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YAZD OLD FORT

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Abstract

Yazd Old Fort has amazing Persian architecture and international heritages. In this historic district (100 Hec.) some pages of Persian history book can be observed. All streets and approaches are built by considering 'climatic', 'defence' and 'socio-economic' conditions. In building houses, orientation, local possibilities, old streets, structure, local technology and materials were taken into account . In this paper we are going to demonstrate the 'Yazd Old Fort' in detail.

Keywords: old tissue, subterranean canal, sunkenyard.

1. Major Historic Cities in Iran

During the second half of the 20th century the Iranian people's attention, turned to the old tissue of historic cities. Nowadays there are more than twenty historic cities which have a proposal for conservation and restoration of their old tissues. The major historic cities are shown in *Fig. 1*, and their population in *Table 1*.

Table 1
Population of major historical cities (Computer Program, 1990).

IRAN	
Major historical cities	Population
TEHRAN	6 028 000
Mashad	1 120 000
Isfahan	930 000
Shiraz	801 000
Yazd	234 000

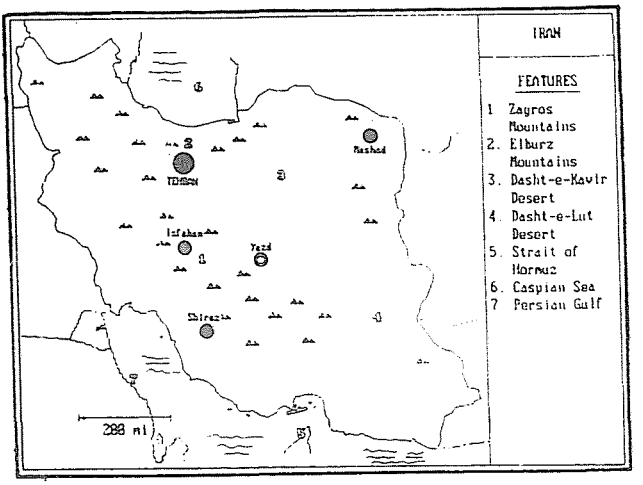

Fig. 1. Major historic cities in Iran and their location (Computer Program, 1990).

1.1 Climatical and Historical Factors of the Main Settlements in Iran

Iran as a big country in Middle East has different climate. You can find Mediterranean climate in the north band of Iran, between the Elburz mountains (indicated by number 2, in *Fig. 1*) and the Caspian Sea (number 6 in the same map), where the landscape is quite green. These mountains are like a thick wall and do not let the humidity and clouds to come to the south. Just the other side of Elburz mountains facing the south is quite dry, so there are two big deserts reaching from the Elburz mountains to the southeast of Iran (number 3 and 4 in *Fig. 1*). This area has a really hot-dry climate while in the north band of Iran the weather is quite different.

The third climate is in the western part of the Zagros mountains (indicated by in number 1 *Fig. 1*,). This has the same climate as the Northern area but it is less humid and a bit colder, you can say that most of this area belongs to the mountainous climate, just as northeast of Iran.

In the south of Iran, all areas and cities near the Persian Golf and Indian Ocean have the hot-humid climate, (see *Table 2*.)

According to historic books, the middle part of Iran has never been attacked by enemies, so the cities in this area are untouched showing lots of amazing architectural skills. The Yazd city is one of them.

Table 2
Different types of climate in Iran

Types of climate	Location
1. Mediterranean climate	North of Iran, between the Elburz Mountains and the Caspean See
2. Mountainous climate	West of Iran, between the Zagros Mountains and Western Boundary of Iran, also the northeast of Iran
3. Hot-dry climate	Dasht-e Kavir and Dasht-e Lut deserts
4. Hot-humid climate	South of Iran, all areas near the Persian Golf and Indian Ocean

1.2 Role of Yazd in Iran During the Last Century

According to the survay study (Ghezelbash and Abooziea, 1985) most of the houses and public buildings in the old tissue are built at the end of the 19th and beginning of the 20th century, in the period of Ghagar Dynasty.

