water of the rivers and Qanants. The people are of lower income, as most of them are peasants that can only cultivate enough for thier minimum needs.

REGION 5:

Since the project site is located in in region five, the issues dealt with in previous regions will be discussed in full in the Site Analysis an Program Statement.



PART 2



CITY & VILLAGE

CITY & VILLAGE:

In order to understand the pattern and relationship in overall plan of my design for a community, I feel it is important to look briefly at the existing communities - small and large. The patterns of settlements in Iran have been shaped by enrivonmental conditions, historical development, and perhaps most importantly by the water supply system. The arid conditions make irrigation essential and water supply is an overriding consideration in the location of the settlements.[1]

Permanent settlements were rare until a QANAT system was developed to solve the water problem. Qanats are gently sloping tunnels dug horizontally into an alluvial fan until the water table is pierced. Water then filters into the tunnel, runs down its gradual slope, and emerges on the surface as a stream (see Fig. 1).[2]

The Iranian society can be divided into three sectors - CITY, VILLAGE, and TRIBE (nomads) - each rooted in a separate social environment, each exploiting a different physical environment and all depending on each other to complete the life cycle.[3]

Cities are viewed as islands in a barren land, linked by a network of roads and caravan trails and occupied by traders and processors who share in "URBAN" rather than "FOLK" culture. Many of the cities and towns fit into a pattern populated by 40,000, and 100,000 persons and situated 80 miles apart along the main highway. The sites were originally chosen mostly as distribution points for farming regions.[4]

Every city and town bears testimony to the program of modernization. Beginning in 1930, wide avenues were cut through crowded residential quarters to help relieve congestion and to provide space for new buildings. These new avenues have destroyed some of the former charm -- in one city (Shiraz), the fine vaulted bazzar was cut through and one of the old palaces was destroyed. The avenue had attracted the shops, but now shopping activity has moved away from bazaars.[5]

Westerners who have visited the Moslem cities, have said that "the modern organization, rather than maximizing movement and accessibility, limits it and

controls behavior by restricting mobility". The order and pattern may be incomprehinsible to westerners, but are not absent.6

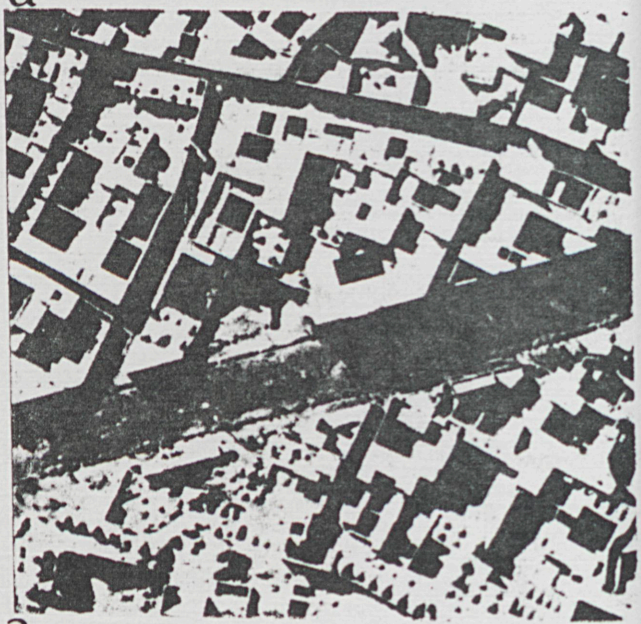
A minimum of specifically urban functions exist in the cities. These may include a market, an administrative center, a military center, a religious center, or a center of intellectual activity exists in cities.

In Iranian communities, man moves continuously in an undulating and expanding space that is forever united. In structured space, man knows where he is, and direction is meaningful to him. The coordinate system in which all creation is situated and moves through is: NORTH, SOUTH, EAST, WEST, UP, and DOWN. Man seeks region order through this system. ORDER is often achieved in man's cities by prominent sites, and interaction that creates a finite, regional sense of place. Points of reference within the landscape often heighten the effect of the place.7

Special patterns of forms for livelihood, occupational structures, dwellings, and water supply systems within a single settlement and throughout the region reveal certain regular associations which combine to form a matrix of the Persian cultural landscape. Uniformity is the dominant characteristic of the pattern - and uniformity within this area is expected. The settlements are occupied by a single people,



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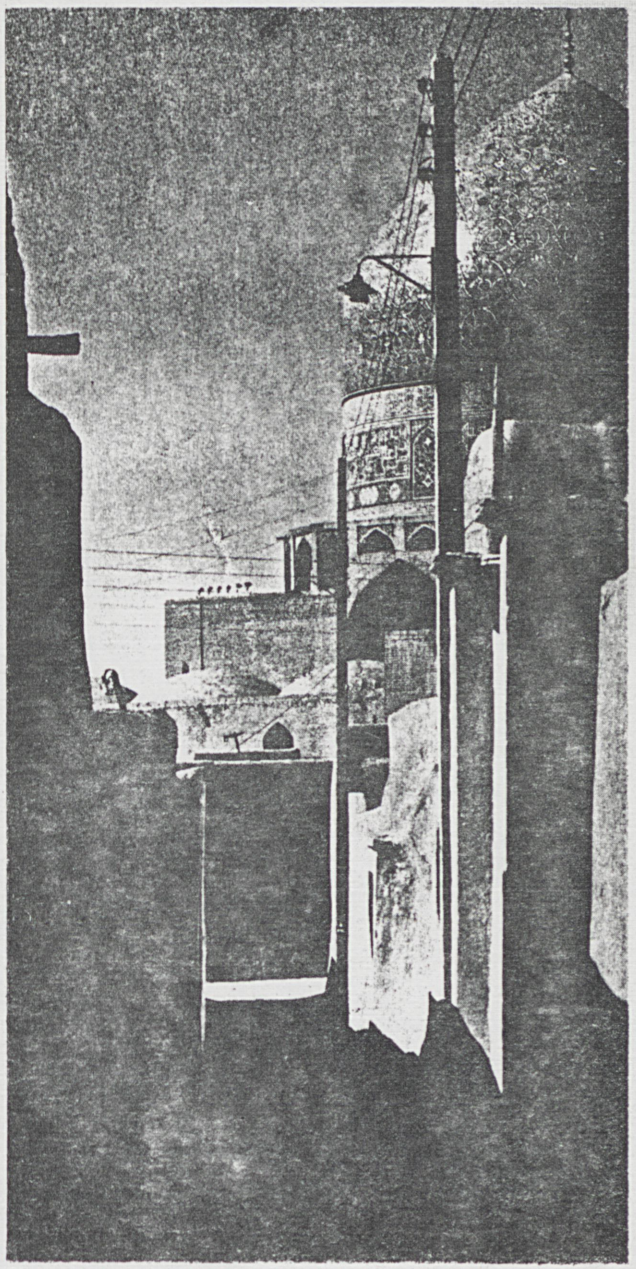
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possessed of a relatively homogeneous culture and technology.[8]

Often pathways penetrate the encircling walls and disperse into lanes two to three meters (approx. 6 to 9 feet) in width that are kept in shade by the high surrounding walls and are relatively cool channels for pedestrians, even in the heat of the summer.[9]

A HIERARCHY of spatial linkages provides an orderly system that allows for both constancy and change. The PRIMARY space system relates to the main flow of the bazaar route. This channel begins at one end of the city and culminates at a NODAL SPACE (mosque or palace). SECONDARY paths are those leading into residential dwellings, which branch off from the main bazaar route like tributaries from a river so dependant spaces such as shops of the bazaar and rooms around the courtyard rely on these primary and secondary paths, or nodal spaces for their existence. The linkage of one space to another is described as CONNECTION, TRANSITION, and CULMINATION.[10]

These patterns and channels are evident in both linear and clustered plans of a village. Mountains, ravines, river beds, or contours of the land can provide natural boundaries within which man creates systems that appear DISTINCLY RANDOM, LINEAR, or CLUSTERED.[11] *As seen in Regions one and two, the random order exists among plantations, but are connected by an overall pattern.*

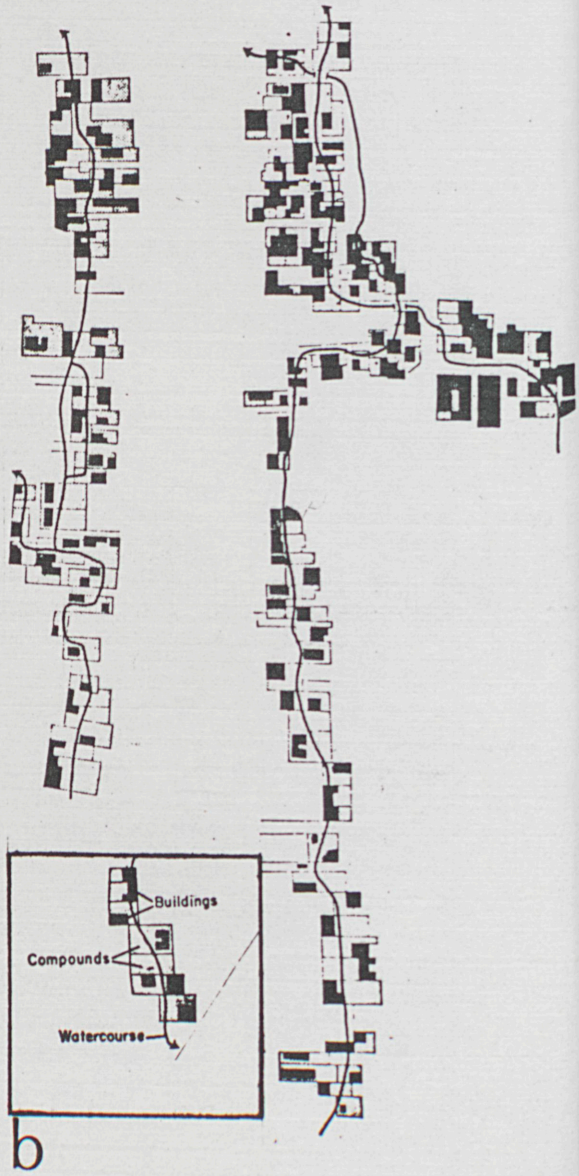


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Linear order almost aways follows the path of water, and its flow determines the streets of the village. Water passing in and out of the courtyard houses strongly connects the dwellings. This linear pattern exists both with surface and subsurface water. In the case of subsurface water, houses are often lowered 6 or more meters into the ground in order to receive the water directly into the courtyard as well as for thermal insulation and retreat from moving sands.12

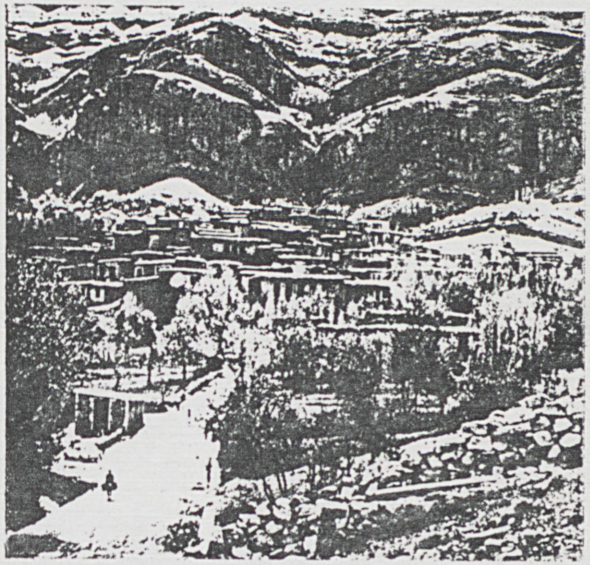
The cluster format exists in the rural habitat of the open plains. The cluster form of order shows a far more vigorous and self conscious mode of giving order to the human settlement. Some have external regularity within which a "close packing" of units occur, but in the semi-mountainous regions, the forms accumulate organically, both in external and internal ways. The cluster form allows dwellings to huddle together and leave the least surface to the scorching sun. The closeness yields protection through mass. The cluster format achieves its unity through predominantly flat-roofed cubes that step down hillsides, filling valleys as extensions of the earth itself.13

Tribes are ethnic groups that migrate periodically in prescribed patterns. According to season, the tribes move from their winter quarters to the summer quarters. In the fall, the tribes move down from mountains to low plains. In



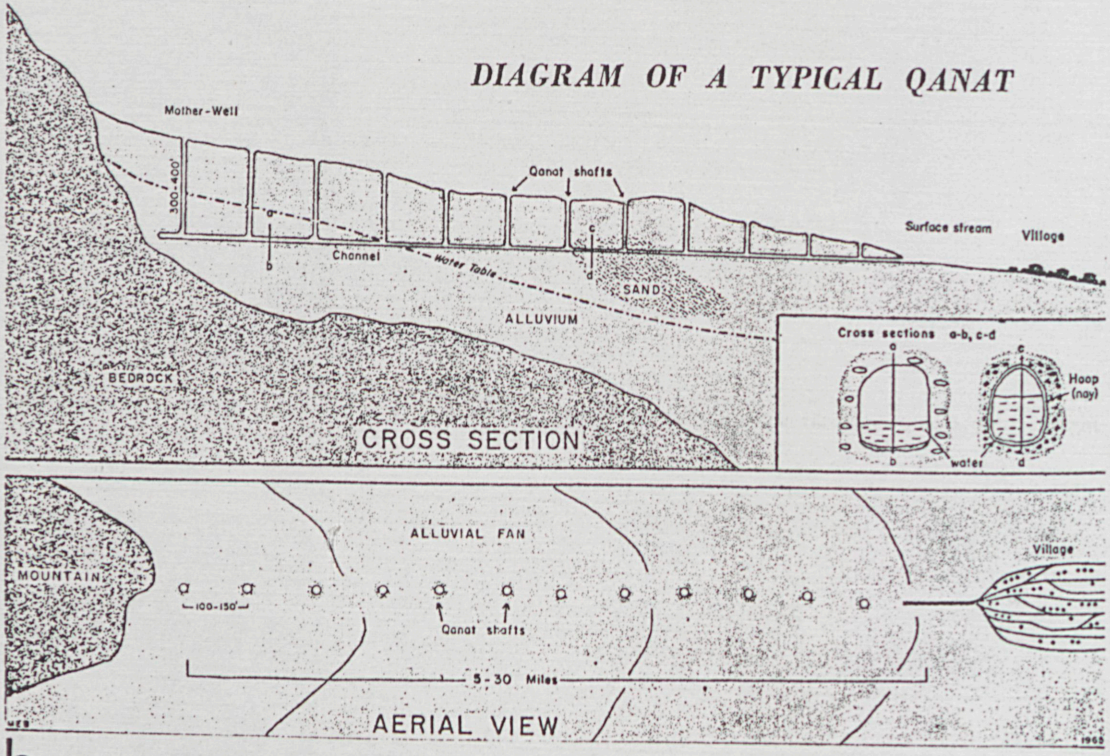
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the spring, they migrate again into the highest mountains and valleys. The migration often covers the distance of 200 miles and takes many weeks.14





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DIAGRAM OF A TYPICAL QANAT
Mother-Well
300-400'
Qanat shafts
Surface stream
Village
Channel
Water Table
SAND
ALLUVIUM
BEDROCK
CROSS SECTION
Cross sections a-b, c-d
Hoop (nay)
water
ALLUVIAL FAN
MOUNTAIN
100-150'
Qanat shafts
5-30 Miles
AERIAL VIEW
1965

b

FIGURE 1

PERSIAN HOUSE



PERSIAN HOUSE:

The Islamic House of IRAN is perhaps one of the most complex in terms of its multi-purpose use and its relationship with nonphysical matters, including such factors as SPIRIT, MEANING, UNITY, ORDER and integration of other physical matters that are absent elsewhere -- AIR, WATER, LIGHT, COLOR and DETAIL. The Persian house is an institution and not just a structure, created for a set of purposes. Its form and organization are greatly influenced by a cultural milieu to which it belongs.1

The house exists among SCHOOLS, (مدرسه), MOSQUE (مسجد), SHOPS and bazaar (بازار), PALACES, and other institutions.2 As the mosque bares the spirit, so does the house, as house is an extension of the mosque. In both Arabic and Persian, the word mana (معنا) has the sense of "meaning" and "spiritual", thus "meaning" exists in Persian house.3

Although people with different attitudes and ideals respond to physical environment; these repsonses vary from place to place, because of change in CULTURAL, SOCIAL, RITUAL, ECONOMIC and PHYSICAL factors. These factors may change in the same place and with the passage of time, but in primitive and vernacular dwellings, these changes are not rapid.4

Islamic architecture emphasizes symmetry because human body, circle which manifests heaven, universe and spirit are or believed to be symmetrical and thus humans can relate to symmetry and its geometric perfection with better understanding and comfort. A typical product of such a society's educational system is the architect - planner, who is given the title MUHANDIS - "he who geometricizes" - and who thereby embodies in his name the fundamental emphasis of the system. Geometric order can be achieved through unification by the use of limited materials, colors, and shapes. One achieves a unity through the use of a

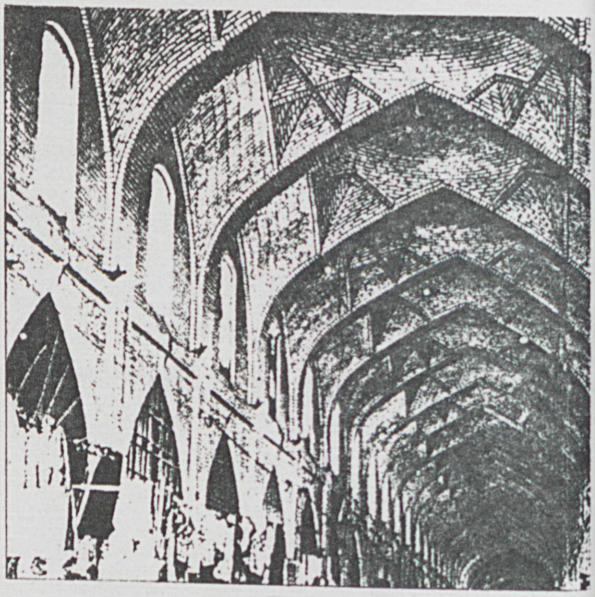


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single material and repitition and elaboratation of this form. A house that is constructed of adobe in its totality, be it in the form of mud, plaster, or brick has achieved unity through its organic and simple form.[5]

