

1. Research and development of the Indigenous building methods, materials, local skills and resources.

c) Caspian Region, Iran

by

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April 1980

1c CASPIAN

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DEVELOPMENT WORKSHOP

The Development Workshop is a team of architects, planners and researchers from a number of countries who work collectively on the development of indigenous building and planning methods in the Third World. Projects have been undertaken in African, Middle Eastern and Asian countries. Members of the Workshop believe that appropriate solutions to human settlement problems can be developed from indigenous methods which have evolved from and remain in the hands of Third World communities. The Workshop works in the field of rural and urban human settlements. The development of small scale construction industries, technical training and local participation are integral to the Workshop's approach.

John Norton is a founder member of Development Workshop.

RESEARCH AND DEVELOPMENT OF INDIGENOUS BUILDING
METHODS, MATERIALS, LOCAL SKILLS AND RESOURCES

C THE CASPIAN

1. Introduction

In 1978 a research programme was instigated as the pilot phase for the development of the built environment in the Caspian Region of Iran *¹, covering the provinces of Gilan and Mazandaran *². (Fig C.1)

2 Aims

The aim of this programme was two fold. Firstly, few people in official decision making positions were acquainted with the real needs, potentials and conditions of the region. For decisions to be made which could accurately reflect the local requirements the information had to be collected and presented in a way that could be used by decision makers. Secondly, the more direct aim was to understand the problems and potentials of the built environment in the area, and through that process, ascertain what assistance could be given to:

- 1) Improve the quality of the built environment.
- 2) Stimulate the use of local materials/resources where possible and through this generate more local employment opportunities and less dependance upon imported skills or materials, i.e. from Tehran or abroad.

*¹ Documented in: DARAIE. M; CAIN. A; NORTON. J; AFSHAR. F.
INDIGENOUS BUILDING OF THE CASPIAN REGION

Tehran, Institute for Peasant and Rural Studies. 1979

*² This programme was sponsored by the Iranian Institute for Peasant and Rural Studies. Tehran, Iran.



Fig C1 LOCATION OF CASPIAN IN IRAN

3 Programme for study

The overall research programme was conducted by an average of 4 people over a period of 6 months, including the time for analysis and production of the results as well as the field work. The field work was done in 3 trips, firstly to Gilan, then to Mazandaran, and a final more selective trip to study certain areas in greater detail in both of the provinces.

Before the field work documented information was collected in Tehran. This included maps, climatic data, and any information already available. There were already some detailed studies of specific villages and neighbourhoods, which, depending on their degree of detail, were later used to cross check the findings of the field work period and were useful in giving an indication of changes that had taken place in the time that had elapsed since the earlier studies were done.

The information on the Caspian Region was gathered on three broad levels: visual observation, physical surveys and case study interviews.

While travelling through the region, visual observations on changes in house types, building materials, settlement pattern and distribution, as well as topography and land use, were recorded in writing and small illustrations, taking the form of Route Notes. This information was also documented photographically. Similar visual observations were recorded on settlements and houses. This material provided a valuable broad reference to the whole region.

Settlements were selected at regular intervals throughout the region and physically surveyed. The settlement

pattern was drawn up and observations were made on the local topography, climate, water resources, social characteristics, defence measures and building resources, at the same time noting what influence these have had on the form of the settlement. In each settlement several representative houses were selected for detailed survey and many others were sketched and photographed. Plans, sections and elevations were measured and drawn up, and a house observation sheet on space use and building technology was filled in.

In the houses surveyed in interview on various aspects of the settlement and the house was held, usually with the head of the family. These interviews, in addition to providing detailed current information, also provided much of the local historical information and details on the development of the house and settlement.

Based on a preliminary study of the region, physical surveys and interviews were conducted on local building and production industries, complementing the information collected on houses and settlements. Whenever possible, local builders were interviewed in addition to the house surveys and interviews. Builders were asked to demonstrate or explain particular local building methods and their opinions on various building materials and techniques were obtained, as well as comparative costs.

Samples of building materials were also collected and analysed.