The industrial civilization had a big effect on transport system, traditions of habitation and socio-urban habits. So after the 60s the general picture of the old tissues has changed. When the first internal combustion engines appeared on the streets, their number increased rapidly, the soil and stony approches were replaced by flat asphalt streets, horses and camels changed into fast vehicles. Urban tissues have been divided into some pieces due to creation of wide streets, boulevards and highways. Narrow zigzag approaches designed for pedestrians and donkeys have changed into new wide streets for public transport.

Furtunately, in Yazd city the industrial civilization had less effect on the old tissue than in the other Iranian cities. Because of its heritage values the first Master Plan of Yazd was perpared in 60s by the Architectural Office of the Faculty of Fine Arts at the Tehran University. The first Master Plan was adapted to the contemporary life in 1976 by the same office. In 80s when the Ministry of Housing and Development of Iran created an Architectural Section of Old Tissue for upgrading the old tissue of Iranian historic cities, the first city chosen for making a proposal for its old tissue was the 'Yazd' city.

During the last century experts always paid attention to the Yazd city. In 1990 this city was chosen as the most beautiful and best city in respect of city structures, city functions, road networks and general view of the old tissue.

2. Yazd: Structure Plan Formed in the Recent Time

The structure plan of Yazd has formed very well. The airport is located outside of the city boundary and far from the residential areas because of its noise pollution. The railway station is on a place with good access to each point of the city by primary distributors. This railway can link this city to the other cities within the national transportation network. The industrial zone is located in the best place in respect of the direction of wind, so the air pollution of factories does not disturb the residential areas. Also the University of Yazd, spine of Bazaar, road network and the other functions are well located (see *Fig. 2*).

2.1 Hierarchy of Road Networks

As mentioned before, the road network of this city is very reasonable. First, the network of primary distributors forms the back bone of the transportation system. All long distance traffic movements in and between metropolitan areas occur through primary distributors. Second, the system of district distributors links the primary network with residential, industrial, principal business districts and distributes traffic between these districts. Third, the local distributor network distributes traffic within environmental areas and maintain linkage between distributors and access roads. The fourth is the system of access roads which forms the linkage between buildings and local distributors (see *Fig. 2*).

2.2 Climatic Factors of Yazd

This city is in the hot-dry climate zone, the average of sunny days is 300 per year! Rainfall and humidity are on a low level, the maximum average rainfall is 98 cm, and the minimum is 16.7 cm; highest and lowest temperature are +45°C in summer and −16°C in winter, average temperature is +39.5°C in June and −0.5°C in January (D.T.P.D., 1960s) and (D.T.P.D., 1976).

Soil is very salty consisting of a mixture of clay and sand. Depth of wells (underground water) was 43 meters many years ago, now is a bit deeper. Favourable winds blow from the north-west on the most of the hot days, while the second favourable wind blows from the south-west only occasionally.