The positive space in the relationship between space and form that determines and gives quality to the space. As in other cultures, a house may be placed within a space which is determined by the material forms it surrounds, but in Islamic architecture, space is "carved out" from the material forms around and is defined by the inner surfaces of these forms. The walls of the garden or the arches of the bazaar define the space, where traditional man moves and lives, as he tries to achieve unity and synthesis.[6] *Synthesis to create an architectural form is achieved in SPACE, SHAPE, LIGHT, COLOR and MATTER.*

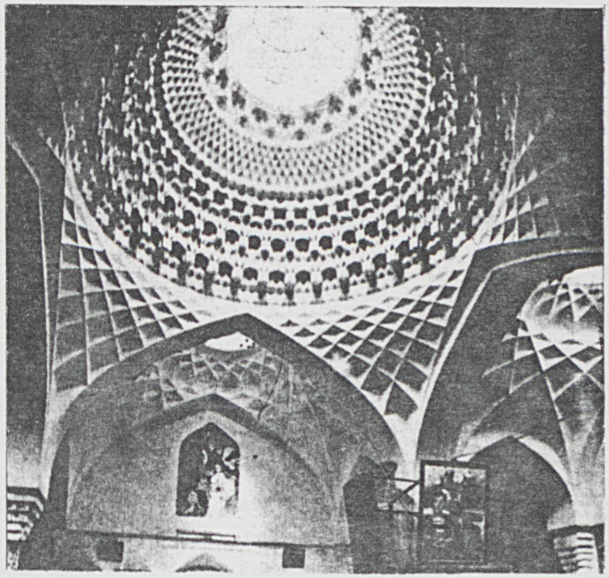
The orientation, qualitative aspects, and relationships between space and form are "ESSENTIAL ELEMENTS OF TRADITIONAL ISLAMIC ARCHITECTURE AND A KEY IN UNDERSTANDING ITS PRINCIPLES."[8] *It is best to study and understand each element involved in islamic Persian architecture in order to understand its use and totality.*

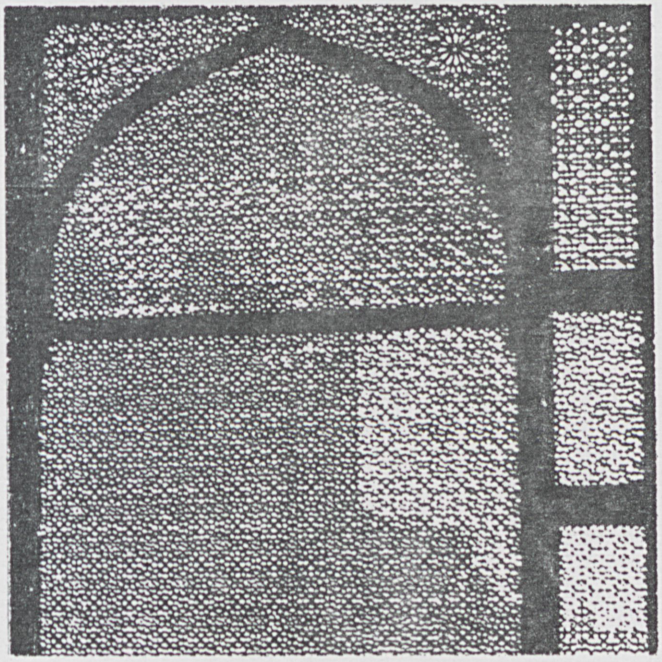




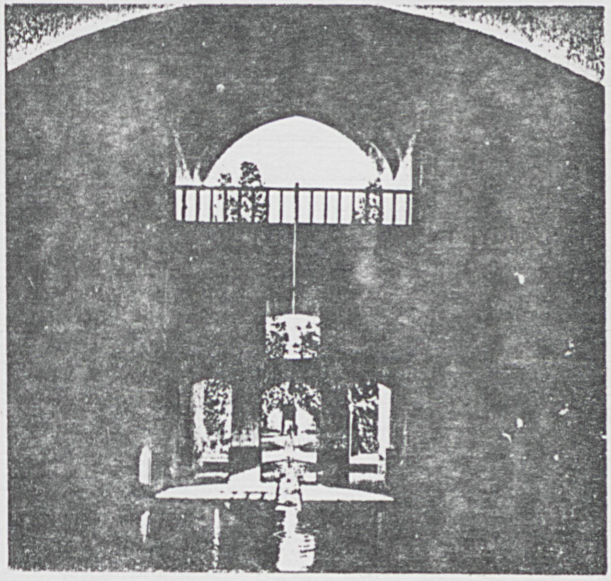
LIGHT:

There is a verse in the Islamic QURAN (قرآن) on the light which says "ALLAH IS THE LIGHT OF HEAVEN AND EARTH." In Islamic Persia, light is an integral part of man's life as the intense luminosity of the rays of the sun is experienced throughout the country. Their use of light is the most dominant feature of Persian architecture in the physical sense and is also a symbol of the devine intellect and being. As the rays of light reflect on the heavy walls and arches, they transform it into a structure with a sense of rising above ground and thus losing its heaviness.[9]





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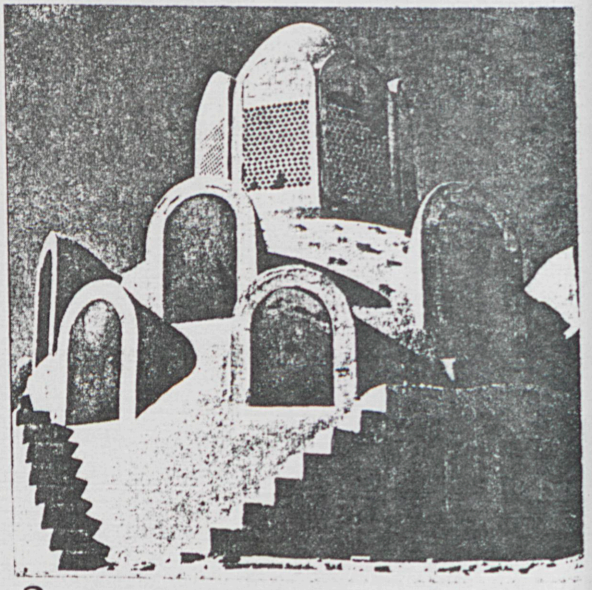
AIR :

The AIR that provides comfort and human existence also manifests other qualities such as heat and humidity, gives matter a lighter appearance, and allows it to reach a feeling of rising and weightlessness. In nature, the most direct manifestation of air is WIND, and in Islamic architecture of Iran the air is given free access into a building and through its space.10

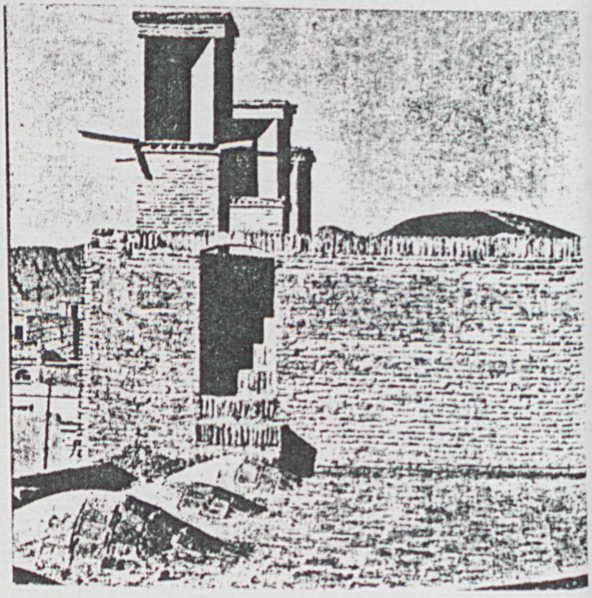
The term WINDOW has the meaning of "WINDS EYES." Traditional man understands its purpose and function, as seen in the way he permitted necessary amounts of air circulation to take place within his shelter to achieve comfort. His sensitivity to wind are apparrent in the abundant roofscape forms wind-catchers, wind towers, and perforated domes which respond to the motion of air as wind.11

The modern day understanding of window as an opening closed off by solid (GLASS) is not apparent in traditional man's shelter. Through the use of his reason, intellect and experience, he achieved result that gave quality and created unity without interrupting the character of the wall.

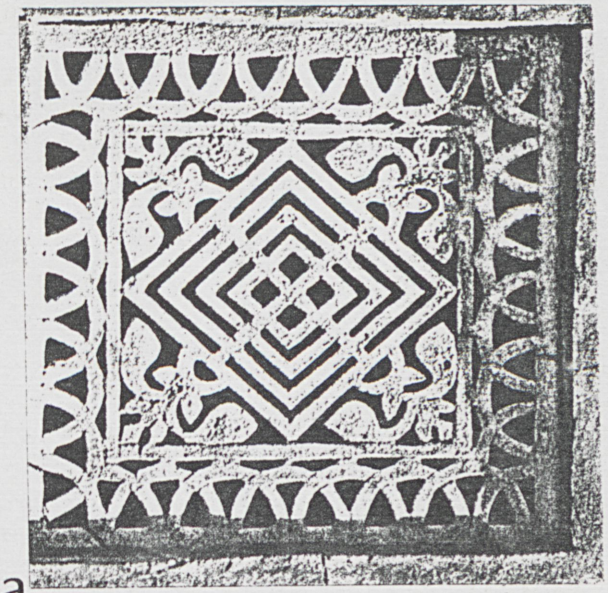
Through manipulation of building materials, the designer has created detail and openings to provide daily air circulation. By the use of tiles of either the same color or contrasting colors, openings are designed so not to break the continuity of the wall



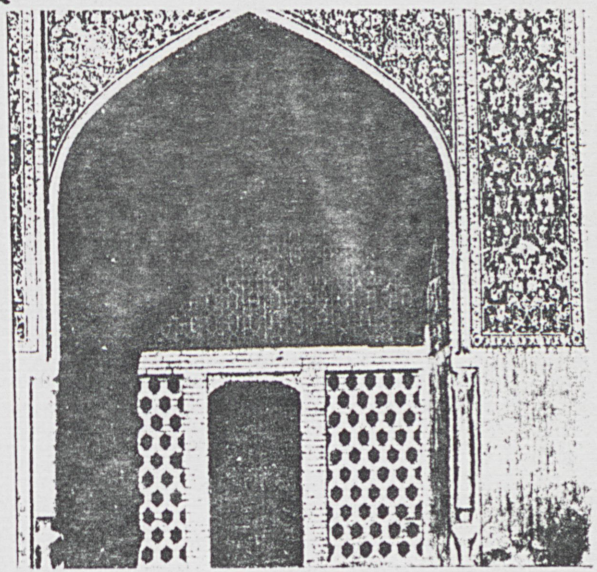
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surface. The depth of openings through materials were often calculated according to sun angles of the region, thus allowing for the winter sun to penetrate fully to provide heat and lumination. Summer sun was reflected, thus allowing only lumination and not heat.



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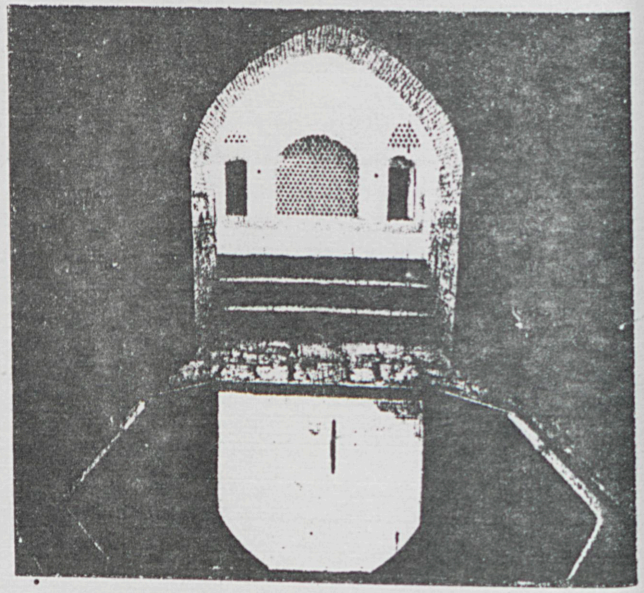
WATER-GARDEN-COURT YARD

Due to climatical conditions and the airdity of the regions, water attracts all forms of life, from people to vegitation. Water plays a vital role in human life and its existence. Communities huddle near mountains, seeking the life-generating force of water hidden within them. Often the dependent spaces within a courtyard focus on the central pool, which reflects life giver, divine mercy and the creator of man.[12]

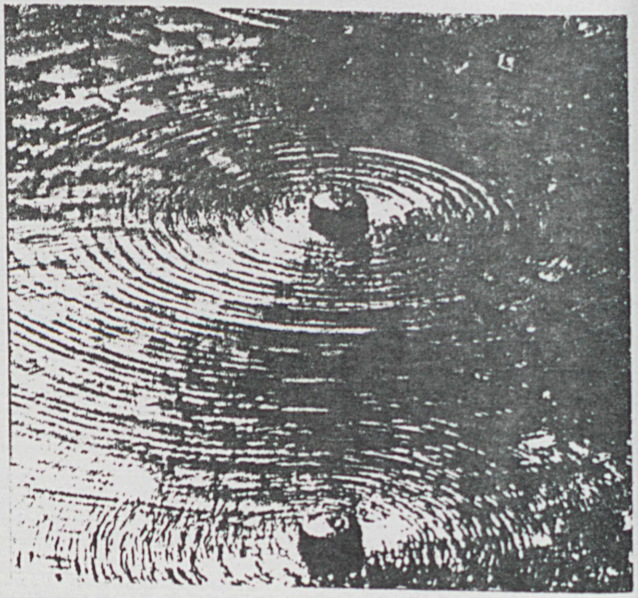
In villages of a linear pattern, a channel of water moving through the village provide water for domestic purposes. Drinking water was provided through water wells. Vegetation was planted along this waterway, thus giving shade and coolness to the resident.[13]

The garden is also apparent in Iranian buildings, as the vegetation receives its life from the soil, water and sun which are all found in the courtyard. In the hot arid regions that lack this type of life the courtyard presents relief and freshness and thus becomes a sanctuary for man. The gardens in Iran are set out within the overall arrangement of spaces. The concept of garden remains as a paradise and an important element which generates CENTRIPETAL force (inward focus) and basic contact with nature.[14]

Just as in family life with its concentric circles of privacy withdrawing



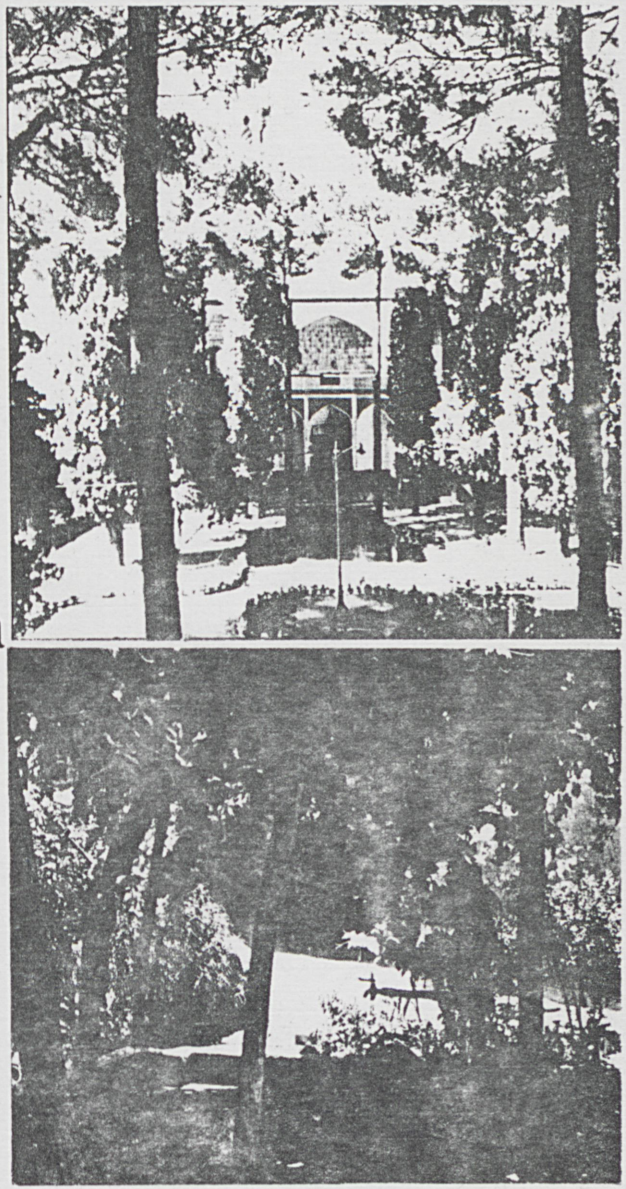
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from public view, the COURTYARD HOUSE provides spiritual direction and communal relationships. The spaces around the courtyard represent the family members and courtyard itself is the parent.[15] *The GARDEN (باغ) floor materials range from simple earth surfaces to paved brick. In the walled creation of man, an order traced in the garden floor by the waterways that flow distributing the life-generating water to the pool and to its components of the garden.*[16]

In Iran, man's perception of "SOCIAL" and "PERSONAL" space is an essential aspect of his use of space, its architecture, and environment. The courtyard of a residential unit is the inner spirit of personal space and the courtyard of the mosque provides the inner spirit of a group.[17] *The courtyard is the beginning and ending point of traditional man's daily activity, as he rises and sets out to do his daily chores and returns to his shelter at nighttime to find coolness and privacy and a peaceful atmosphere of the inner spirit.*

The Islamic culture of Iran emphasizes the privacy of the individual. The function of entering into a courtyard is in an indirect manner, breaking the direct visual contact with the outside. This concept is best illustrated in the form of CONNECTION, TRANSITION and CULMINATION.[18] *The connection is the point where the "PERSONAL" space connects*