4 Caspian Region

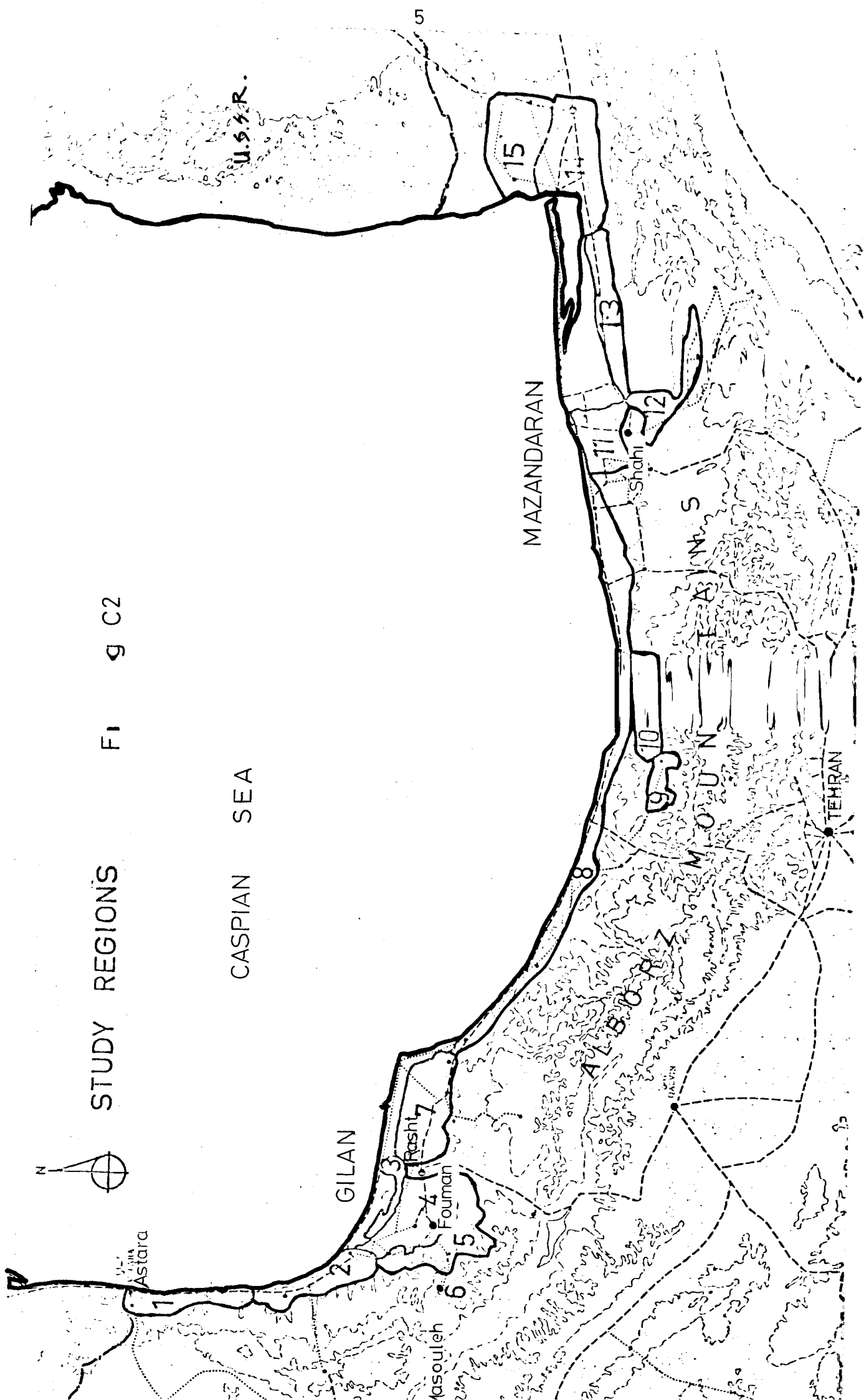
The field area for this study was defined by the northern slopes of the Alborz mountains (Fig. C.2); a region which exhibits similar ecological characteristics from Astara



STUDY REGIONS

FI 9 C2

CASPIAN SEA



in the northwest to the foothills of Gorgan in the east of the region. The Alborz mountains, forming a barrier to the penetration of rain clouds into the south, contain the abundant rain and humidity on their norther slopes and the coastal plains of the Caspian.

The study area was divided into two broad ecological subregions:

The plains; occupied by a sedentary population who were traditionally engaged in rice cultivation, silk production, and animal husbandry. The plains have a high mean annual rainfall, humidity and air temperature.

The hills; covered by forests and vegetation and provide good grazing grounds for animal husbandry. The population engaged in this activity migrates to the cooler, less humid hills in the summer and returns to the plains in the winter months.

The Caspian's narrow coastal plain has an average width of about fifty kms, and was produced by a general retreat of the sea, which at one time probably extended as far as the foot of the Alborz mountains. Numerous rivers originate in the northern foothills of the Alborz, but they are all short and cover small distances before they reach the sea. There are, however, four rivers of importance that empty their water in the Caspian. They are, the Aras (Arazes), Sefid Rud, Gorgan, and Atrek. These rivers have respectively built the Moghan Plain, the Sefid Rud Delta (Rasht Plain), the Gorgan and Atrek Plains. In addition, a group of rivers - Talvar, Haraz, Babol, and Tejan - have built up the Mazandaran Plain.

The northern foothills and the slight to moderately sloping foothills areas of the Alborz mountains bordering the southern coast of the Caspian Sea are characterised

by a humid and subhumid subtropical climate. These areas include the Caspian provinces of Gilan, Mazandaran, and Gorgan. Climatic conditions in these regions differ from those of other parts of Iran and have certain similarities to the Mediterranean climate; it is humid in the western part and subhumid, semiarid in the eastern part. (Fig. C.3, C.4, C.5)

5 Building techniques, materials and forms.

The particular topographical, environmental and socio-cultural conditions of the Caspian Region have produced a range of building techniques and forms unlike those found in the rest of Iran.