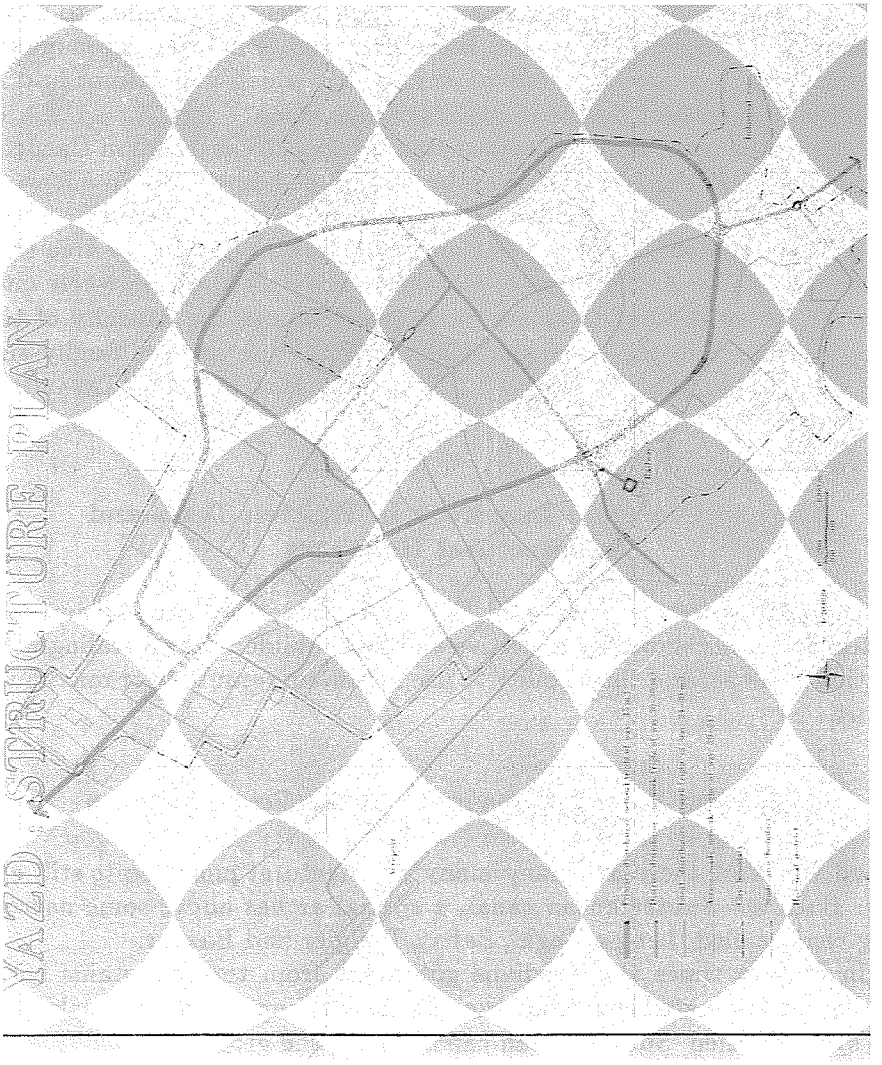

Fig. 2.

2.3 Cultural, Socio-economical and Traditional Factors in Historical Development of the Town

The culture of the Yazdian people is of a high level as compared to other Iranian cities. People have tried to keep their traditional Persian language and nowadays they use some old Persian words which you cannot find in the everyday speach of people in other Iranian cities.

One of the most famouse export item of this city is Yazdian Carpets. The most of these carpets are woven by women at home, who do not work outside, this job for girls who want to marry yields a good income.

By development of the city the old tissue has limited to the area that you can see in *Fig. 2*. The area of old the tissue is 1/20 of the whole city. In the old tissue the buildings are more compact and the capacity of the houses is more than the other parts of the city. The average family size was 3.6 for the whole city, and 3.8 for the Old Fort in 1986 (TAVASOLY, 1987).

3. Yazd Old Fort: Inventory in Written Texts and Architectural Heritages

The principal aspects of Yazd Old Fort to be examined are the amazing architectural skills shown by primitive and local builders when dealing with climatic problems, and their ability to use minimum resources for maximum comfort.

3.1 Existing Historical Monuments in the Recent Situation

In Yazd Old Fort there are many many architectural monuments still existing. Such as: Subterranean canal, a special arches above some narrow zigzag roads called 'Leng-e Tagh', Sabat, Badgier and Bazaar.

In ancient times the Yazdians got water from the mountains lying hundreds of kilometres far from the city by drilling holes and making a canal system called 'Subterranean canal' under the ground.

People have learned how to solve their probelems by collaborating with nature. The narrow zigzag and shaded streets had been made for pedestrians and donkies only. The enemy horsemen could not move fast in these narrow zigzag streets and occasionally after the bends there were a lot of arches (Leng-e Tagh) hardly higher than the horse, that could get the men fall off the horseback.

Some parts of approaches are covered by arch-roof called 'Sabat'. Inside this Sabat it is very cool, and over it there is a room. In general, all

streets and approaches are built considering climatic, defence and socio-economic conditions.