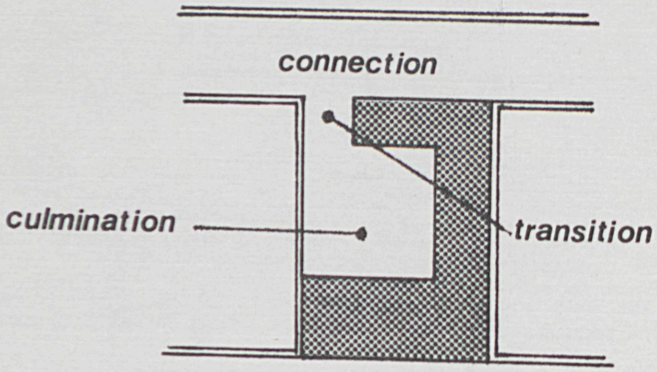


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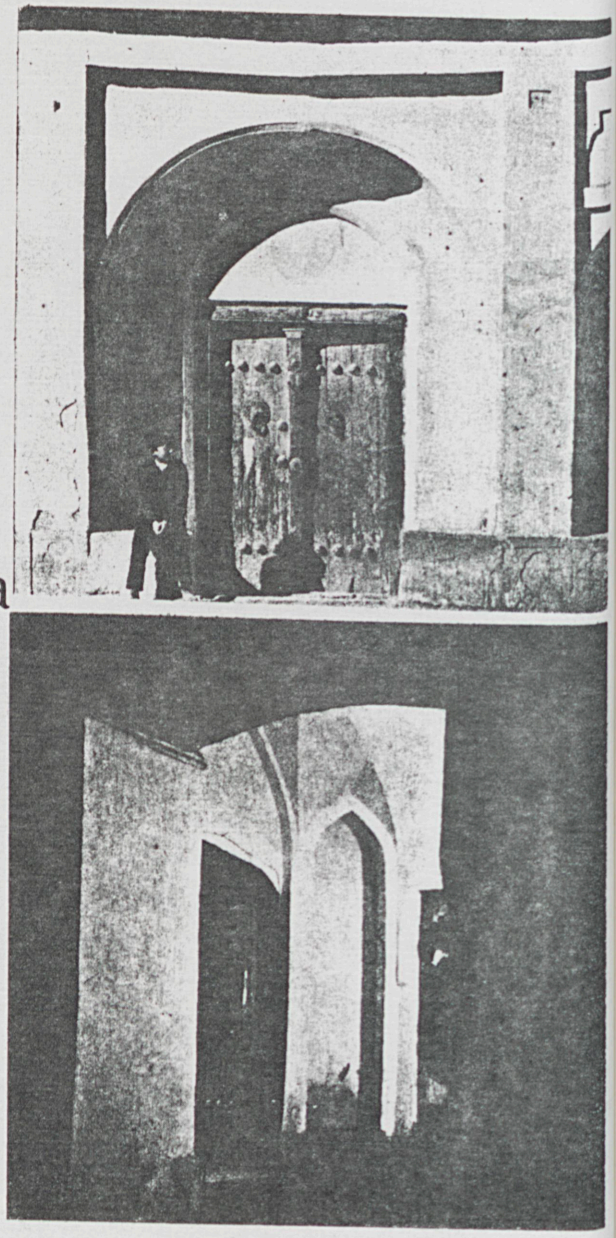
to public secondary path; transition is the entrance through a channel, which connects the "PRIVATE" and "SOCIAL" space and often narrows to stress privacy; the culmination is the courtyard where traditional man reaches his daily destination.

This concept of CONNECTION, TRANSITION and CULMINATION can also be applied to other aspects, such as community plan ( ), the inner part of a house. In the case of community ( ), the connection becomes the point in which the primary path connects to a secondary path, which then leads to the house; the transition is the much narrower secondary path which reduces traffic defining a district; and finally the culmination is the entrance to the house.

The house itself bares connection which is the entrance channel between path and courtyard; courtyard is the transition as man's very final destination is the room space, and culmination is his room space.



a



FORM - SHAPE - SPACE:

The regional culture affects FORM, PLAN, SPATIAL ARRANGEMENTS, and ORIENTATION. Materials, construction, and technology are the modifying factors rather than form determinants. The materials, construction, and technology do not decide what is to be built nor the form, but rather make possible the enclosure of a space and make possible or impossible certain decisions. Also the site does not determine form, but rather influences the pattern of the city and house.

ORDER and PROPORATION are important to traditional man, since he lives in a natural environment full of order and proportion. He achieves this through his use of ARCHITECTURE, GEOMETRY, and HARMONY: numbers signify shape; geometry which represents the personality of number signifies form; and at last harmony of space generates form. Proportion is to space what rhythm is to time and harmony to sound.[20]

The triangle is the first form to enclose space with generation of points and lines.[21]

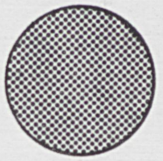


The SQUARE is the most externalized form of creation, which represents quality. It is also the symbol of stability and completion.[22]

The CIRCLE has no beginning and no end and is symmetrical about its center axis. It is also the most geometrical symbol.[23]



As traditional man puts strong emphasis on family, he creates important sociological reinforcement through inward organization of his space and its usage. In the conception of PLACE (OKo), a central space is created by enveloping it in walls. These boundaries may in time become "USABLE", or "LIVING" walls containing secondary spaces, that are dependant upon primary space for their LIGHT,



AIR, VIEW, and CONNECTION. Space is viewed as one of the most direct symbols of being. In structured space, man knows where he is and direction is meaningful to him.24

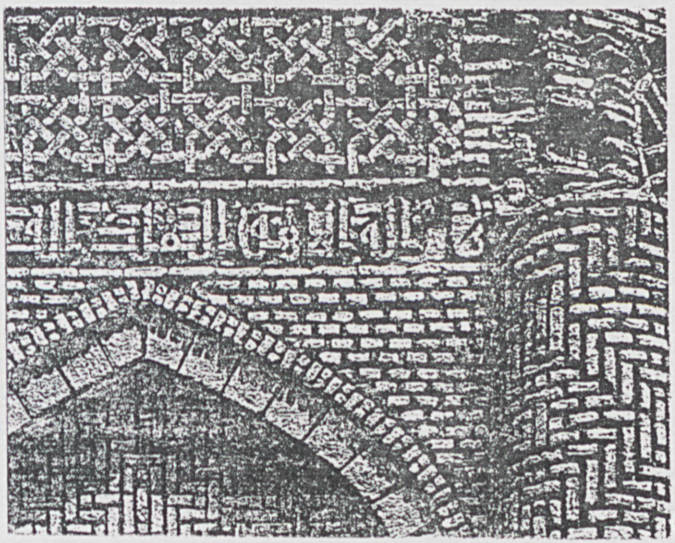


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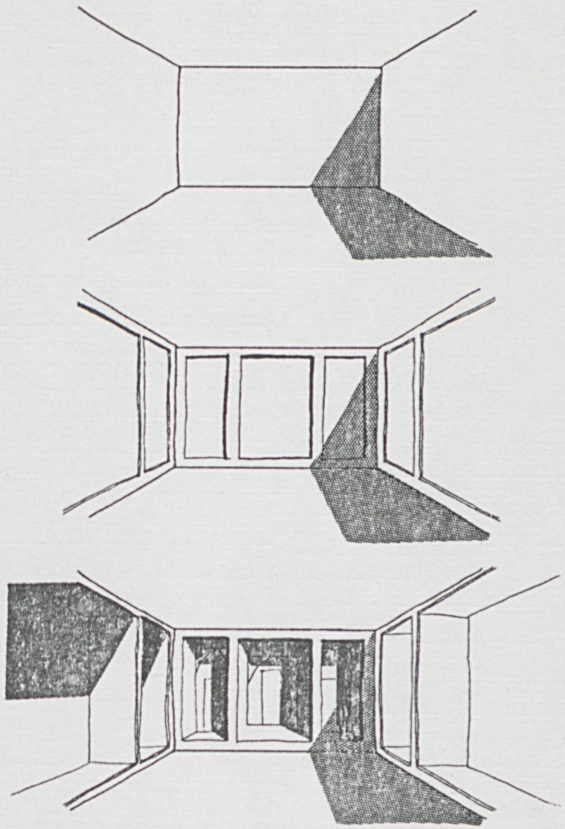
WALL:

Vertical surfaces are extension of the two dimensional planes, by extending them further into space creates another dimension. As a result SPACE, NICHES, and OPENINGS are developed. Use of a single material and single proportion, multiple materials and more elaborate proportions, and finally use of single or multiples of material in single pattern or patterns not only creates contrast and unity, but also creates the hierarchy that provides order.[25]

The detail and manipulation of brick or tile for breaking the plain wall and allowing the intense light to create dynamic shadows gives a transcending quality to vertical surfaces.[26]



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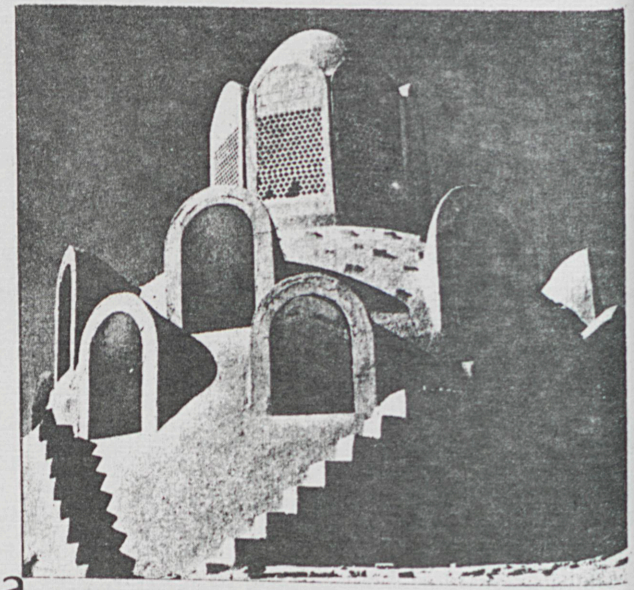


ROOF :

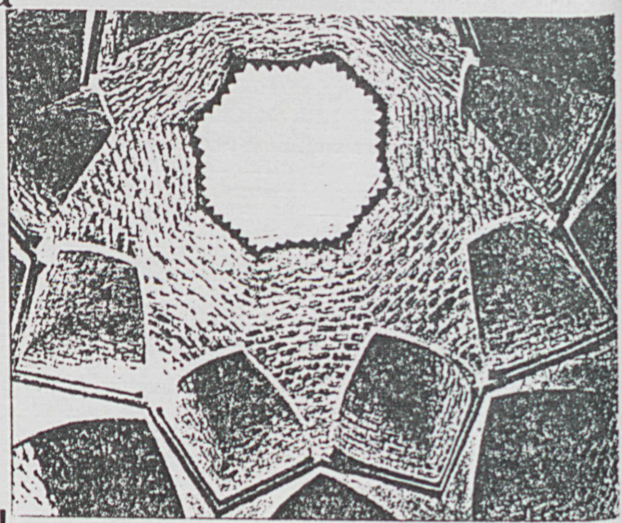
A soaring dome imparts NOBILITY, while proximity of the piers and walls suggest INTIMACY and SECLUSION.[27] *Symbolically, dome functions as a "CONTAINER", built according to the laws of mathematics and statics, encompassing a hemispherical space while leading to a central point.*[28] *A dome acts as a funnel for light, with its elegant textures and color giving quality and quantity to light. The dome also funnels the interior air through the openings at the point or its perimeter, while allowing the fresh air to enter from wind catchers at its base.*

This limited shape, regarded by the traditional man as the sixth plane of the cube; is a static, non-expansive shape capable of generating lines of movement limited to horizontal direction. It is a stable form wholly resting unto itself.

Flat roofs are most commonly used in the Persian house, as in almost all regions, the climate necessitates the need for cooling in the night. Thus many families sleep on these flat roofs during summer months. These flat roofs become spaces with their own qualities, as they break visual contact with the neighbors; while allowing the social activity to take place on them. During the hot months, not only the courtyard but also roofscapes are used at nighttime to hold



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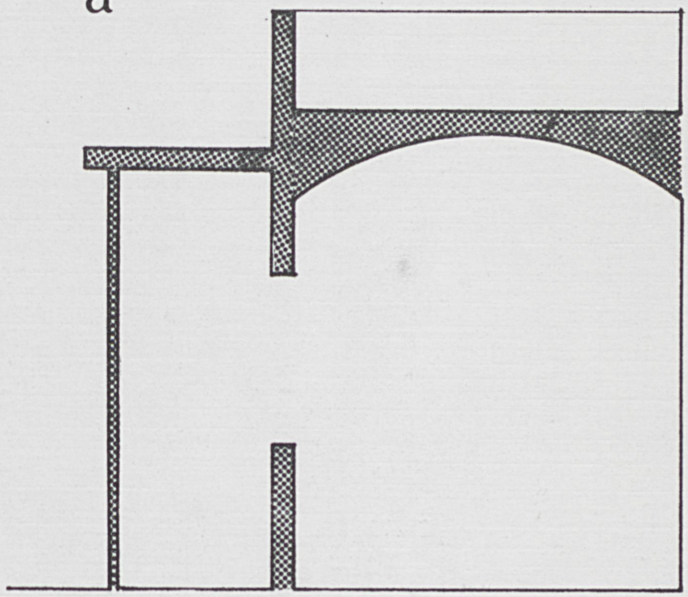
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meetings, gatherings, weddings, religious ceremonies, and many other activities. The flat roofs are used on smaller spaces, as timber and steel can expand over a limited dimension without the use of columns as support. The use of columns often can interrupt a free space, thus limiting the movement required. On large spaces, domes are often used to provide uninterrupted space.

A BARREL VAULT is used in similar spaces in the regions, where timber was not available or the user group recommended for barrel vault rather than beams. The barrel vault only appears in the space that covers, as the roof remains flat.



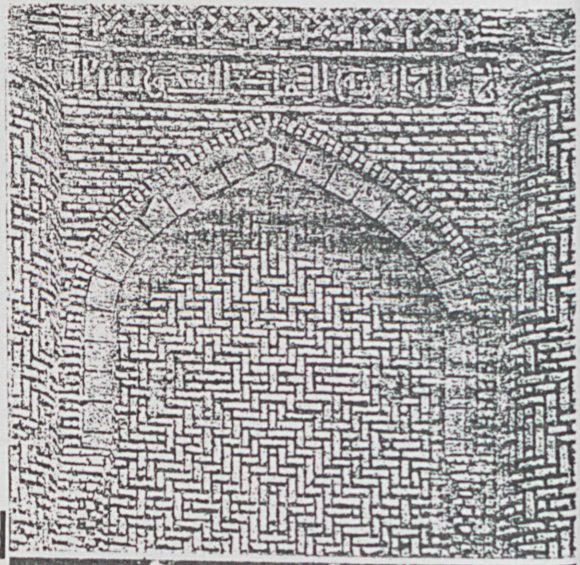
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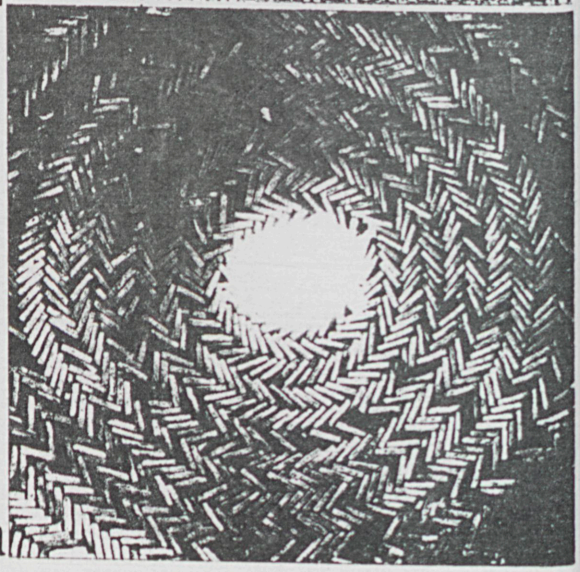
DETAIL :

The rich tapestry of a traditional society expresses a total design through series of patterns and textures. The significance of art depends on the judicious use of SPACE, SHAPE, SURFACE, COLOR, and MATTER, as a result of strong relationship among them.[29] *In Persian architecture, materials are used honestly, and have explored their potentials, although these materials have changed due to technical discoveries.*[30] *For example, sun dried brick and adobe have been replaced by fired and glazed brick and tile, as brick in Iran expresses function as well as the possibilities of the medium. The sensitivity of the architect, artist, and craftsmen in the creation of a powerful structure through expression of materials used to their potentials, have created not only beautiful, but also exhilarating structures.*

The treatment of large surfaces were always of special concern of designers, and this challenge was met in several ways. They laid the brick in various ways to create linear patterns and textures, and designs were in high relief. The use of a single material for both structure and decoration gave unity; while skillful designs prevented monotony. Some designs evolved from structural features, while others showed geometric panels on walls as details.[31]

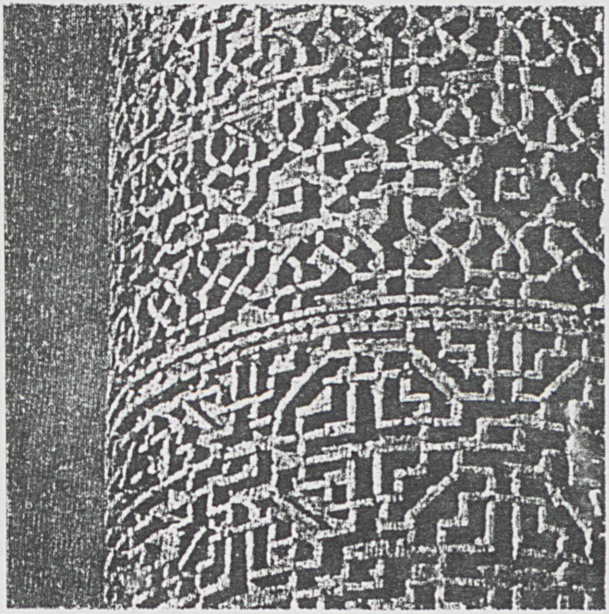


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Since the brick was locally produced, several pleasing features were achieved. UNITY was achieved since the repeated use of brick allowed each building to give visual strength to each other, but also carry its own charm and character.[32] *The patterns in high relief give the feeling of DYNAMICS as a sun moves from one side to another, highlighting each segment as though the building facade was under a spotlight and presenting itself to those who observe it. Glazing was often applied to give added depth to the wall facade.*[33]