5.1 Roofs

Regional construction variations in the study area are most clearly reflected in the roof types, reflecting changes in materials and micro climate. In general the steepness of pitched roofs decreases from the coast to the mountains. This is most marked in a section taken from the coastal area north of Rasht and passing through Fouman inland to the mountains.

The reason for the change at each stage of this cross section is twofold. Reed thatch is used in the coastal areas because it is the most abundantly available material, growing in the marshes. The pitch of these roofs is very steep where the rainfall is high (1600 mm/year) to ensure water run off; the pitch is shallower where rainfall is less, producing the difference between reed thatch roofs in Gilan (55°) and Mazandaran (35°). In Gilan the coastal houses have large overhanging eaves which reflect the degree of exposure to, and direction of bad weather. The overhangs often protect frail wall structures behind, such as reed walls. (Fig. C.6)

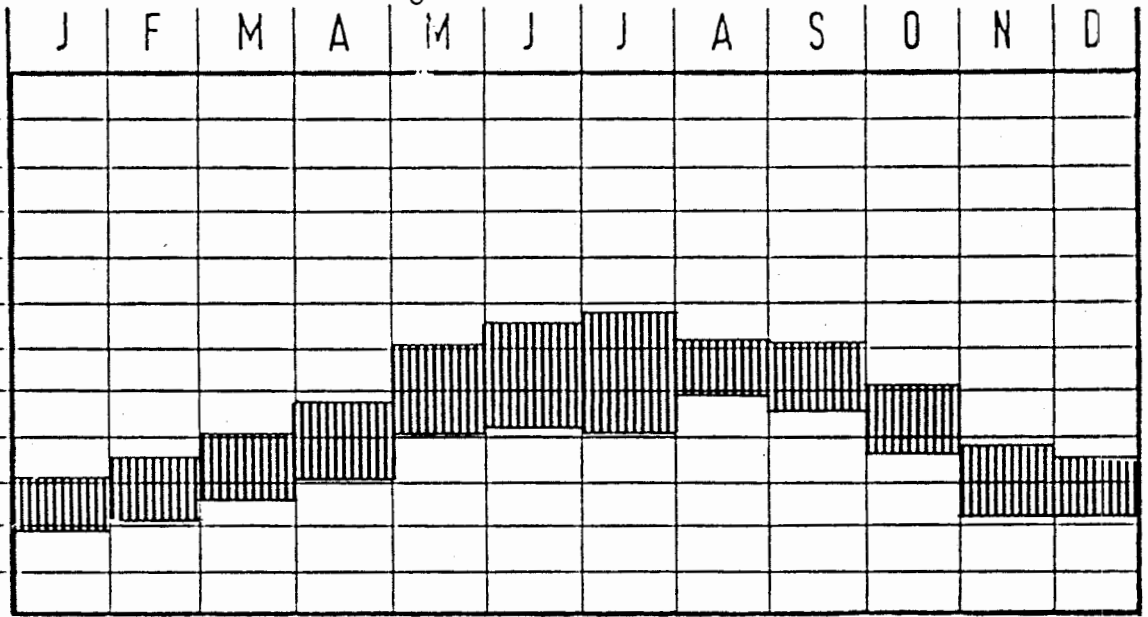
Fig C3

FOUMAN
Elevation -10m.