Bazaar (market) works as the economic pivot of the city. It is like a dome covered street surrounded by many little private shops and workshops. In the Bazaar each department has its own part and name, for instance, Gold Department, Shoe Department, Hardware Department and, so on.

When you walk in Bazaar, you see some tunnels which go about 50 steps underground and link to the subterranean canal. The name of these tunnels are 'Abambar' (water cistern). This way each pedestrian could get drinkable cold water.

When you walk around the Bazaar, besides departments and Abambars you can see some fascinating public buildings: Mosques for praying, Madresses for studying, Caravancerais for the travelers to rest and Cerais for commerce.

3.2 Historic Buildings of Legacy by Architectural Classification

The most important historic building in study area is Gamie Mosque, which has really magic architecture. The harmony of 'form' and 'function' is unbelievable. The entrance with its two high Minarets and their attractions, the courtyard with its golden decorations facing Mecca, the main space of the mosque called 'Shabestan' with its beautiful dome and other spaces are in a harmony like in a simphony.

Yazdian people studied the building site under all sorts of weather conditions and in all parts of the day, they considered local wind patterns, misty or foggy locations, shady and sunny spots and their relations to the seasons, the movement of hot and cold air, and built their houses accordingly.

For their own comfort, they designed buildings which respond successfully to the hot-dry climate. For example, they built the rooms around the courtyard for different seasons. Sometimes in the courtyard you can find another courtyard in the lower level called 'Sunkenyard'. These deep courtyards with their pools in the center and trees surrounding are rather cool. In these houses you can see rooms designed specially for winter and summer. 'Hashty' is a special space linking the house and the street. The entrance door is the only opening of the dwelling towards the street.