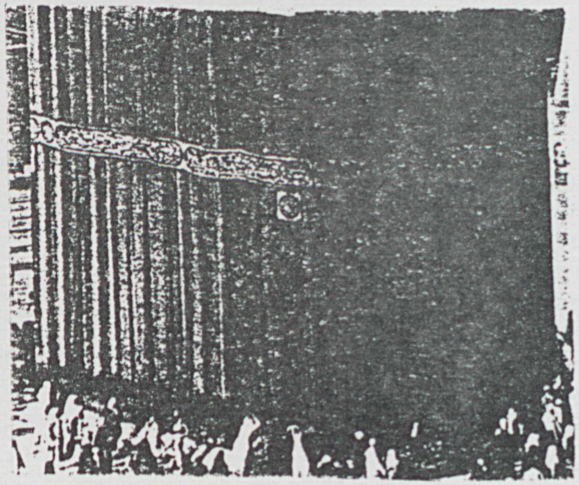
COLOR:

Color is the result of POLARIZATION OF LIGHT. As light dominates Persian architecture, color has dominated Persian art. The intense blue sky, the vivid and ever-changing color of the mountains, have encouraged and intensified this love for color which is seen in all the arts, from minitures and carpets to tile buildings.[34]

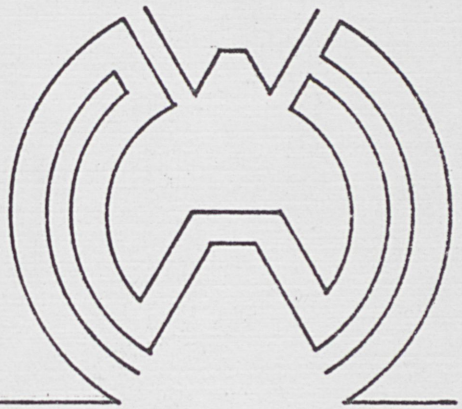
As the triangle in geometry reflects the fundamental conception of SPIRIT, SOUL and BODY, the three colors - WHITE, BLACK, and SADDLEWOOD - also represent these aspects. WHITE is a mixture of all colors and is pure and symbolically viewed as light descending from sun. White thus unites all colors.[35]

BLACK is referred to in SUFISM as BLACK LIGHT (نورسیاه), which means that due to the intensity of light, it is hidden and has the sense of ascending. For example, the cloak of KABAH (کعبه) represents the mystery of being, the light of majesty, the color of devine. Saddlewood is the color of earth, void of colors and therefore it is the natural color.[36]

GREEN is the single color that is viewed in Islam as superior to YELLOW, BLUE and RED. Yellow and blue form the GREEN and with its opposite as red, green is viewed as fertility, and eternity, while yellow represents past and blue as future. The harmony of opposites is most typical of the architecture of the hot arid-regions of Iran, where blue-green tiles contrast harmonically with the buff-yellow of both its regional architecture setting. Colors are often used in gentle variations applied brilliantly to cover large surfaces to enhance the vitality of the building and help define the architectural form.[37]



PASSIVE TECHNOLOGY



PASSIVE TECHNOLOGY:

The Iranian civilization through many centuries has developed solutions to adapt to the varying physical environments and climates. The solutions have been the best alternatives considering the tools available to them. The technology of the traditional man has been passive systems, which are often referred to as SOFT TECHNOLOGY.

SOFT TECHNOLOGY deals with the existing building material and its characteristic properties, as well as the proper use of SUN, WIND, and MOISTURE to achieve human comfort. For example; in most parts of the country, traditional man uses indigenous materials, such as ADOBE, CALICHE, ROCKS, SAND GRAVEL, and LIMESTONE with sensible design solutions like orientations to sun and wind, or away from sandstorms. He created a system to allow nature to ventilate and cool his space rather than depending onthe future mechanical technology to cool his space by consumption of non-renewable energy.

I will provide information on each aspect of traditional man's achievements followed by a discussion of recent developments in the area of soft technology and their application to such cultures while keeping the character adn image of the environment.

Materials:

ADOBE is perhaps the oldest of traditional man's construction material, and only after development over the years have improvements been made to better withstand the physical environment (i.e. moisture, earthquake, etc.) Adobe as seen today is little more than dry mud. Its elements are SOIL, FIBEROUS MATERIAL, WATER and SUN. To prevent erosion by water, often plaster to waterproofing material is applied. To give added strength in compression and tension, one can add other elements such as CEMENT, LIME, PETROLEUM STABILIZERS, and HORSE and COW MANURES in the making of adobe blocks.[1] In some areas of Iran, where CANES were available the builder tied a series of them together and used them as a technique we know today in concrete design as reinforcing bar. These straws were kept moist before installation within the walls to give higher elasticity to the wall.

Adobe mixtures can be used in many forms such as MUD FORM, PLASTER, SUNDRIED BLOCKS and GLAZED and FIRED BLOCKS. In the case of blocks, the mixture was

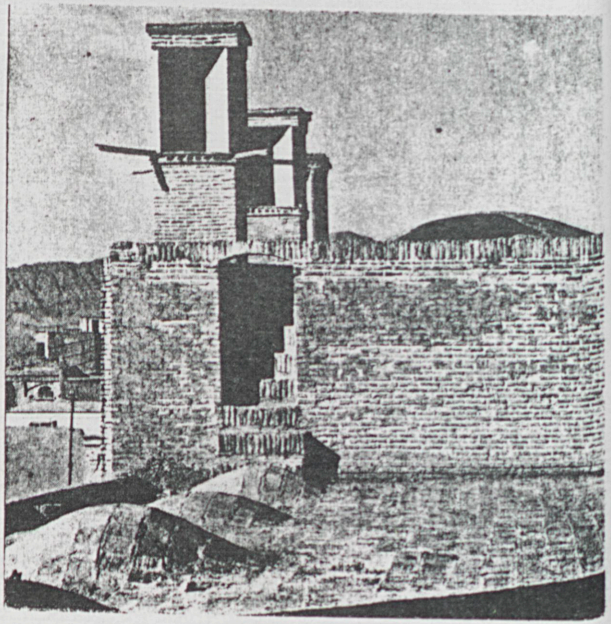
poured in the 12" x 12" forms, tamped, smoothed by hand, and left to dry overnight directly on the ground. Due to the heavy mass of the adobe, a strong foundation is a prerequisite in order to fully support it. The proportion often used for exterior walls was the width being one tenth of the height.[2] The interior walls were often ten inches thick, depending on the local climate.

In colder climates, the south facing walls were used as a thermal storage mass, and therfore were thicker in width. EARTH, ADOBE, STONE, AND SAND used by traditional man were excellent choices because they could be structural, didn't leak, required little fuel energy to produce, and were cheap.[3]

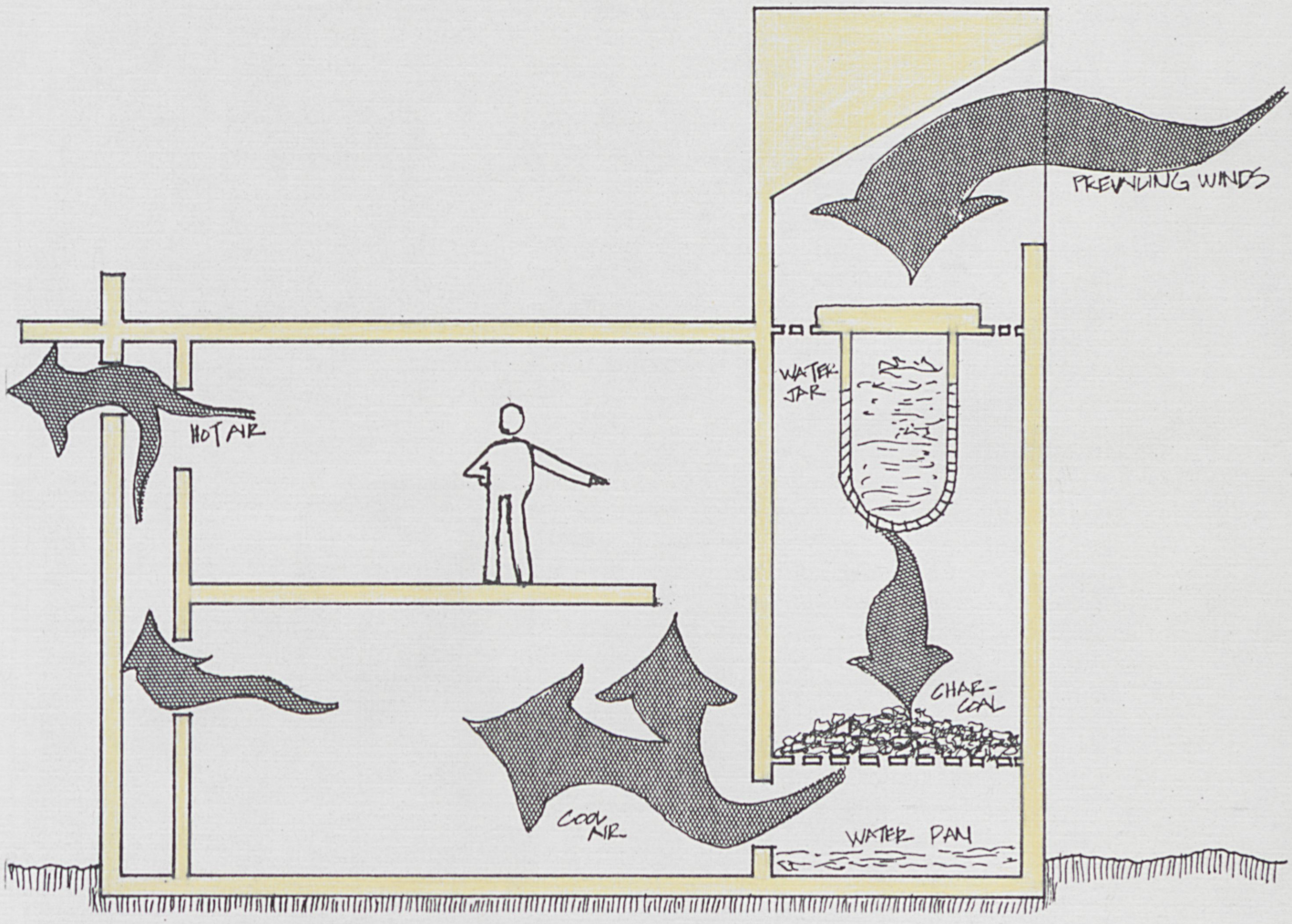


Coolling tower:

In the arid regions of the country, traditional man developed cooling towers that made use of the prevailing wind and basic principles of thermodynamics. WIND SCOOP TOWERS catch above-ground winds, which are generally strongest 6 to 12 meters (20-40 feet) above the ground. The air is channeled down masonry or adobe shafts, passing through the cool shafts, circulating past the porous clay water vessels, which are filled with water daily, and gradually sweat moisture that cools the passing air and increases the heat carrying capacity.[4]



The water at the bottom of the pool that is collected from the dripping water vessel and added daily, further cools the


PREVAILING WINDS
WATER JAR
HOT AIR
CHAR-COAL
COOL AIR
WATER PAN

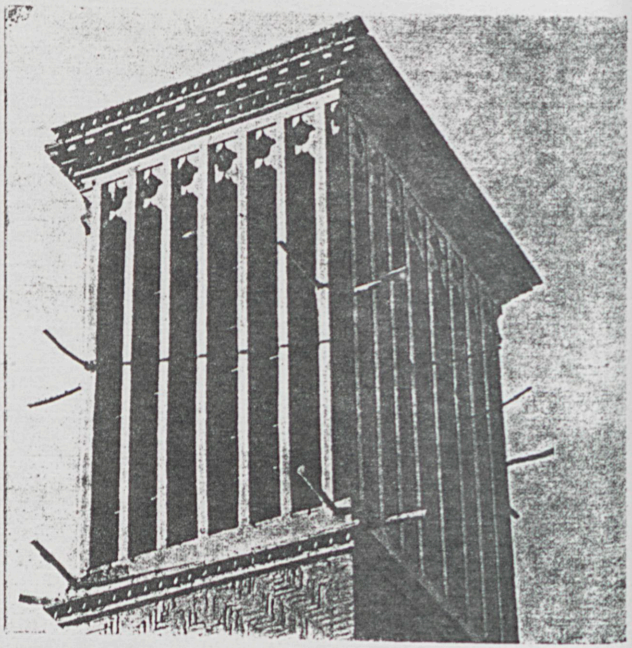
passing air by evaporation. In order to filter the air and if necessary, dispose of the excess water, an open mesh screen with a layer of charcoal also further cools the air. This system allowed the traditional man to cool his building well below ambient termperatures in very warm climates.

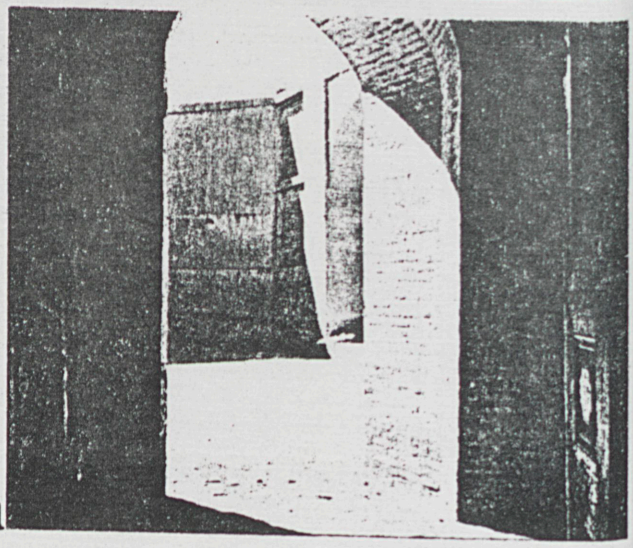
Both the operational aspects were impressive, and also the way in which these towers were designed in terms of their structural beauty that enhanced the city scape, giving a sense of unity to the buildings. The careful design by traditional man allowed the tower to be a beautiful sculptural element, rather than merely a cooling tower.

Orientation:

It is elementary to all living creatures; human and animal, that to be comfortable in winter, one must orient himself to the sun to absorb as much of the sun's warmth as possible, and in the warm climates orient away or be protected from the sun's heat and remain in shade to cool the body. This is almost a human instinct from the time a person is capable of movement without assistance.

In Iran the spaces that were occupied most often were located to receive more sun in cold climates and less sun in warm climates. The walls acted either as a thermal mass or time lag for heat depending on the climate.





a

Porch:

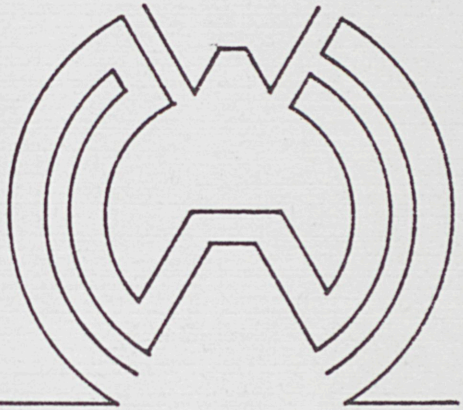
In the regions where sun control is important, often a porch extends from the room and intecepts the rays of a high summer sun to keep the room shaded and cool. A garden or water is located in the courtyard to provide cooling by evaporation in the hot days and cool nights of summer months. The thin walls were often sprayed with the pool water during the evening hours, and the breezes at night cooled off the house.

Water heating:

Although public baths are most common in Iran, some residential units had pivate bathing spaces. These houses heated with necessary water by placing a large metal tank on the roof protected by a short wall at the north side and painted a dark color to absorb sun's maximum heat. The tank was filled with water during the early morning hours and was heated by sun until the time for use. Gravity provided the necessary pressure to propel the water to the bathing area directly below.



PROGRAM



PROGRAM:

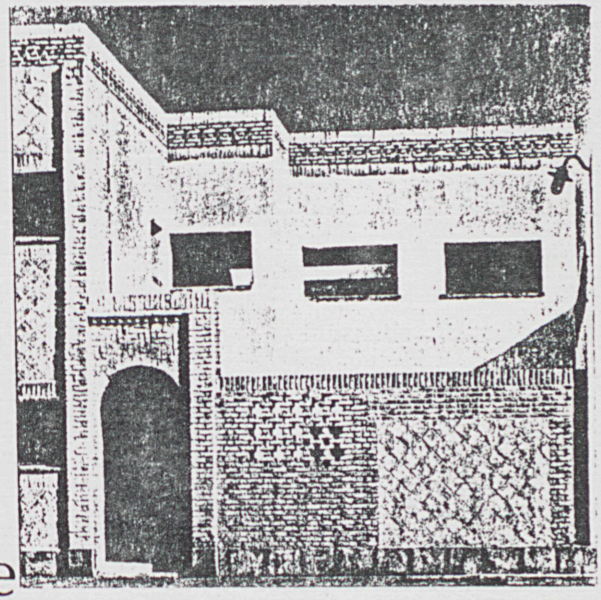
The minister of housing and urban development of the government of the Islamic Republic of Iran asked for the development of a housing complex located in the northeast section of city of Shushtar. The previous buildings on the current site were destroyed due to imposed war by the neighboring country.

The site is located to the north and across the river from the existing city, with fairly recent development (constructed 1979) to its west and north. The southern section of the site is not damaged and continues to function. The development and expansion of the city of Shushtar has been done over a long period of time, with its northern and western section being constructed most recently. The expansion has been along a main spine that has been influenced by its proximity to the river and to the path of the river. The spine begins at the city center and follows the river branch. As it crosses the river, it becomes the image of the river and turns eastward.