8

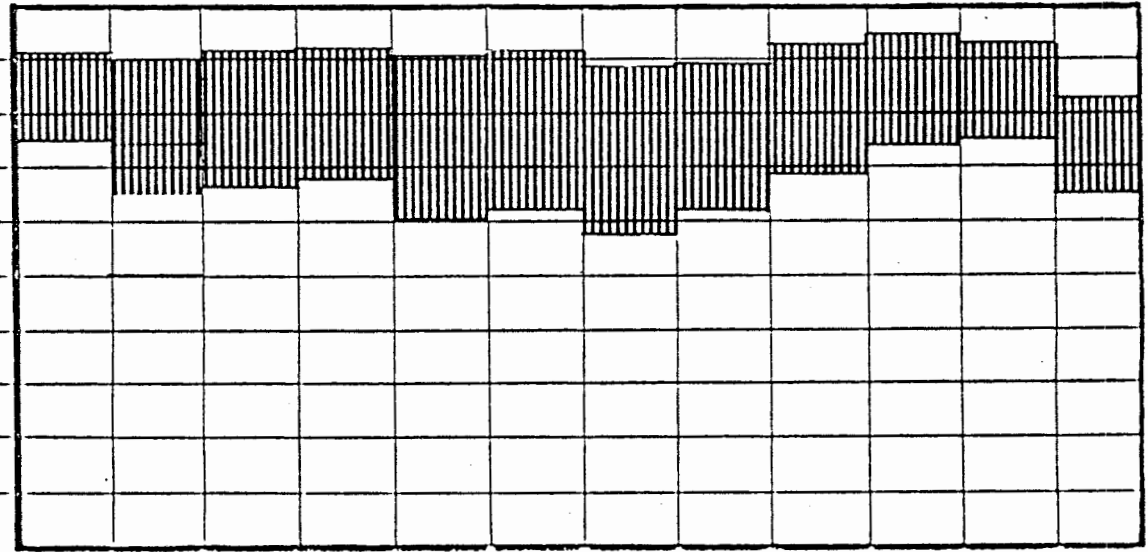
AIR TEMPERATURE °C

45
40
35
30
25
20
15
10
5
0



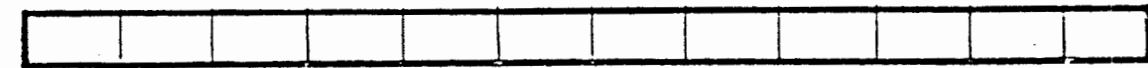
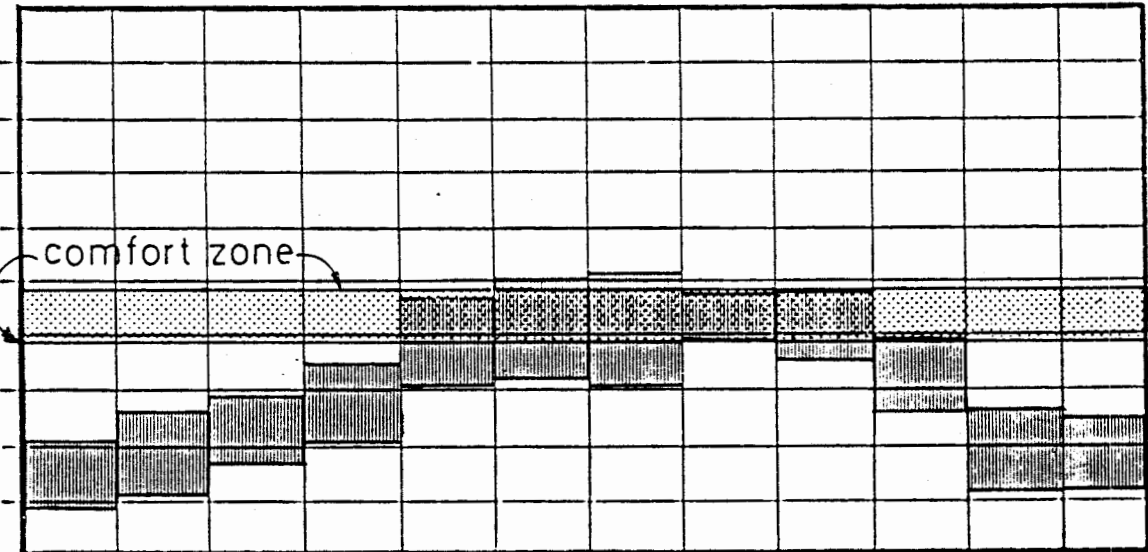
RELATIVE HUMIDITY %

90
80
70
60
50
40
30
20
10



WIND EFFECTIVE TEMPERATURE °C

45
40
35
30
25
20
15
10
5



RAIN
mm.

150
100
50
0

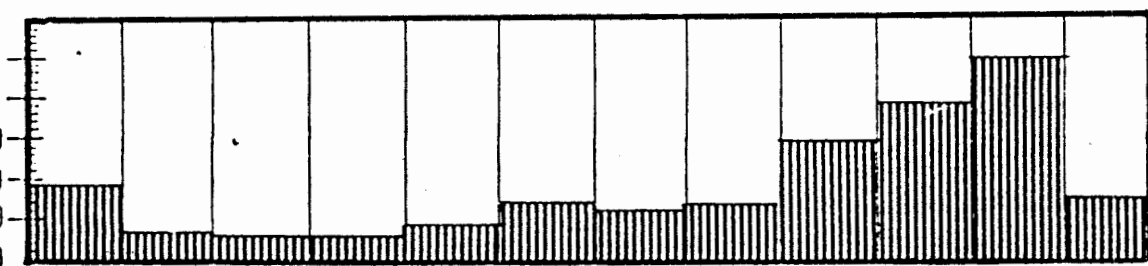
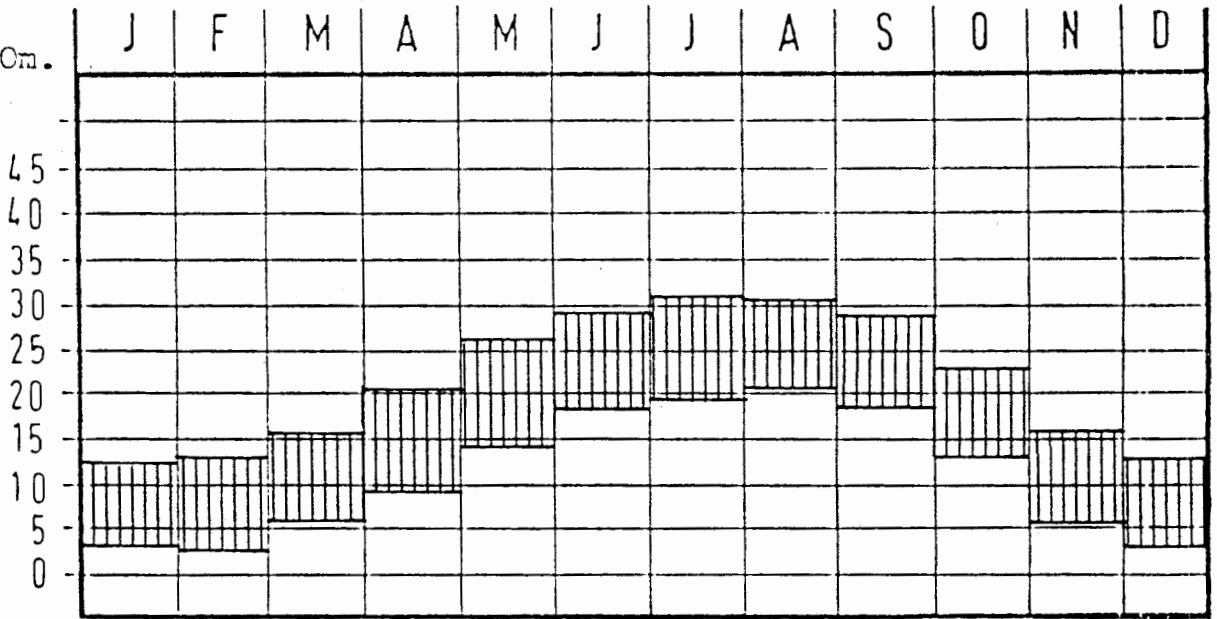