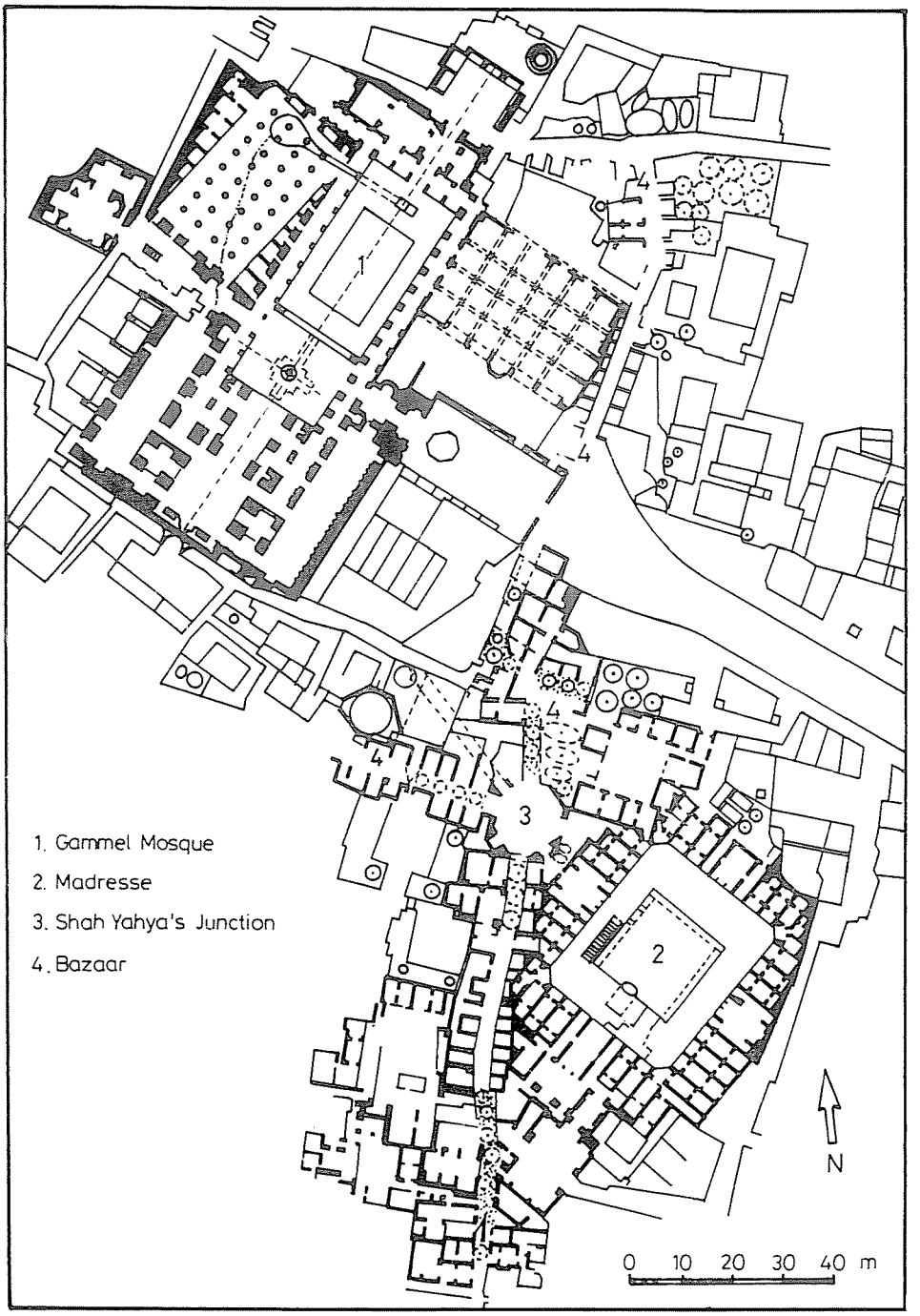

Fig. 3. Gammei Mosque Set (D.T.P.D., 1976)