Although future development has been planned to take place to the west of the new development and east of the city, the government of Iran after consultations, has decided to re-develop the ruined site, where most occupants prefer to live in thier original neighborhood.

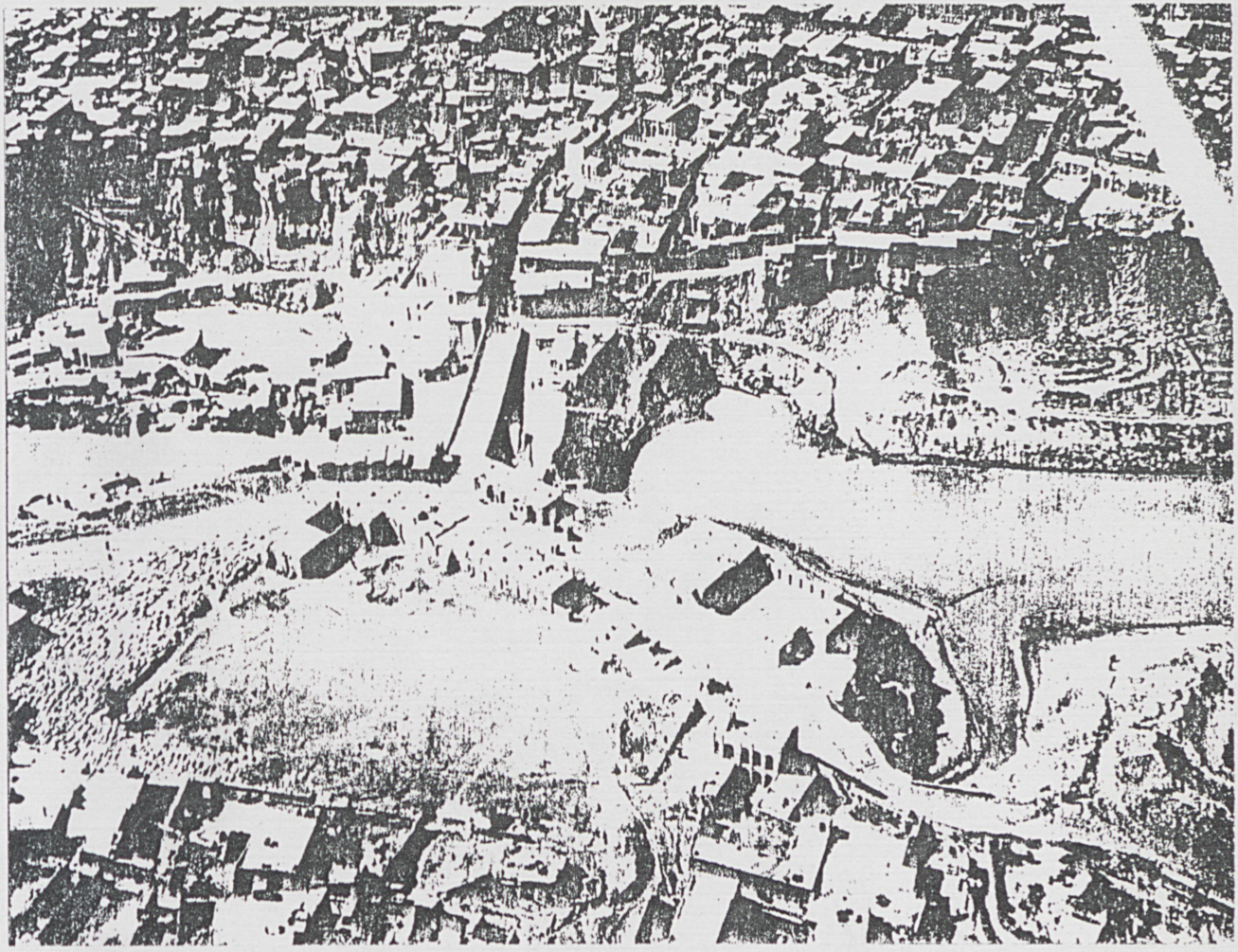
The population of Shushtar is about 40,000 and the new community houses between 20,000 and 30,000 people who are mostly workers in the new agro-industrial plant. Nevertheless it is an encouraging mix of income levels.

The plan should accomodate growth over time, yet project a strong SENSE OF PLACE, IDENTITY, IMAGE, SPIRIT, QUALITY, and REALIZATION. The design should provide protection from extremes of climate, maximizing energy conservation through natural ventilation and cooling, sun protection, effective insulaiton and provide special emphasis on the use of passive solar energy in the form of soft technology.

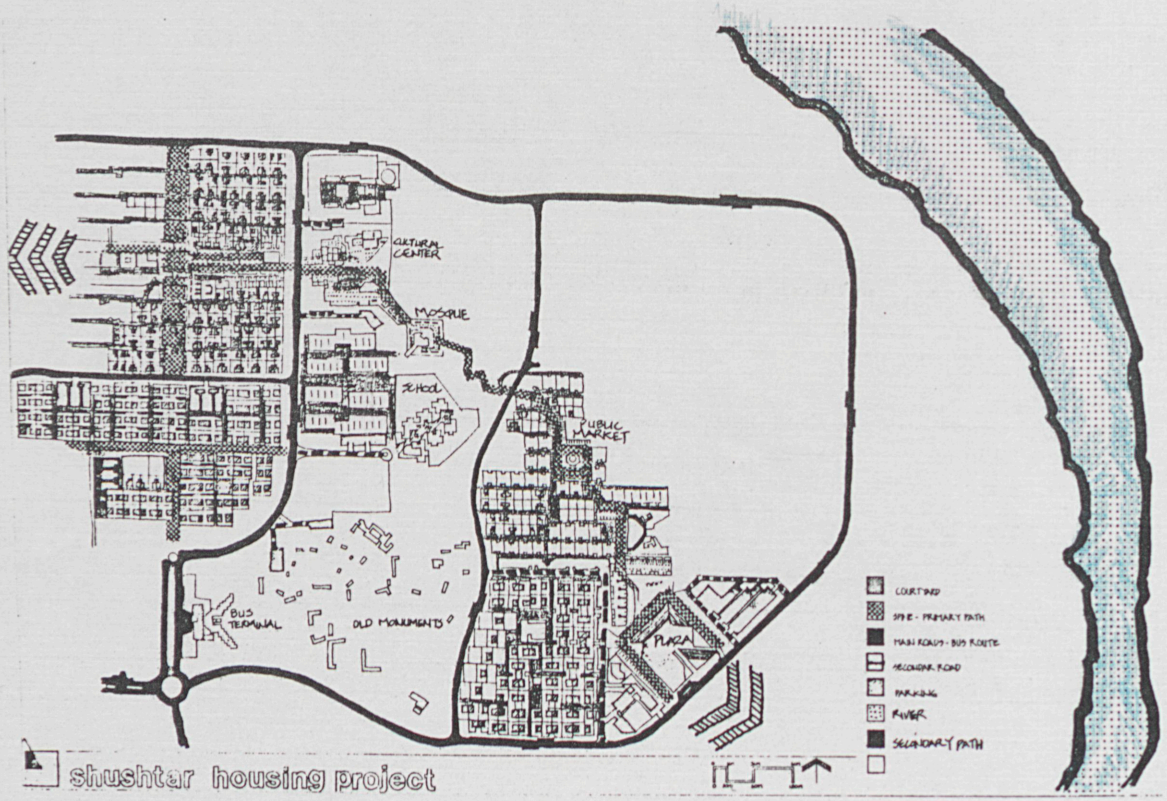




shushtar housing project



The design should show a clear organization between parts of the community with efficient circulation, safety, and security. The building materials are to respond to the characteristics of the locale to give visual continuity and sense of being as a whole.



The user group is in the lower middle class, with the following occupations as their source of income:

Commercial (17%)
- *merchants*
- *retail shop keepers (cloth, food, household goods)*

Artisians & Craftspersons (35%)
- *carpet weaving (designers, dryers, cleaners, etc.)*
- *construction workers*
- *blacksmiths*
- *carpenters*
- *masons*
- *brickmakers*

Agriculture (20%)

Services (20%)
- *barbers*
- *bath keepers*
- *civil servants*
- *policemen*
- *taxi and bus drivers*
- *railroad*

Industrial (8%)
- *agro-industrial*

The housing must accomodate four sizes of compounds: SMALL, MEDIUM, MEDIUM-LARGE, and LARGE. Throughout Iran, the occupants of all communities range from small to large families, often with multiples of families, either related or not, living in one housing unit. A 1972 study of the Iranian communities indicates that the number of households per compound is as follows:[1]

The spaces within each compound, the number of each space & their sizes are:

	No. of Space	Small	No. of Space	Medium	No. of Space	Med-Large	No of Space	Large
GUEST	1	3x4=12	1	3x4=12	2	3x4=12 2.5x3.5=8.75	2	3x4=12
LIVING	1	3x4=12	1	3x4=12	2	3x4=12	2	3x4=12
FAMILY	1	3x4=12	2	3x4=12 2.5x3.5=8.75	2	3x4=12	3	2 of 3x4=12 1 of 2.5x3.5=8.75
KITCHEN	1	2x2=4	1	2x2=4	1	2x3=6	1	2x3=6
CENTRAL HALL	1	2.5x3.5=8.75	1	2.5x3.5=8.75	1	3.5x5=17.5	1	3.5x5=17.5
CIRCULATION & MECHANICAL		22.25		24.5		37		41
TOILET	1	1x1=1	1	1x1=1	2	1x1=1	2	1x1=1
SHOWER & SINK	1	1x4=4	1	1x4=4	2	1x4=4	2	1x4=4
COURTYARD	1	6x4-24	1	6x4-24	1	5x7=35	1	5x7=35
PORCH		8		8		12		16
STORAGE		6		6		10		10
TOTAL		114 sq. Meters		125 sq. Meters		191.25 sq. Meters		211.25 sq. Meters

No. of Households/Compound	Percentage Total	
1		39.29%
2	35.00%	
3	12.86%	
4	7.14%	
5	5.71%	
6 or more	0.00%	

The mean number of households per compound is 1.57%.

Most often the density of the settlements are calculated in terms of number of persons per hectar (approx. 2.47 acres), rather than number of compounds per acre. The number of occupants per hectar ranges 100-240 persons depending on the site and economic level of the occupants. The density for this project has been set at 200 persons per hectar (approx. 81 persons per acre), or 50 square meters per person. Four compounds would require 1.5 of hectar (1/2 acre). The average number of persons per household is 4.89 and the number of households per compound and total square meters required for each compound are as follows:

Size	No. of Persons/ Comp.	Square Meters/ Person	Total Square Meters	No. House-holds/Comp	Average No. Persons/ Household
small	5	50	250	1	5
medium	8	50	400	2	4
med-large	11	50	550	2	5.5
large	14	50	700	3	4.67

The four unit types not only require PERSONAL PRIVACY, but also COMMUNAL PRIVACY and INTERACTION SPACE. The space must accomodate the children as well as adults.

NON PHYSICAL ASPECTS:

LIGHT: OPEN TO SKY

VIEW: INDIRECT

PROXIMICS: PEDESTRIAN PATH

CIRCULATION: DIRECT

PHYSICAL ASPECTS:

WIDTH: 1.5 METERS(min)

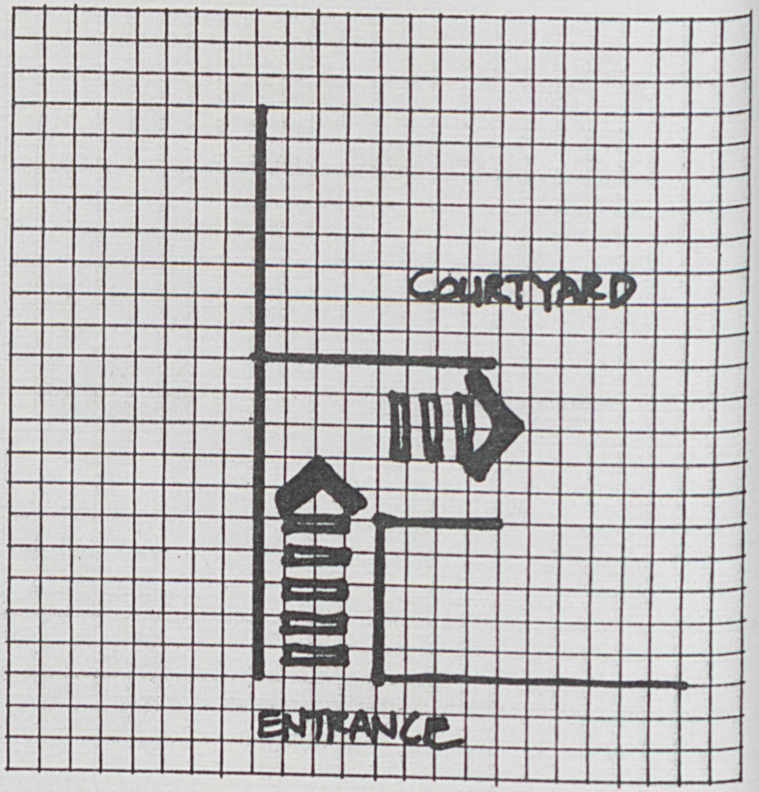
LENGTH: ———

HEIGHT: ———

DETAIL: NECESSARY

FINISH: WOOD DOOR

COLORS: IN CONTRAST TO THE WALL



COMMENTS: A change of level into court-court yard and use of vegetation to break direct visual connection.

NON PHYSICAL ASPECTS:

LIGHT: OPEN TO SKY

VIEW: INWARD

PROXIMICS: PEDESTRIAN AND INTERIOR SPACES

CIRCULATION: EASY ACCESS TO ALL SPACES

PHYSICAL ASPECTS:

WIDTH: 4 METERS

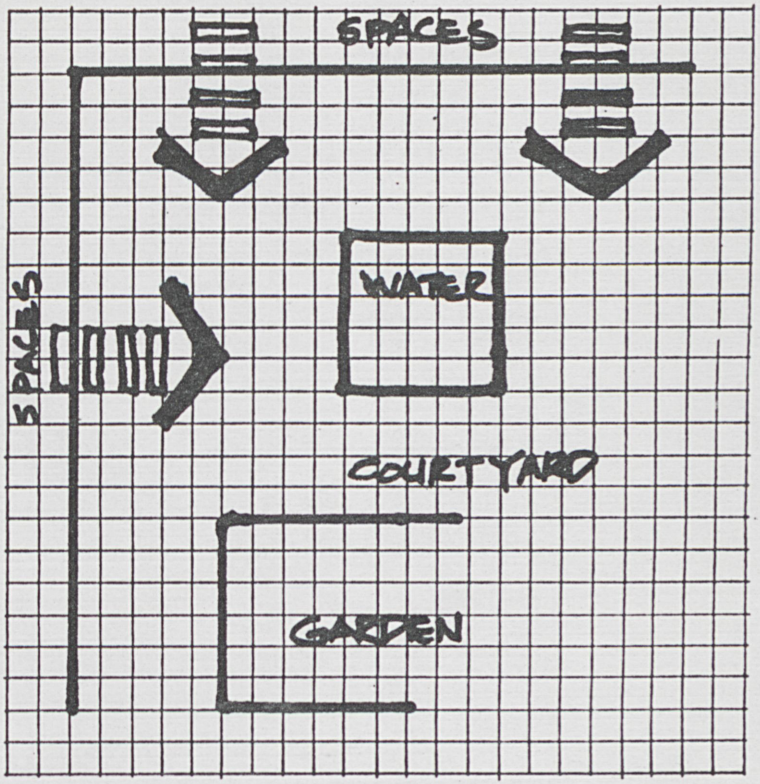
LENGTH: 6 METERS

HEIGHT: ———

DETAIL: PLEASANT

FINISH: MOSAIC

COLORS: LIGHT TO REFLECT SUN



COMMENTS: The court yard needs to be a minimum of 75cm lower than the rooms to protect from possible flooding. also allow for garden and water to exist.

NON PHYSICAL ASPECTS:

LIGHT: NATURAL DAYLIGHT

VIEW: INTO COURT YARD

PROXIMICS: TO COURT YARD & ALL SPACES

CIRCULATION: THRU COURT-YARD

PHYSICAL ASPECTS:

WIDTH: 1 METER (min)

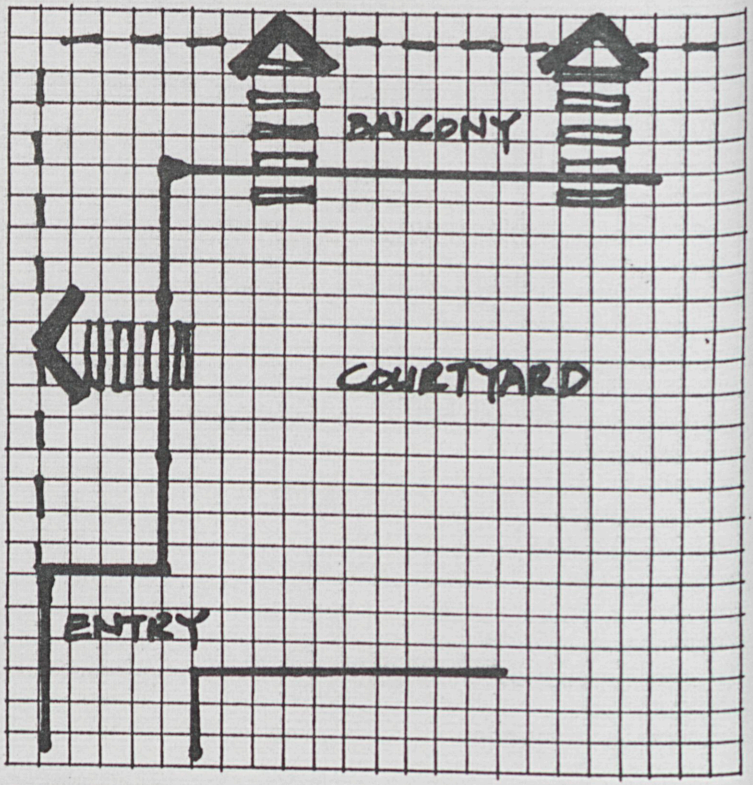
LENGTH: 8 METERS

HEIGHT: SAME LEVEL WITH SPACES

DETAIL: HIGHLY NECESSARY

FINISH: MOSAIC FOR FLOOR, PLASTER WALLS

COLORS: BRIGHT WARM



COMMENTS: This space is a transition between court yard and living space, and is used as sleeping space in hot summer months.