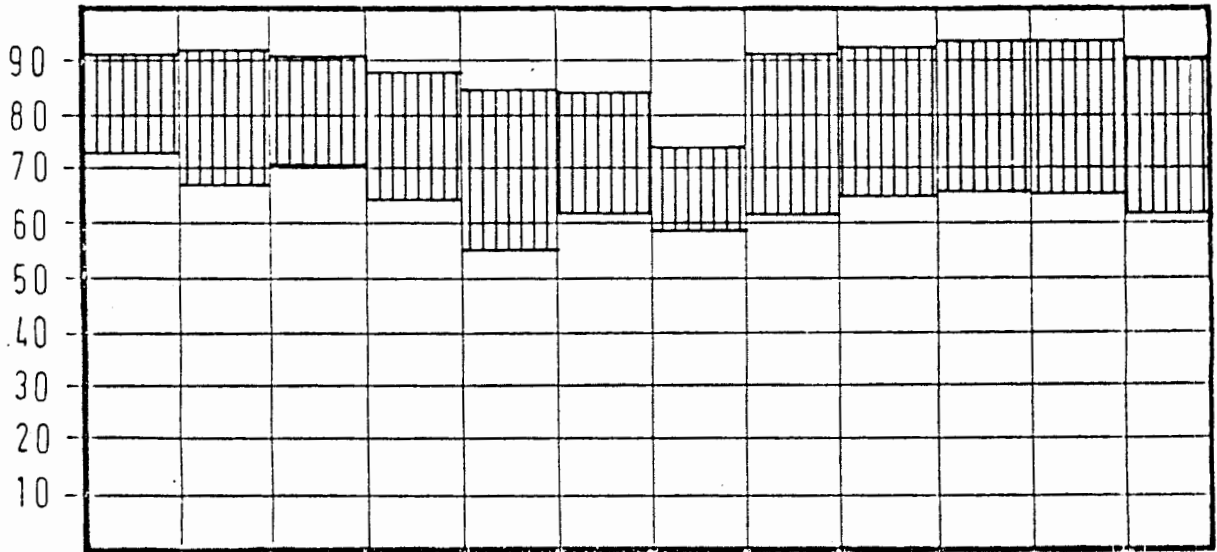
Fig C4
SHAHI

Elevation 150m.