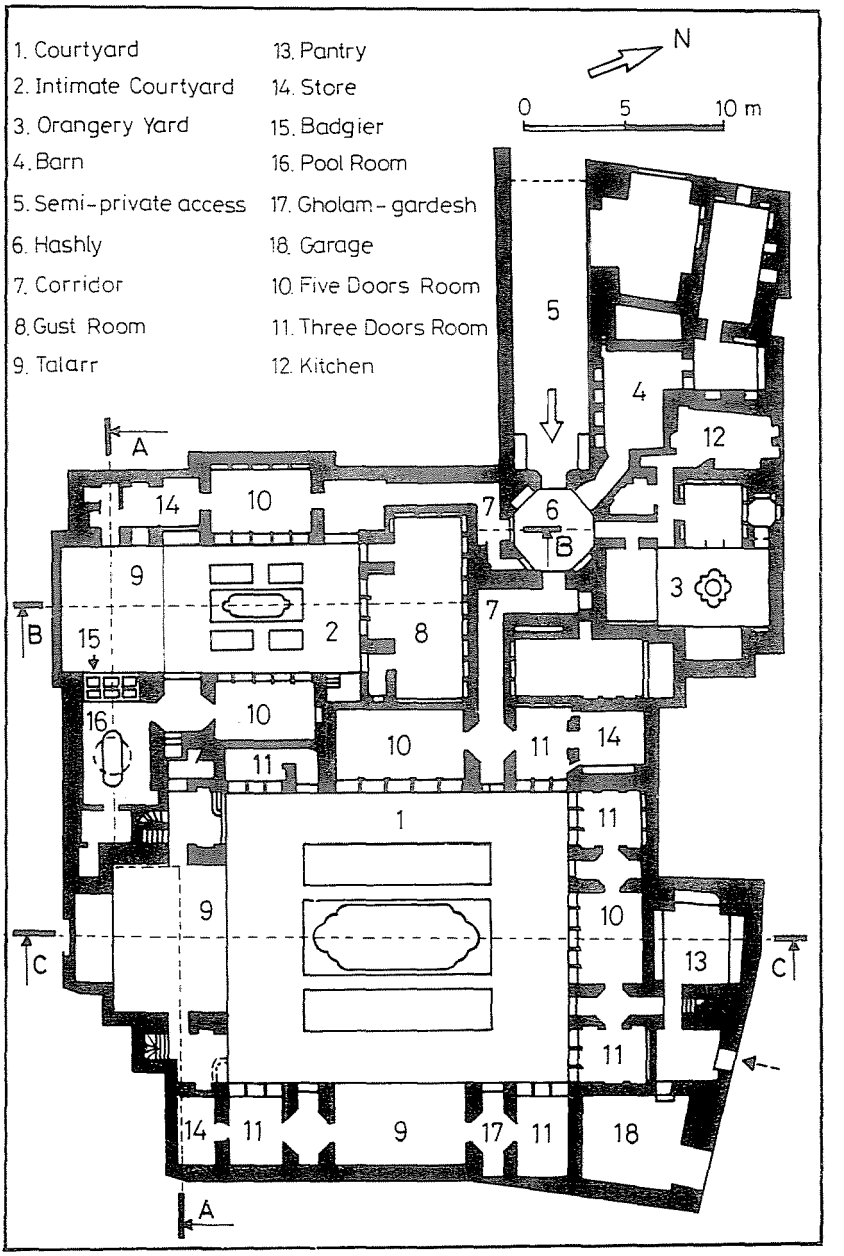

Fig. 4. A typical plan of the Four Season Houses

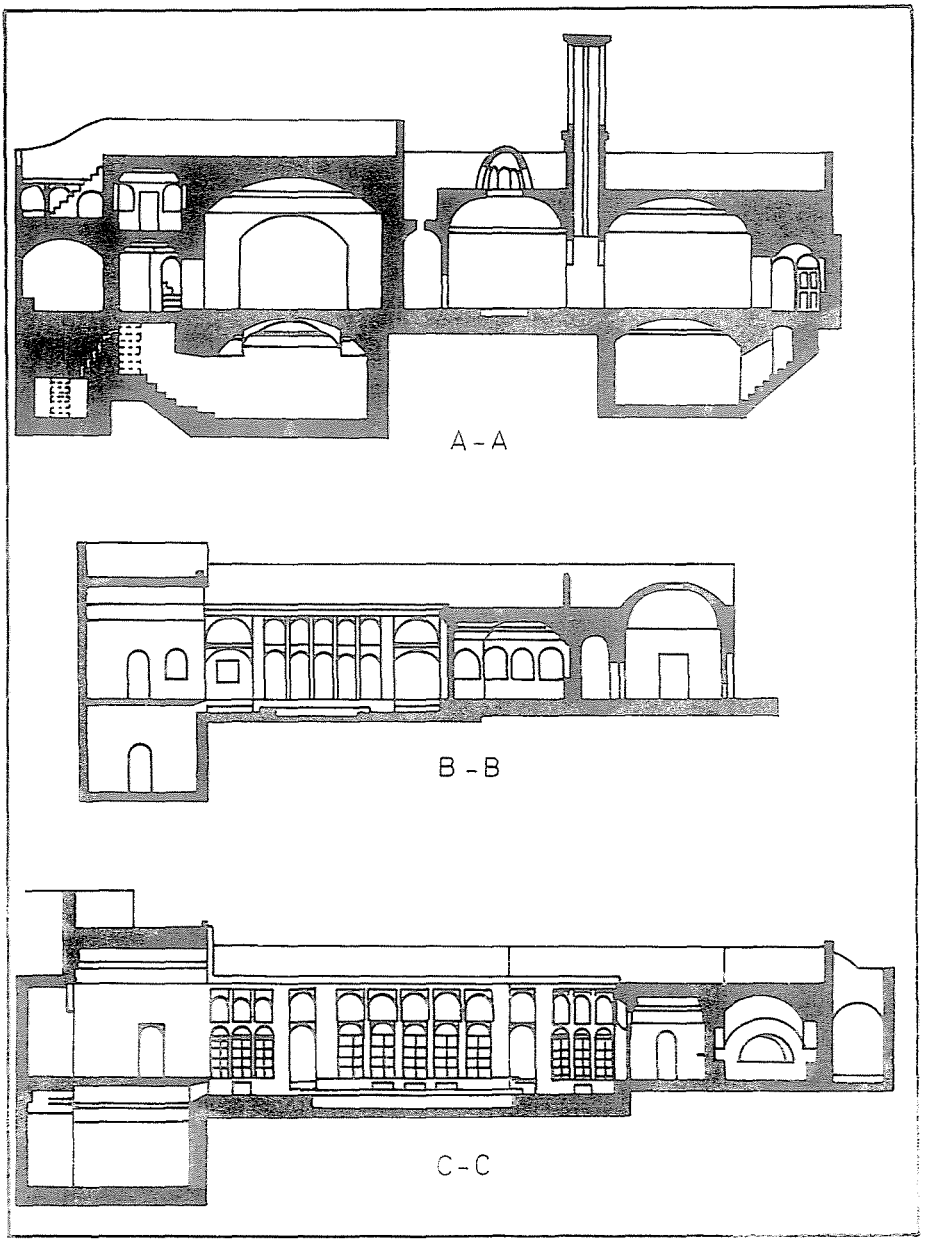

Fig. 5. Sections from Four Season Houses

3.3 The Major Residential Problems of the Yazd Old Fort

According to a survay (TAVASSOLI, 1989) the residential areas have the following problems that are included:

A) The residential buildings are too old and naturally it causes some problems for residents.

B) The structure has fatiqued especially due to natural vibrations and bombardment (in war time 1979–87) living in it is dangerous.

C) The repair expences are high as compared with the income.

Yazd Old Fort Study (TAVASSOLI, 1989) shows what the residents say. The changes of people's life had a grate effect on their road system and their contemporary needs. Weaving industry and handicrafts are very important and according to a socio-economic study, with renewal of this traditional actions you may hope to rehabilitate the Yazd Old Fort.
In short the major residential problems are listed:

3.3.1 The study area has not even the minimum of the road network for inner transportation, so the reconstruction and repairing of the old houses are nearly impossible.

3.3.2 You can find many huge abandoned areas and houses which are decayed and their owners do not restore them. So these rabish spaces offer a terrible visual aspect decreasing its urban level.

3.3.3 The historic values declared for national and international heritages have been preserved as individual buildings and some of them are scattered among these abandoned spaces. So in rehabilitation you should pay attention to the environment of the historic values as well.

3.3.4 The civilization of the study area is lower than national standards of urban facilities and utilities.

3.3.5 Lack of weaving industry and handicrafts is one of the most important economic reasons of demolition of Yazd Old Foft.

3.3.6 There is no low or any rowls for restructuring of the houses.