NON PHYSICAL ASPECTS:

LIGHT: INDIRECT

VIEW: TO SPACES AND CIRC.

PROXIMICS: CIRCULATION AREA

CIRCULATION: ACCESSABLE TO GUEST AND COURTYARD

PHYSICAL ASPECTS:

WIDTH: 1.5 METERS

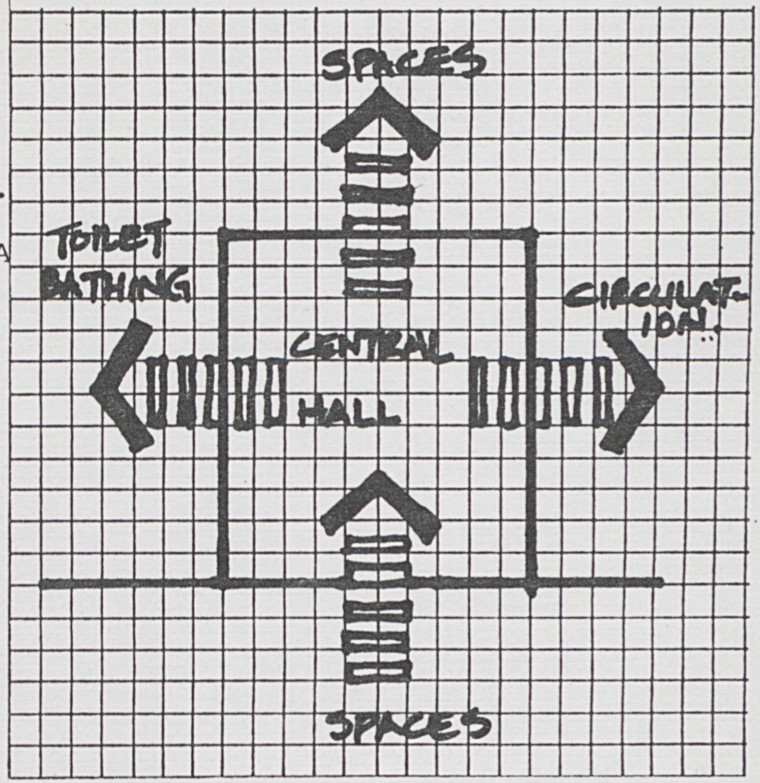
LENGTH: 3 METERS

HEIGHT: 3 METERS

DETAIL: MINIMUM

FINISH: PLASTER-PAINT

COLORS: LIGHT COLOR



COMMENTS: Centeral hall acts as light shaft and transitional node for circulation and other spaces.

NON PHYSICAL ASPECTS:

LIGHT: INDIRECT (max.)

VIEW: INTO COURT YARD

PROXIMICS: KITCHEN AND FAMILY SPACE

CIRCULATION: TO KITCHEN BY SERVICE WINDOW

PHYSICAL ASPECTS:

WIDTH: 3 METERS

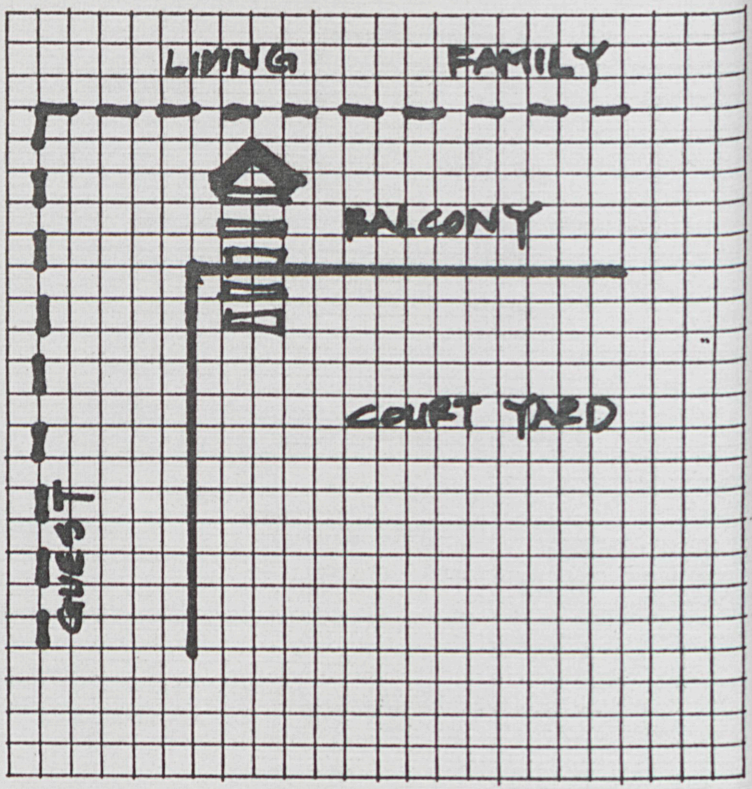
LENGTH: 4 METERS

HEIGHT: 3 METERS

DETAIL: MINIMUM

FINISH: PLASTER-PAINT

COLORS: WORM BRIGHT



COMMENTS: Living space is used for sleeping, dining, gathering of the family, while children use the family room.

NON PHYSICAL ASPECTS:

LIGHT: INDIRECT

VIEW: INTO COURT YARD

PROXIMICS: TO KITCHEN AND BATHING AREA

CIRCULATION: ACCESSABLE THRU CENTERAL HALL & COURT YARD

PHYSICAL ASPECTS:

WIDTH: 3 METERS

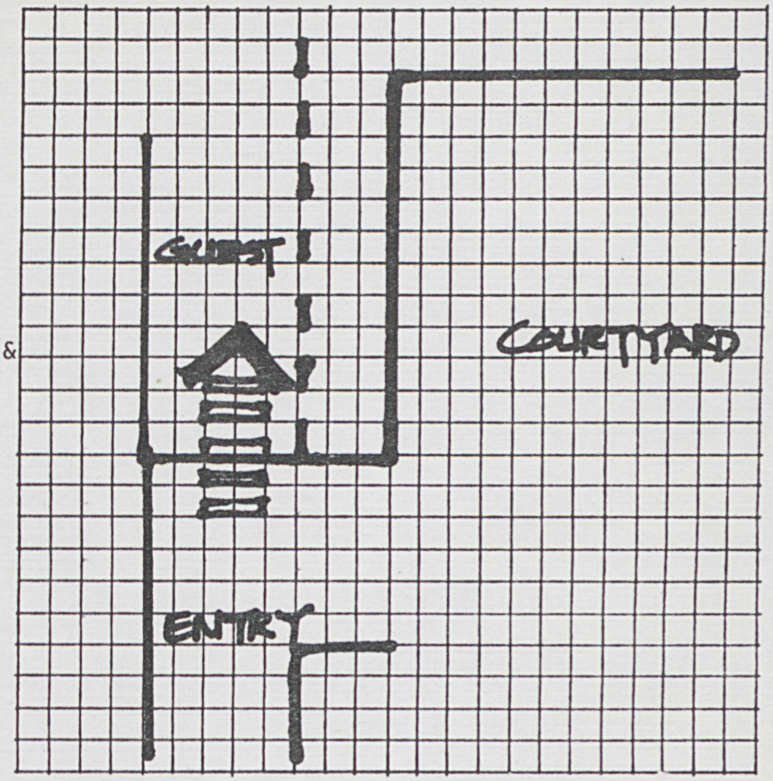
LENGTH: 4 METERS

HEIGHT: 3 METERS

DETAIL: MINIMUM

FINISH: PLASTER-PAINT

COLORS: BRIGHT, WARM



COMMENTS: This space must not take away the privacy of the residents, while providing direct access from entrance.

NON PHYSICAL ASPECTS:

LIGHT: INDIRECT (max.)

VIEW: INTO COURT YARD

PROXIMICS: LIVING

CIRCULATION: THRU COURT YARD

PHYSICAL ASPECTS:

WIDTH: 2.5 METERS

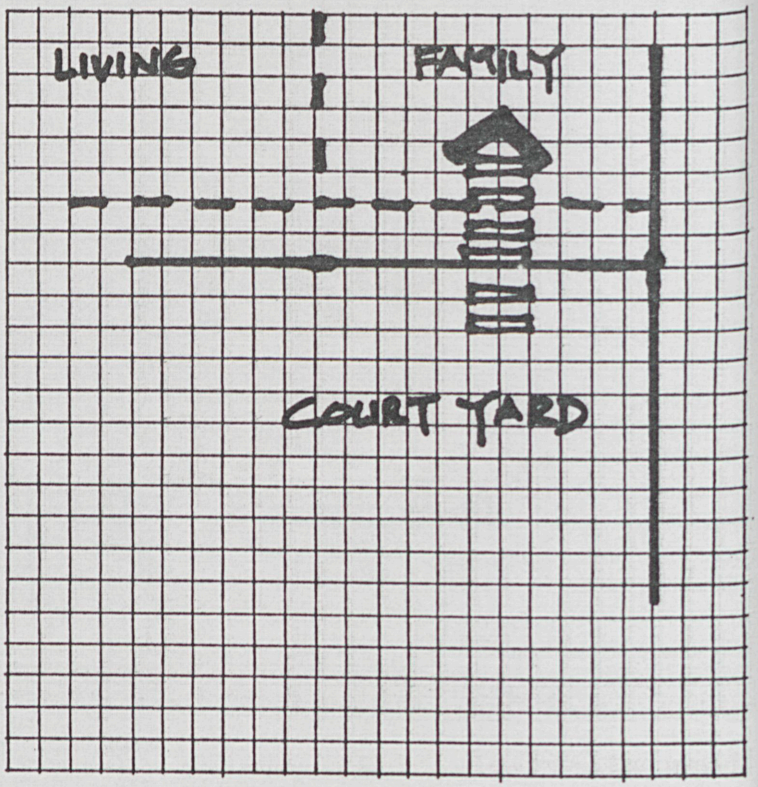
LENGTH: 3.5 METERS

HEIGHT: 3 METERS

DETAIL: NONE

FINISH: PLASTER-PAINT

COLORS: BRIGHT



COMMENTS: Family space is used by the childrem when in the house. the walls should be of durable and washable finish to allow for daily cleaning.

NON PHYSICAL ASPECTS:

LIGHT: MAXIMUM

VIEW: NOT NECESSARY

PROXIMICS: ENTRANCE AND BATHING SPACE

CIRCULATION: STEPS TO ROOF

PHYSICAL ASPECTS:

WIDTH: 2 METERS

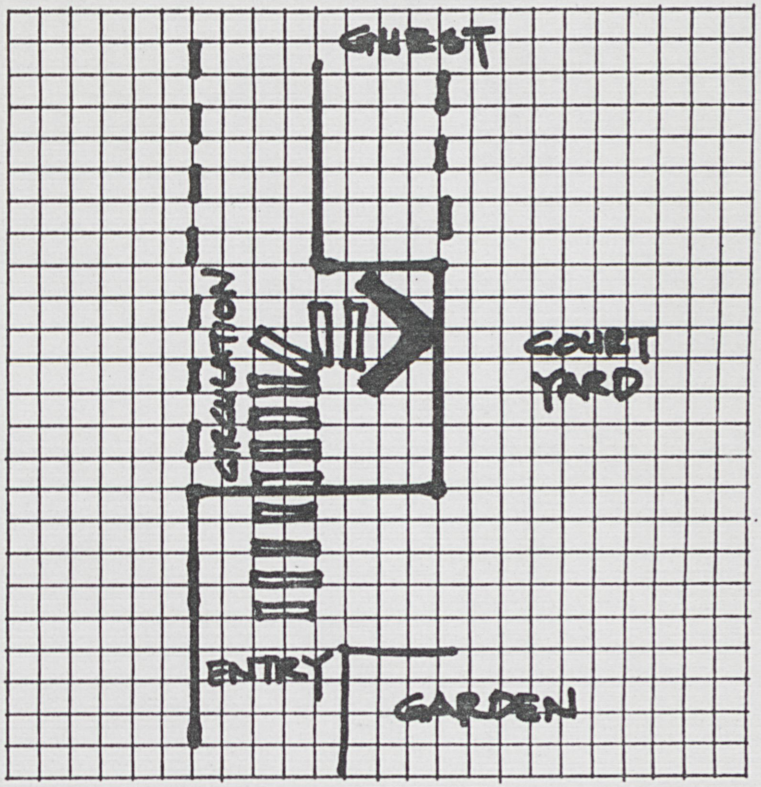
LENGTH: 2.5 METERS

HEIGHT: ABOVE ROOFLINE

DETAIL: NONE

FINISH: PLASTER-PAINT

COLORS: BRIGHT



COMMENTS: Steps must be located so the occupants of the second level can use it immidiatly after entering the house.

NON PHYSICAL ASPECTS:

LIGHT: NOT CRITICAL

VIEW: NONE

PROXIMICS: GUEST, TOILET

CIRCULATION: THRU CENTERAL HALL

PHYSICAL ASPECTS:

WIDTH: 1.5 METERS

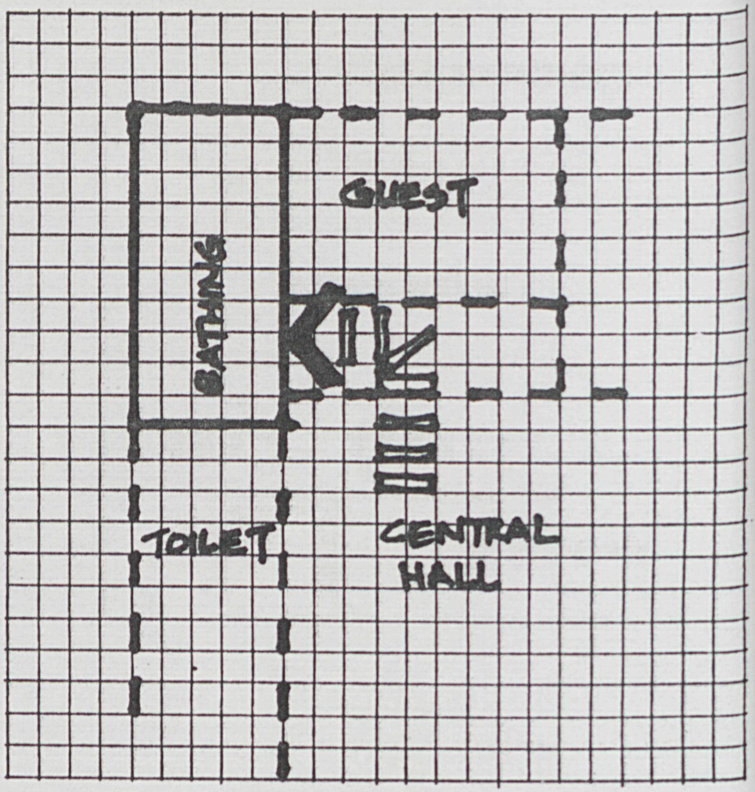
LENGTH: 3.5 METERS

HEIGHT: 2.2 METERS(min)

DETAIL: NONE

FINISH: PAINT

COLORS: BRIGHT



COMMENTS: Since bathing is little used, the light is not critical and it should be located near guest and centeral hall for easy access.

NON PHYSICAL ASPECTS:

LIGHT: NOT CRITICAL

VIEW: INTO COURT YARD

PROXIMICS: GUEST AND LIVING

CIRCULATION: SERVICE WINDOW INTO GUEST & LIVING

PHYSICAL ASPECTS:

WIDTH: 2 METERS

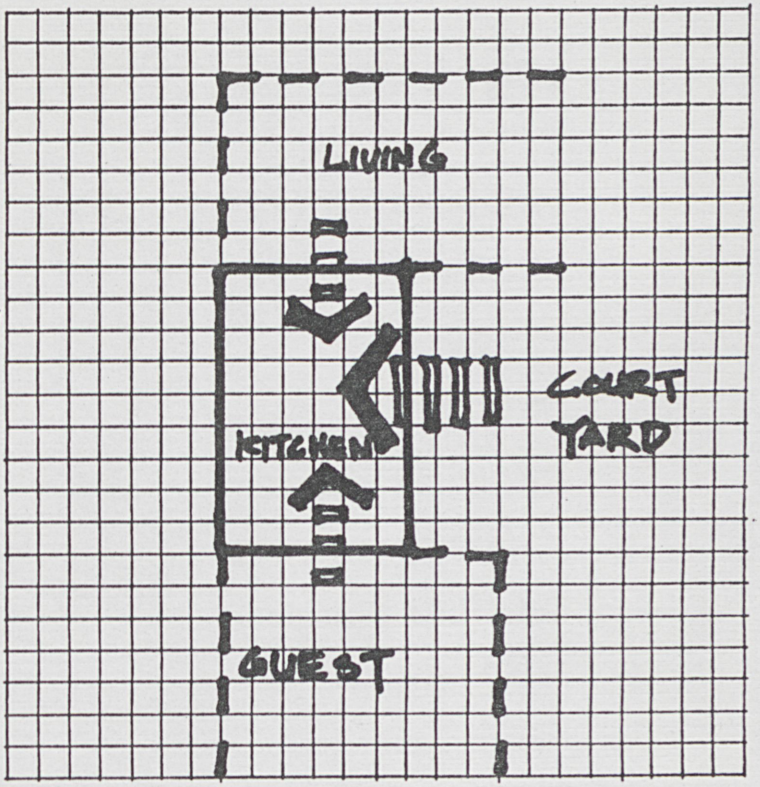
LENGTH: 3 METERS

HEIGHT: 4 METERS

DETAIL: NONE

FINISH: WASHABLE SURFACE

COLORS: BRIGHT



COMMENTS: KITCHEN IS TO PROVIDE EASY SERVICE TO GUEST AND LIVING.