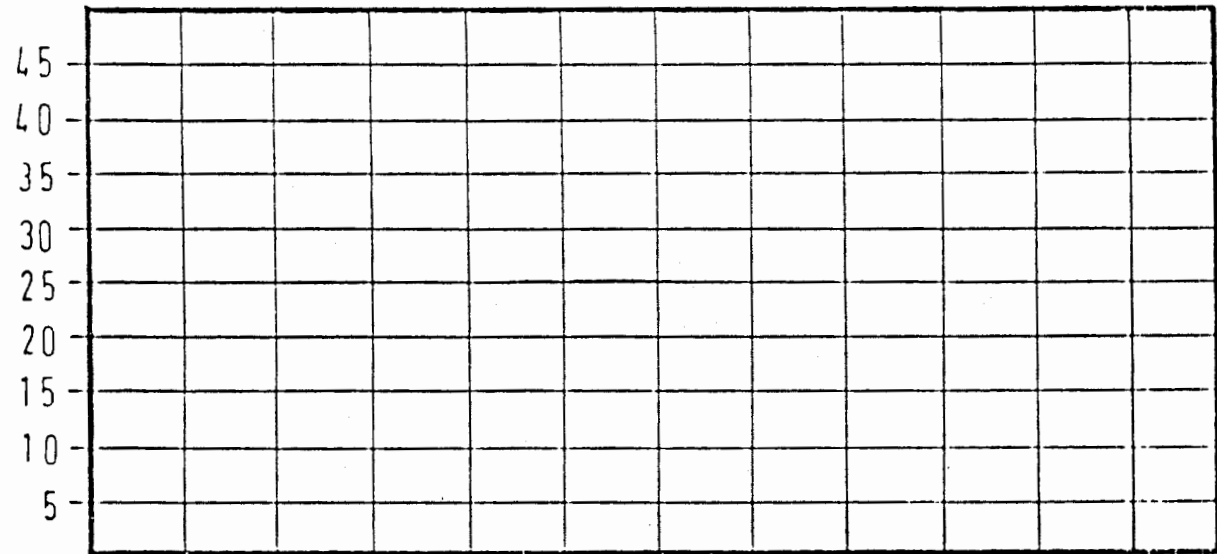
AIR TEMPERATURE °C



RELATIVE HUMIDITY %



WIND EFFECTIVE TEMPERATURE °C



RAIN

mm.

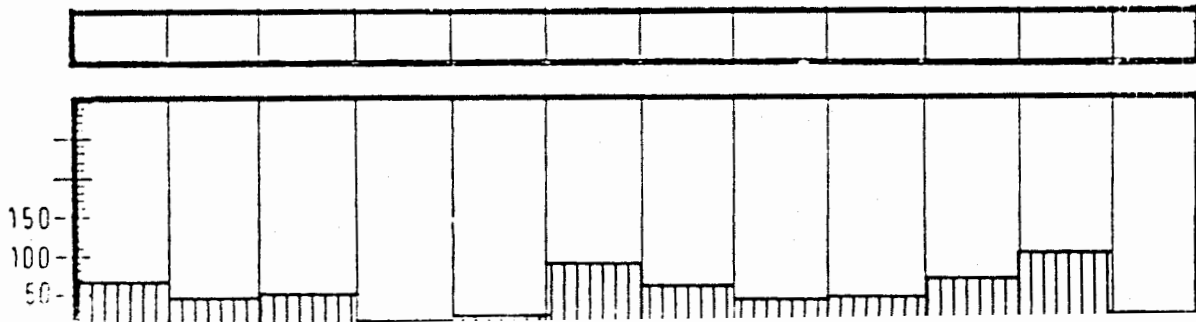
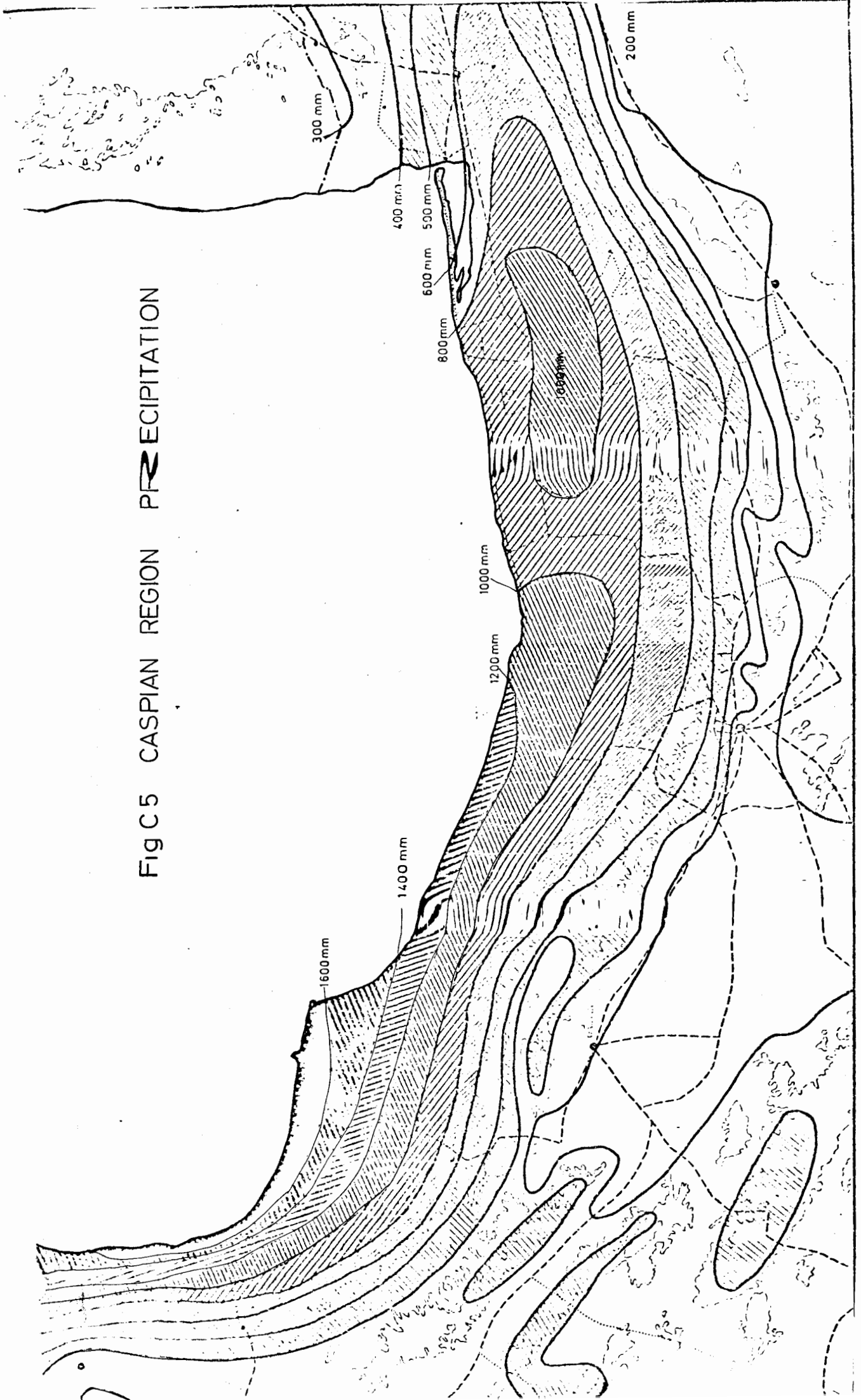