3.3.7 Existant of the low in-come people. Also Afganian emigrates and war refugees during the war time (1979–1987). Not only they low in-come but also they have made a lot of social problems for this district.

3.3.8 Lack of young people and their escape from these areas to new settlements if possible. It means, the present state of the old Fort does not meet people's taste. Statistics show that the number of old people with low income in this area is higher than in the other parts of the city.

3.4 Emphesize of Yazd Old Fort and Different Districts

Individual archeological monuments are often well preserved and can still have specific functions within the urban cluster. But when an area such as Yazd Old Fort is discussed for revitalization, you should pay attention to classification of the old tissue districts. It means you should dividethe whole study area to different zones with different classes, then specifying different policies for each zone.

In 'Yazd Old Fort Study' proposed by the author, the study area is divided into three zones according to the historic values. This will be done in two steps.

In the first step the study area will be surveyed for evaluating the architectural/historic values one by one.

The second step is the data analysis by the following method, in my opinion:

For achieving 'Zone A' (class I), all the high quality architectural values are represented. Then you make a bigger set, you continue this till you can make some big sets in the study area.

For finding 'Zone C' (class III), you do the same but with the map of low quality architectural/historic values ruins and new buildings.

Fixing 'Zone B' (class II)' with medium quality architectural/historic values and new buildings of high quality (in respect of both materials and architecture). If you have no full survey for the medium quality of architectural/historic values, with an indulgence, you can say the parts of the study area outside Zones A and C constitute Zone B. I had no full survey so I used the second solution.