NON PHYSICAL ASPECTS:

LIGHT: NOT CRITICAL

VIEW: NONE

PROXIMICS: BATHING AND CENTRAL HALL

CIRCULATION: ACCESSABLE THRU CENTRAL HALL

PHYSICAL ASPECTS:

WIDTH: 1.5 METERS

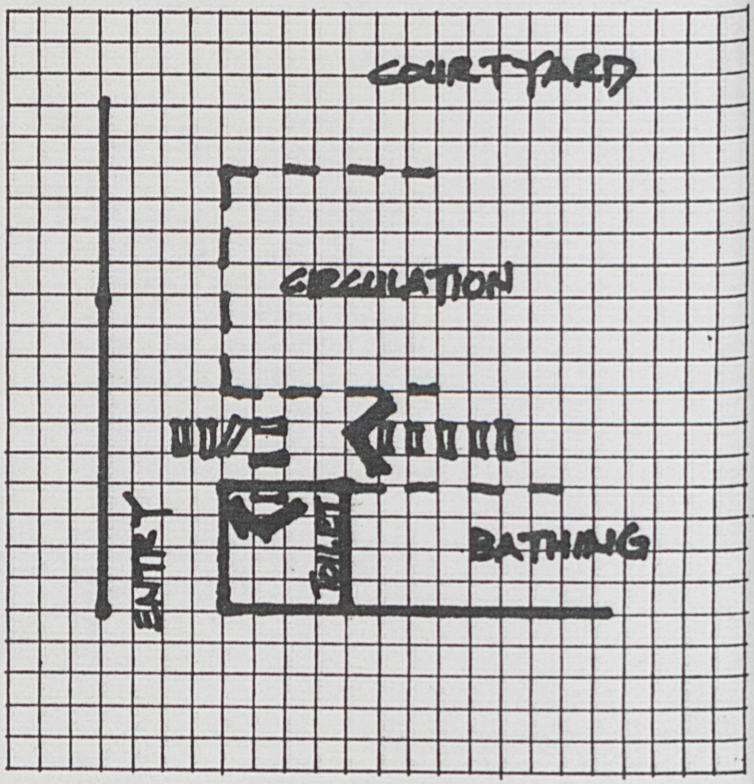
LENGTH: 1.5 METERS

HEIGHT: 2.2 METERS (min)

DETAIL: NONE

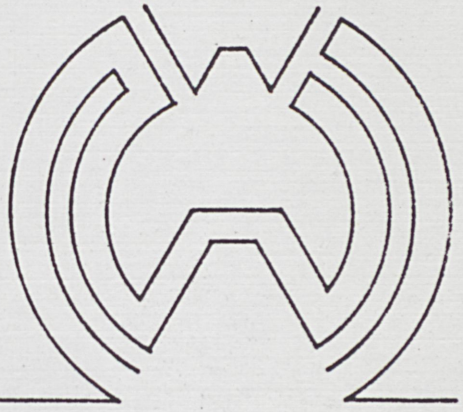
FINISH: NONE

COLORS: EXPOSED BRICK



COMMENTS: Toilet is place as close to pedestrian wall as possible as the toilet does not have pleasant smell and also the main sewage is under pedestrian path.

PHYSICAL ENVIRONMENT



PHYSICAL ENVIRONMENT:

The physical environment of this region is perhaps the most severe in terms of HEAT and HUMIDITY. Located on the north shore of the gulf and sea, there are many rivers that flow into the gulf, weaving in and out of the CITIES, TOWNS, and VILLAGES, causing high humidity with constant winds during the evening and nighttime.

The temperatures for the regions range from an absolute minimum of 24°F to absolute maximum of 131°F, with the average of the four summer months (June-September) at 113°F. The humidity is between 40% and 80% during the year with an average of 50% annually.

A 10-20 mph wind is typical for most of the year, with largest number of days occurring in the months of April - August!

SHUSHTAR, IRAN

Region No. 5 Latitude 3205N Longitude 4830E Elevation(FT) 210

Parameter Description	فروردین Mar21-Apr21	اردیبهشت Apr-May	خرداد May-Jun	تیر Jun-Jul	مرداد Jul-Aug	شهریور Aug-Sep	مهر Sep-Oct	آبان Oct-Nov	آذر Nov-Dec	دی Dec-Jan	بهمن Jan-Feb	اسفند Feb-Mar	سالانه ANN
Absolute Max. Temp:(C°)	35	42	48	52	55	51	49	45	38	31	29	30	55
:(F°)	96	108	119	125	131	124	120	113	100	88	84	86	131
Mean Max. Temp :(C°)	25	32	39	43	44	45	43	37	27	19	18	21	45
:(F°)	77	90	102	110	112	113	109	98	81	67	65	69	113
Mean Min. Temp :(C°)	12	17	23	26	27	27	23	17	13	8	7	8	7
:(F°)	54	62	73	79	81	80	73	63	55	47	44	46	44
Absolute Min. Temp:(C°)	2	8	6	21	21	12	16	10	2	-2	-4	-2	-4
:(F°)	36	47	43	70	70	54	61	50	35	29	24	29	24
Mean Rel. Humidity:(%)	59	48	42	39	42	46	51	59	76	80	77	69	50
Mean Precipitation:(mm)	21	10	22	00	00	1	6	9	22	44.5	5.05	18.75	205.3
:(in)	.82	.41	.89	00	00	.05	.25	.37	.87	1.78	2.02	.75	8.21
Mean Snow Fall :(mm)	00	00	00	00	00	00	00	00	00	00	00	00	00
:(in)	00	00	00	00	00	00	00	00	00	00	00	00	00

BIOCLIMATICAL CHART:

Both the change from one region to another and extremes of hot and cold temperatures hamper the daily activity of man, as his physical body is conditioned to withstand only a narrow range of temperatures. To counter this problem, man developed systems such as FIRE, SHELTER, and CLOTHING.[2] His choice of a particular solution was based on the use of REASON and INTELLECT as he carefully studied and understood the properties of climatical environment. Much later in the Civilization process, a Scientist developed a chart to show traditional man's method of analysis and conclusion. This graphic form was called the Bioclimatical chart.

The climatic environment that effects a human body consists of four variables: AIR TEMPERATURE; RADIATION; AIR MOVEMENT; and HUMIDITY. The air temperature and radiation complement each other, since in order to maintain comfort in high temperatures, a low radiant temperature is required. In the same respect, temperature and humidity are inter-connected. As the air warms up, the relative humidity must fall to maintain comfort.[3]

The relationship of AIR MOVEMENT to TEMPERATURE and HUMIDITY is that when air movement accures at times of high temperature, less stress is put on man's physical body. On the other hand, when the temperature is low, winds put a larger stress factor on human body, after a certain point in the rise of the air temperature and humidity, the wind can no longer bring more desirable heat effects.[4]

The Bioclimatical chart provide for each region can determine the comfort conditions most suited for that particular region in different time periods. I will develop such a chart based on town of Shushtar's climatical data.

DATA DESIGN

FOR PERIODS IN ZONE "A"
Provide thermal radiation
Take adv. of solar heat

FOR PERIODS IN ZONE "B"
Provide shade
Provide moderate heat

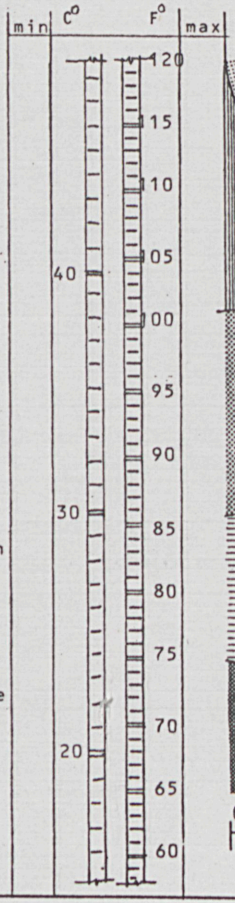
FOR PERIODS IN ZONE "C"
Provide Max flow of air
check radiation

FOR PERIODS IN ZONE "D"
provide evaporative cool.
Check heat intake

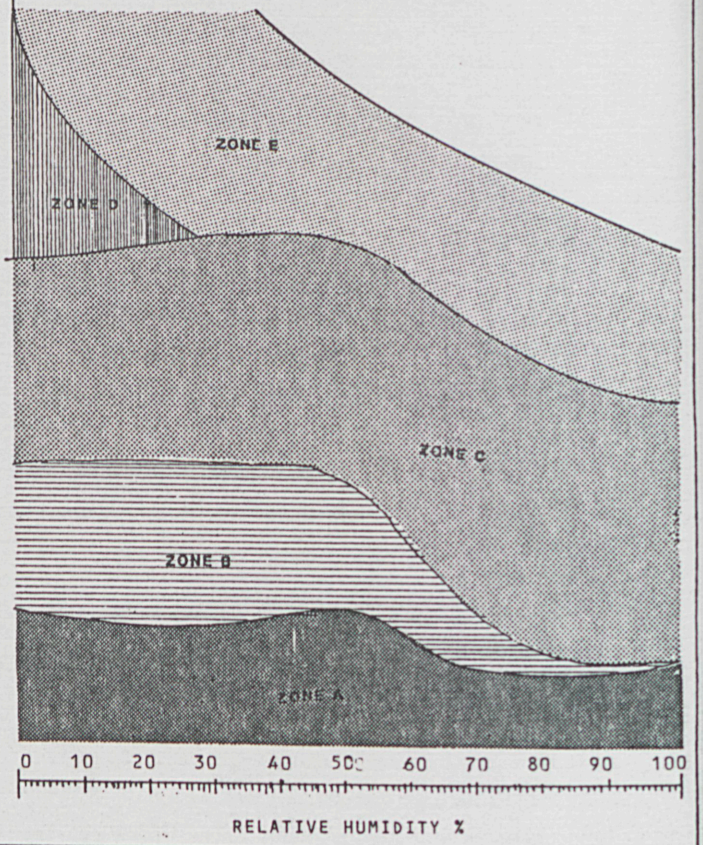
FOR PERIODS IN ZONE "E"
check heat intake and
air flow
Provide Air cooling

NOTE:
To find comfort condition at different periods, draw a horizontal line from temperature scale, a vertical line from humidity scale. The intersecting point of the two lines would determine the comfort conditions.

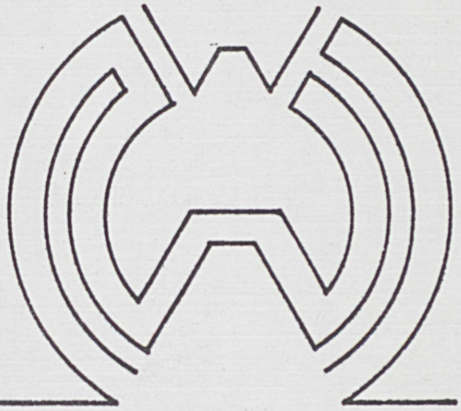
MEAN MONTHLY TEMP.

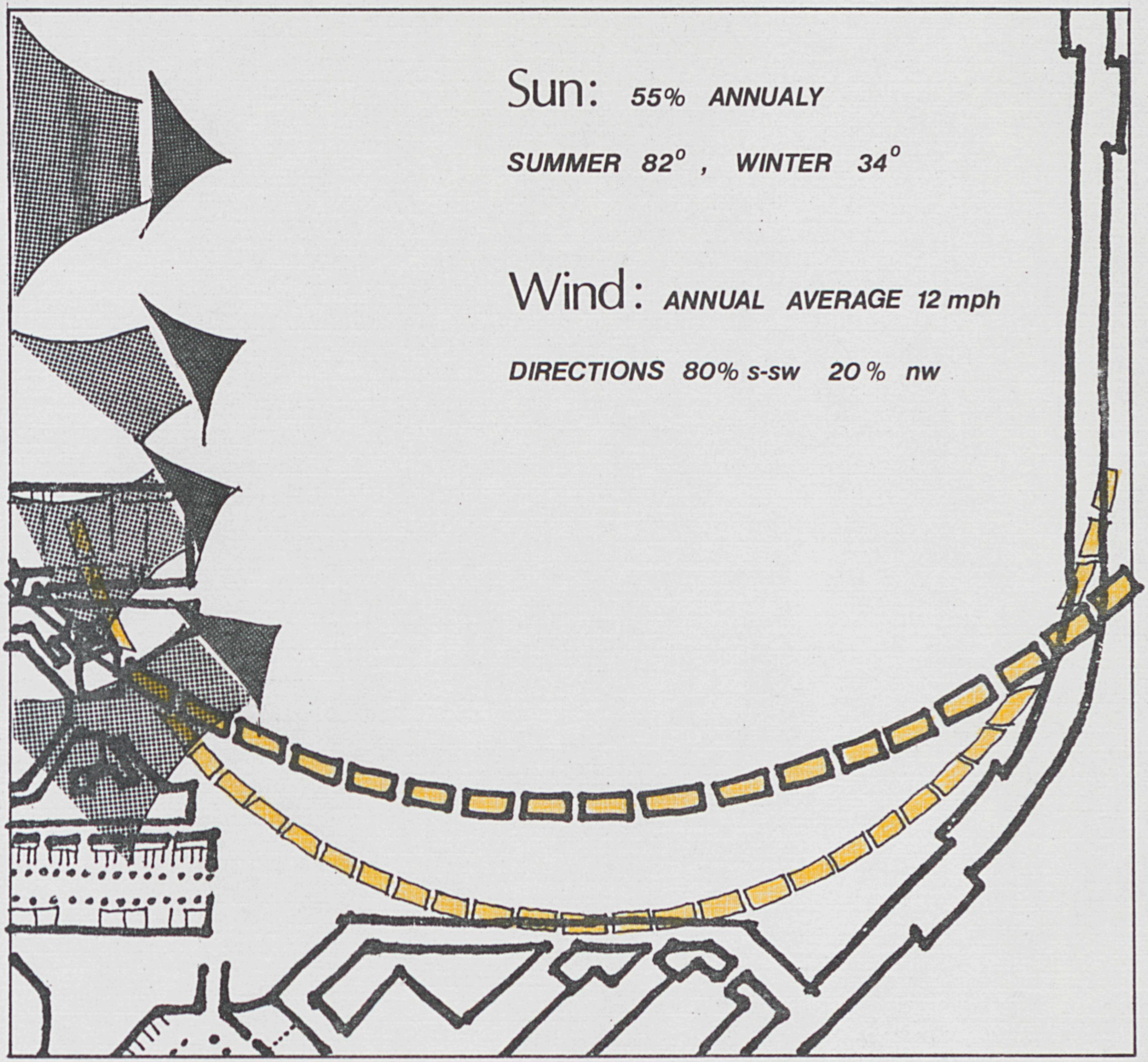


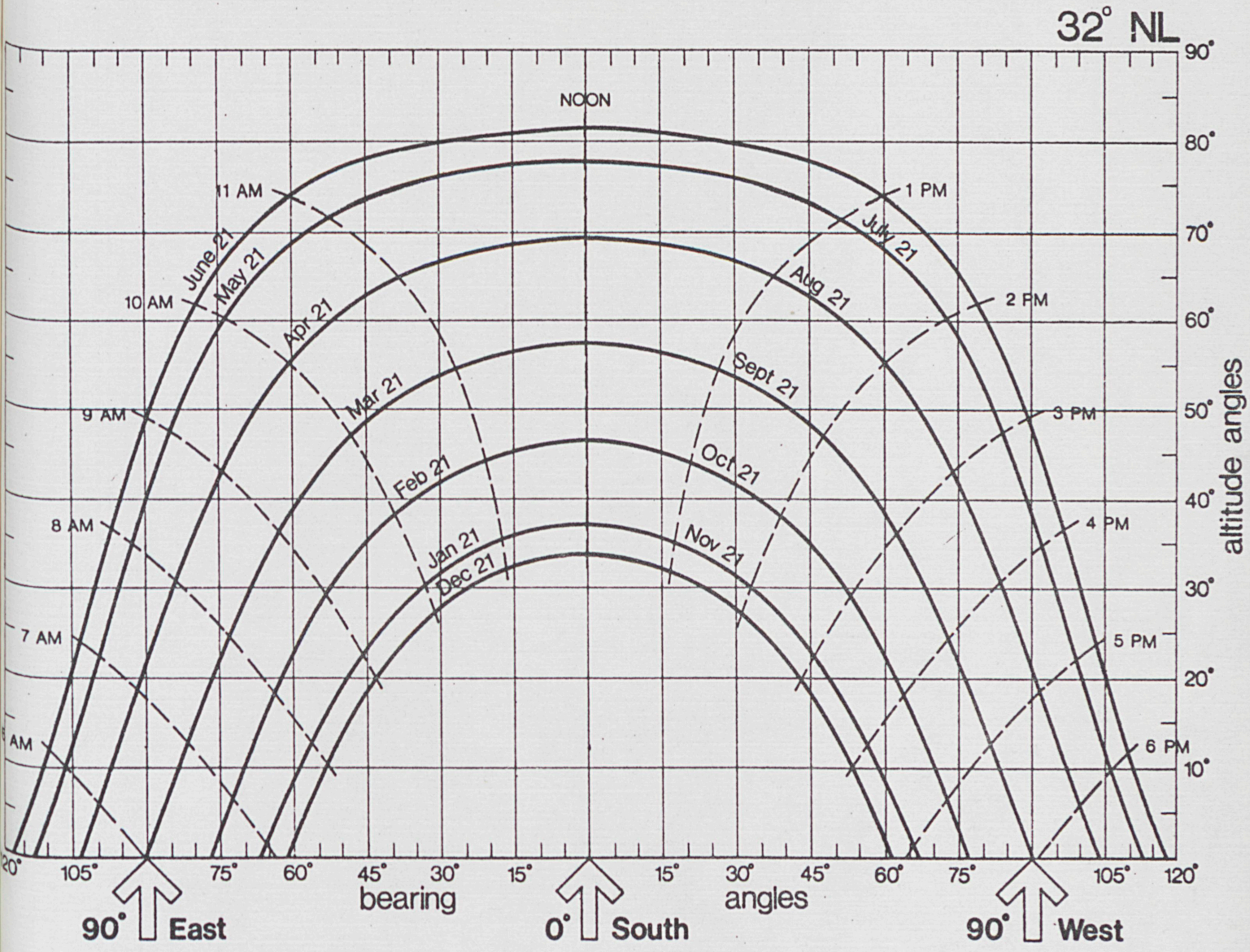
NOTE:
Use Shushtar's Climatical Data on previous page to determine the comfort condition and solution.