Fig C5 CASPIAN REGION PRECIPITATION

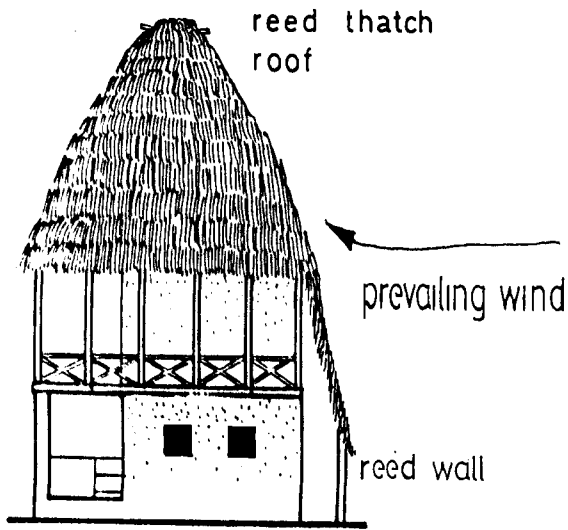


Moving inland reed is replaced by rice thatch. Rice is grown over much of the Gilan plains. The pitch is shallower (40°): the rainfall is less (1000 mm/year). (Fig. C.7)

At the junction of plains and foothills, as forests start replacing fields of rice, wood shingles replace thatch. These shingles allow the roof pitch to be much shallower, and as the rainfall decreases into the mountains, the pitch can be further lowered. There is a progression from 35° to 25° . (Fig. C.8) Although there are exceptions, such as Masouleh, the change from shingles to flat timber and mud roofs occurs at the point where there is insufficient rain to support forests, altering the materials which are available for roofing, and where the relative dryness of the climate makes flat roofs practical. Flat roofs are typical of the drier slopes and plateaux of the mountains. (fig. C.9)

Tile roofs which occur in areas where soil is suitable for tile production (Astara, Behshar and the towns of the Rasht/Lahijan area), are in exception to the pattern outlined above, since they are suitable for use in areas of heavy rainfall without requiring a steep pitch.

Similarly, sheet metal roofs do not reflect local changes in climate, the exception of those in the Turkomansahra area where a peculiar 'H' ridge form of sheet metal roof is, according to locals, to assist in the collection of rainwater. (Fig. C.10)