The different zones of the 'Yazd Old Fort' are represented in *Fig. 6*.

3.5 Demands of Road Network Proposal

According to survey of 1988, most people were unsatisfied with access to and road networks in the Old Fort (Travassoli, 1987).

Access design is one of the most important parts in town planning. Nowadays, fast transportation in a city is just the same as movement of blood in a body. By stopping the circulation of blood, the whole body will die. Access design in historic centers has always been one of the most difficult things in urban design. Access design in settlements is much easier than in the historic center because there are no limits in the land-use, no limit with private plots and so on.

Demands of road networks of 'Yazd Old Fort' can be stated like this:

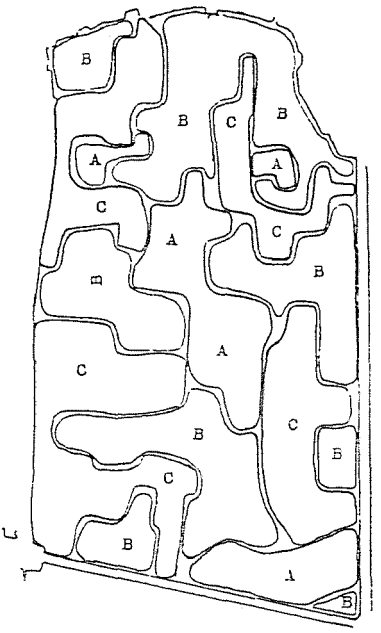

Fig. 6. Classification of different districts of 'Yazd Old Fort'
Zona A: Class I (areas with a majority of buildings and spaces of the highest importance).
Zona B: Class II (areas with straggling important buildings and elements, medium quality of historic values)
Zona C: Class III (areas of little architectural or historic importance)

3.5.1 Construction of new roads and widening of existing ones should be carried out without threatening the historic/architectural values.

3.5.2 Hierarchy of roads is necessary for road networks of Yazd Old Fort.

3.5.3 Considering the contemporary life and everyday use of private cars, each plot should have direct access to the street. In special cases where it is impossible, local parking lots are necessary.

3.5.4 The local distributors should be adapted to the major roads of the tissue. If any new parts are needed, they should be as short as possible.

3.5.5 The local distributors should be designed for local traffic only and the transit traffic should not be let in the historic center.

3.5.6 Road widening should be done without disturbing the security and tranquillity of the residential plots.

3.5.7 The 'Yazd Old Fort' should be considered as one unit, so it is forbidden to design a straight street to cut this district into two parts.

3.5.8 The configuration of the existing road networks should be preserved. In other words, 'road widenings' should follow the curvatures of the old roads and road networks. It does not mean that you cannot create a new road or omit a curvature of a road. It means you should try to keep the main configuration of the old road networks in your proposal.

3.5.9 Public parking lots for public places should be built as much as needed, but for residents their capacity should be decreased to an average of ten per plot.

3.5.10 Parking the car on the roadside is a typical city habit so while widening a road you should take the idea of 'on-street parking' into consideration.

3.5.11 For each new dwellings to be built in the old tissue, one garage per unit must be designed.

3.5.12 Observance of hierarchy of roads for road widening is important and necessary.

References

1. D.T.P.D. Master Plan of Yazd, Tehran University, 1960s.
2. D.T.P.D. Revision of Master Plan of Yazd, Tehran University 1967.
3. ERPI FEYYAZ: Urban Traffic Planning, Middle East Technical University, 1980.
4. GEZELBASH MOHAMMAD-REZA – ABOOZIEA FARHAD: Physical Alfabet of Traditional Yazdian Houses, Tehran, 1985.
5. M.H.C.D Yazd Study, Tehran, 1988.
6. Pc. Glob Software, Computer Program, 1990.
7. TAVASSOLI MAHMOOD: Access Design, Tehran, 1977.
8. TAVASSOLI MAHMOOD: Urban Design in the Inner Core of the Historic City of Yazd, Tehran, 1987.