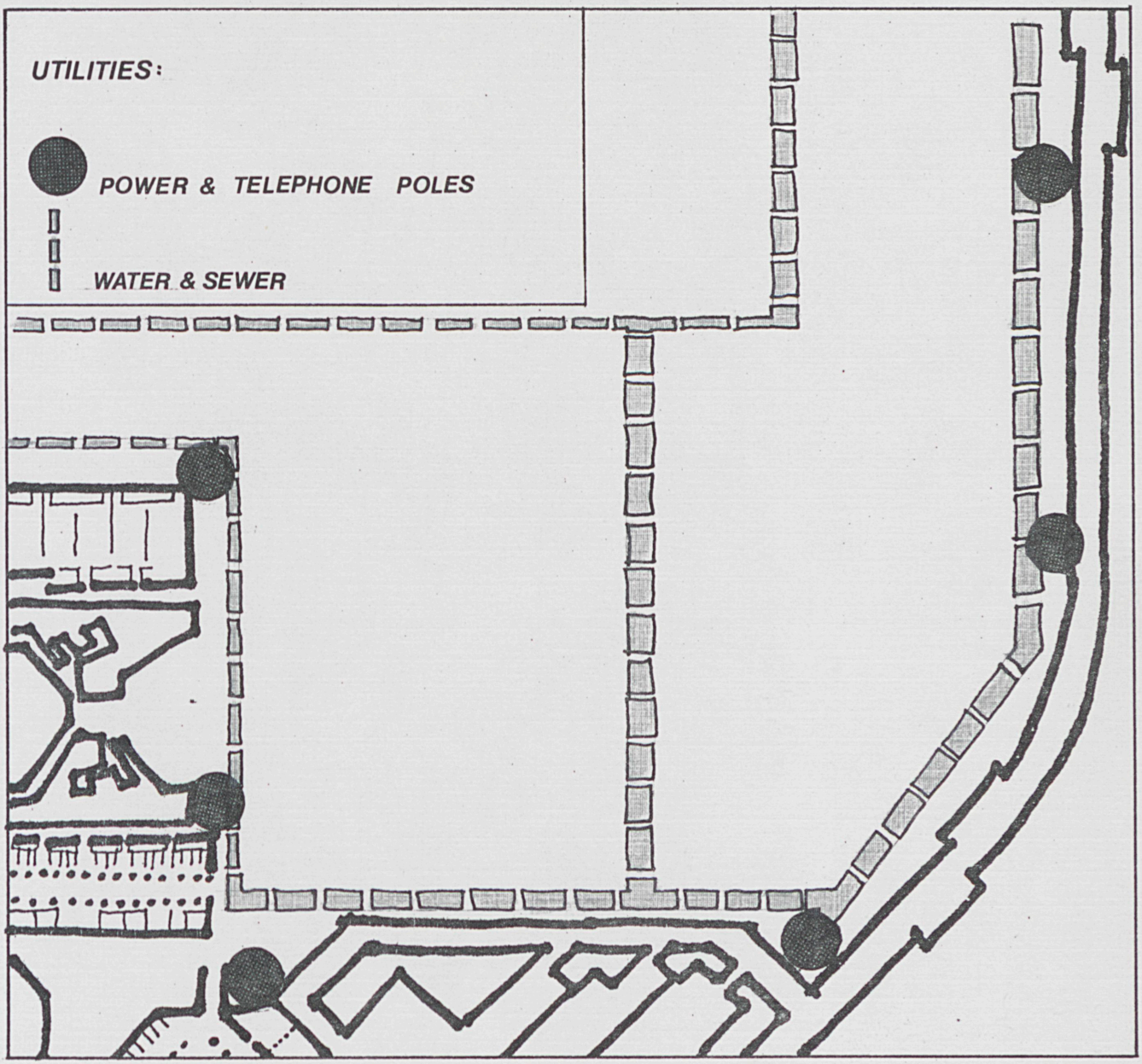
SITE ANALYSIS

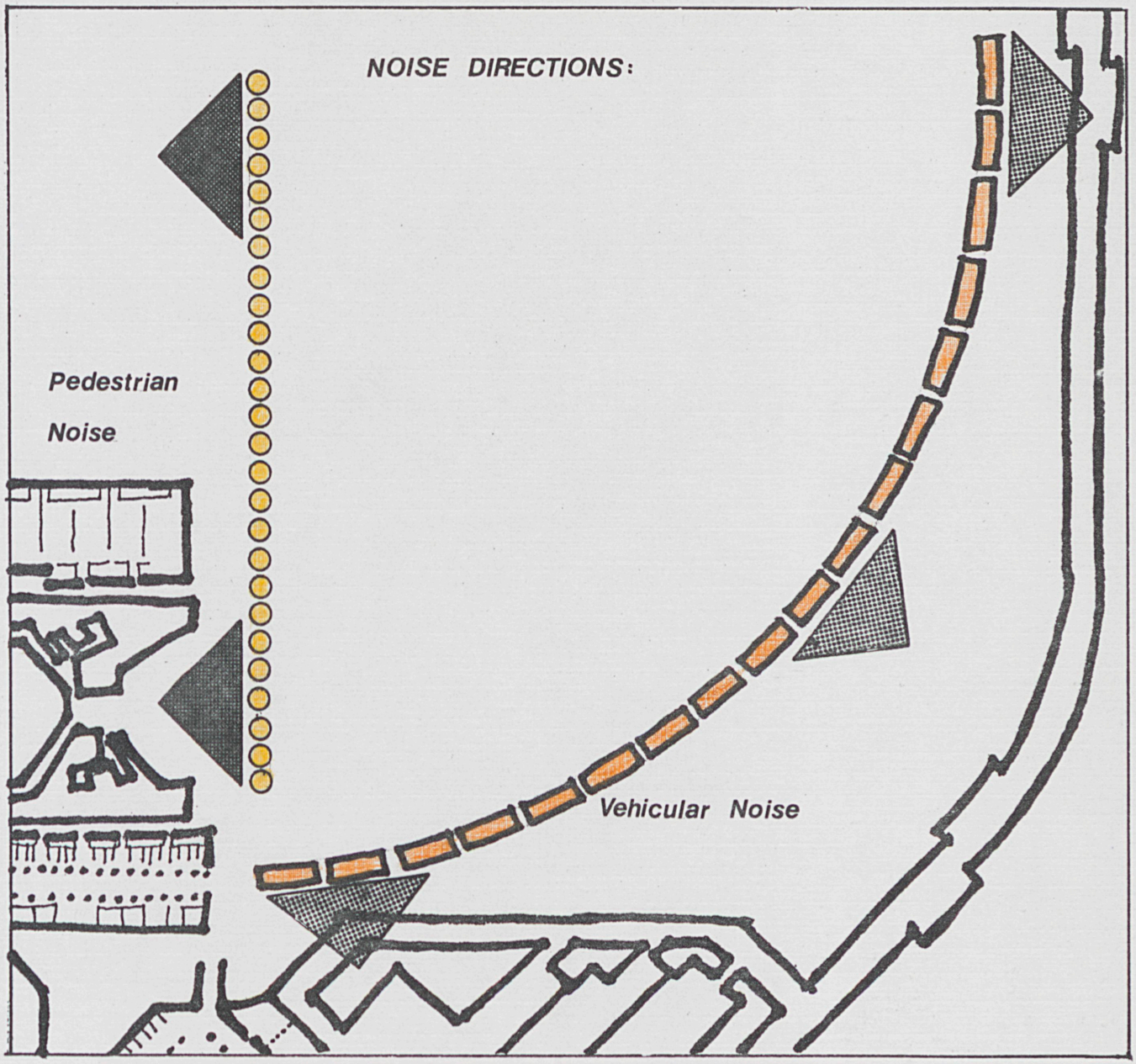



Sun: 55% ANNUALY
SUMMER 82° , WINTER 34°
Wind: ANNUAL AVERAGE 12 mph
DIRECTIONS 80% s-sw 20 % nw

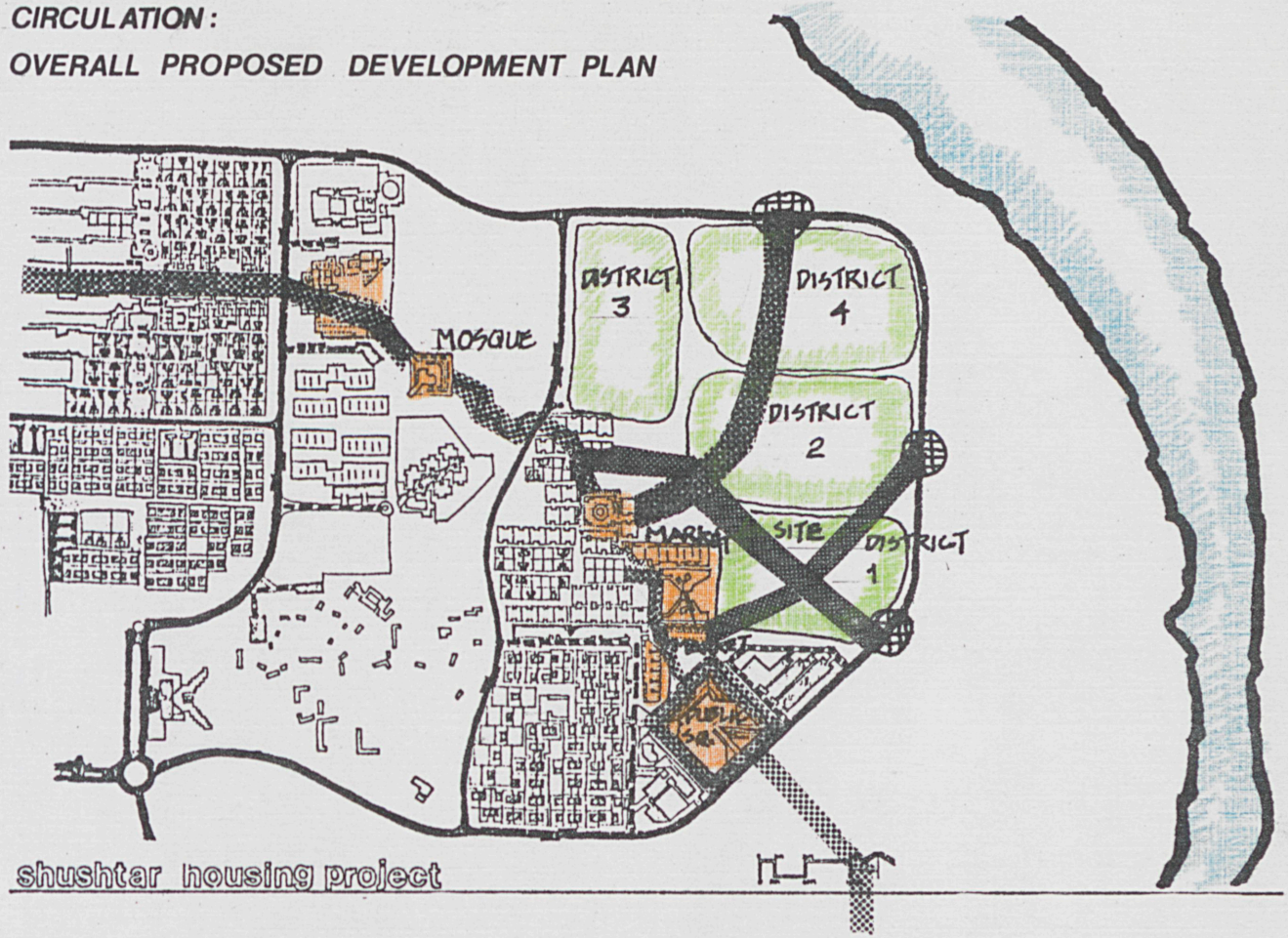

32° NL
NOON
11 AM
1 PM
10 AM
2 PM
9 AM
3 PM
8 AM
4 PM
7 AM
5 PM
6 PM
June 21
May 21
Apr 21
Mar 21
Feb 21
Jan 21
Dec 21
July 21
Aug 21
Sept 21
Oct 21
Nov 21
90°
80°
70°
60°
50°
40°
30°
20°
10°
altitude angles
105°
75°
60°
45°
30°
15°
bearing
angles
90° East
0° South
90° West


PROXIMICS &
VIEWS :
shushtar housing project
NEW DEVELOPMENT
FUTURE DEVELOPMENT
SHUSHTAR CITY


UTILITIES:
POWER & TELEPHONE POLES
WATER & SEWER


NOISE DIRECTIONS:
Pedestrian
Noise
Vehicular Noise

CIRCULATION:
OVERALL PROPOSED DEVELOPMENT PLAN



EXISTING PRIMARY PATH

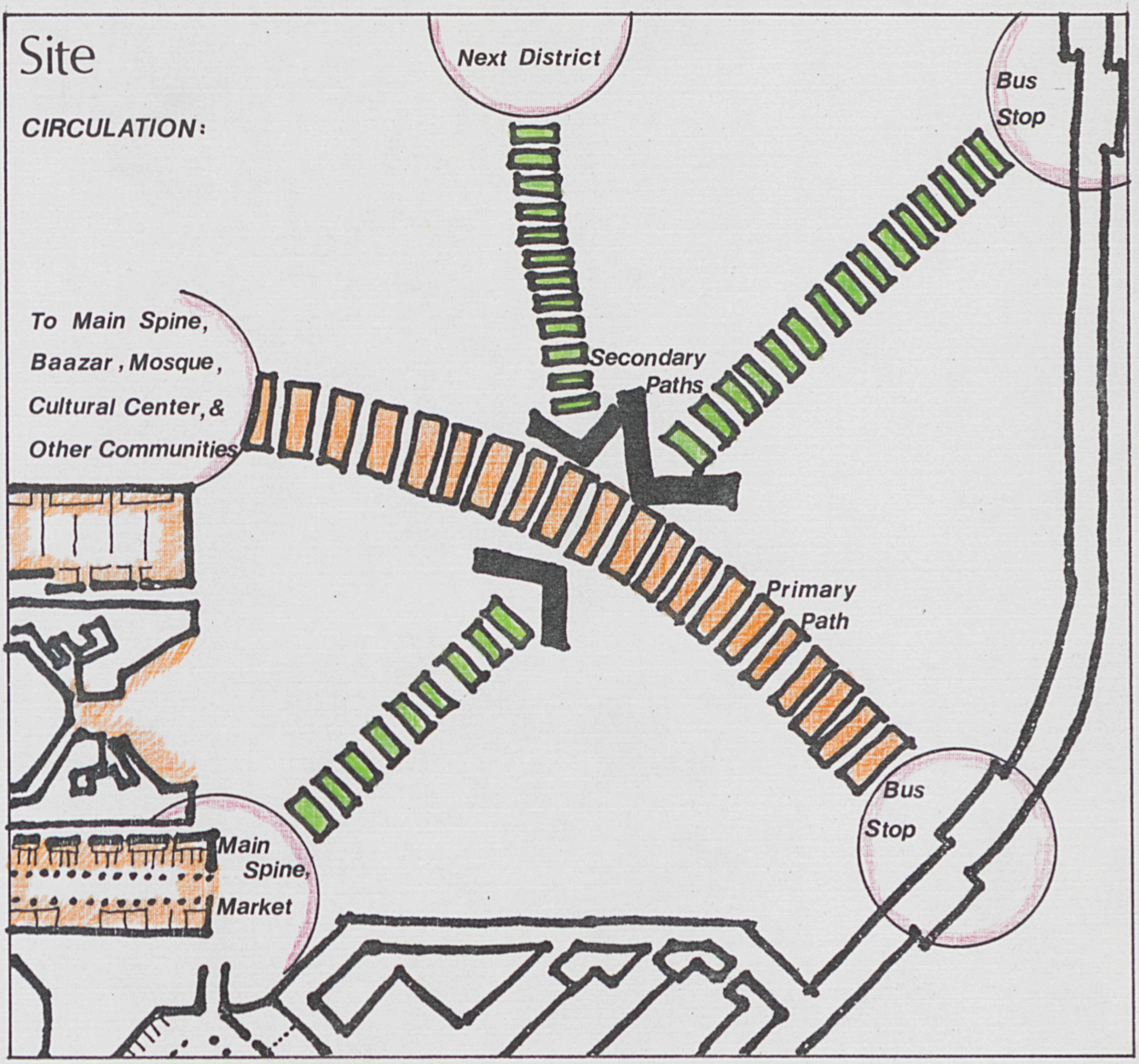
PROPOSED PRIMARY PATH

PROPOSED SECONDARY

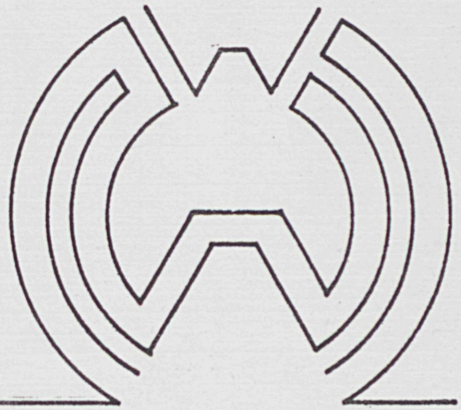
RIVER

PUBLIC SPACES

PROPOSED DISTRICT LAYOUT


Site
CIRCULATION:
Next District
Bus Stop
To Main Spine, Baazar, Mosque, Cultural Center, & Other Communities
Secondary Paths
Primary Path
Bus Stop
Main Spine, Market

FOOTNOTE & BIBLIOGRAPHY



FOOTNOTES

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10. *Ibid., p. 17.*
11. *Ibid., p. 81.*
12. *Ibid., pp. 81-82.*
13. *Ibid.*
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2. Nader Ardalan and Laleh Bakhtiar, The Sense of Unity, p. 12.
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