Side Elevation
Shijan Village

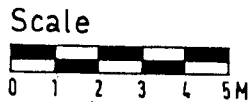


Fig C6 REED THATCH HOUSE

Fig C7
RICE THATCH
HOUSE

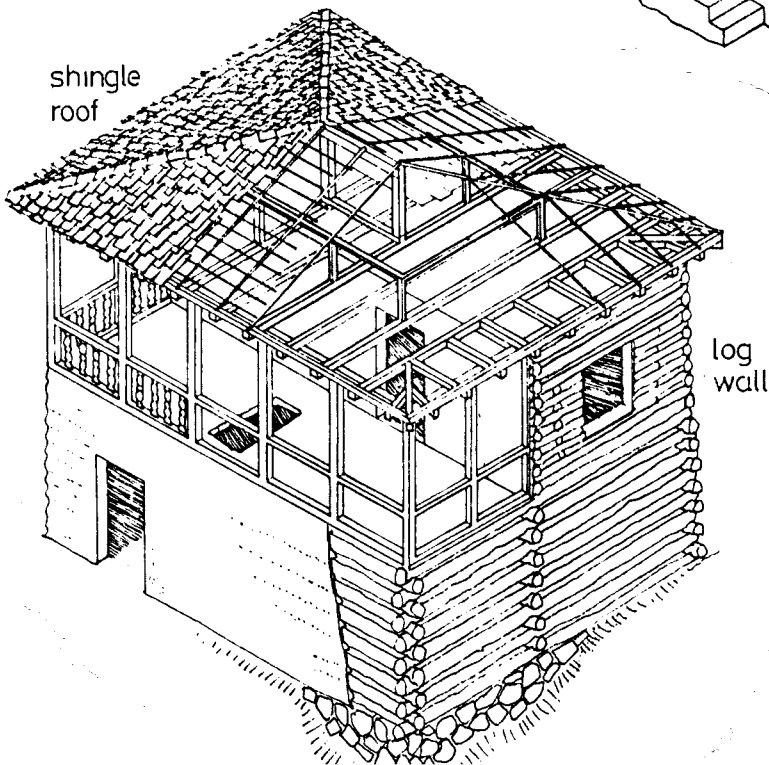
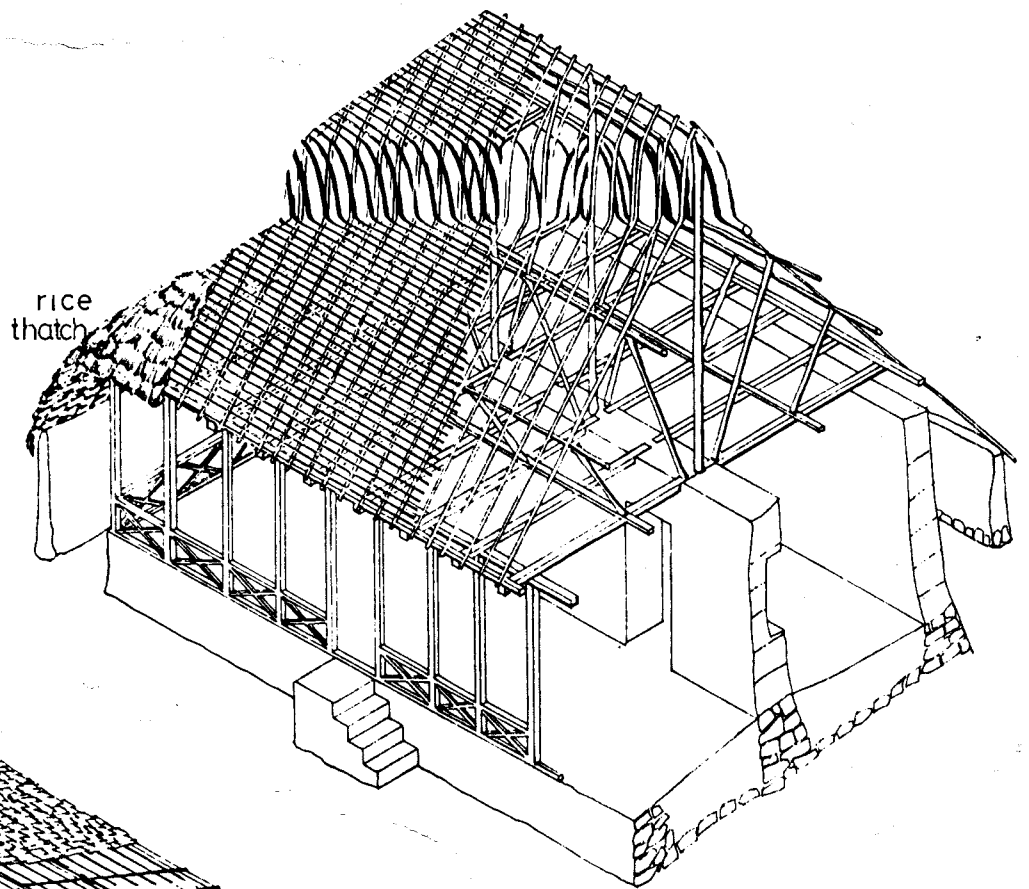
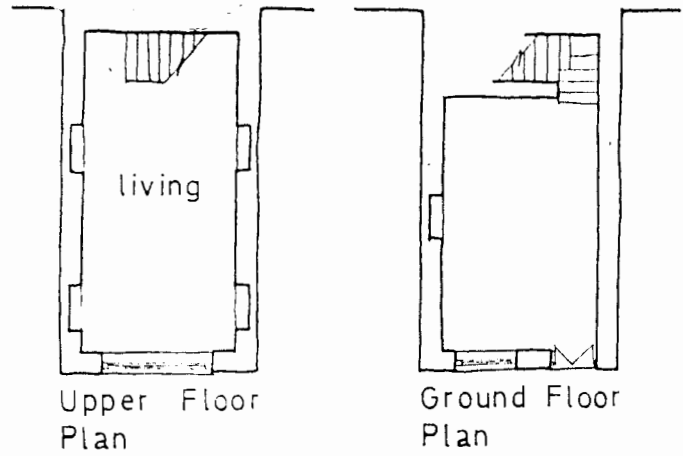


Fig C 8 SHINGLE ROOF
HOUSE

Fig C9 FLAT ROOF HOUSE

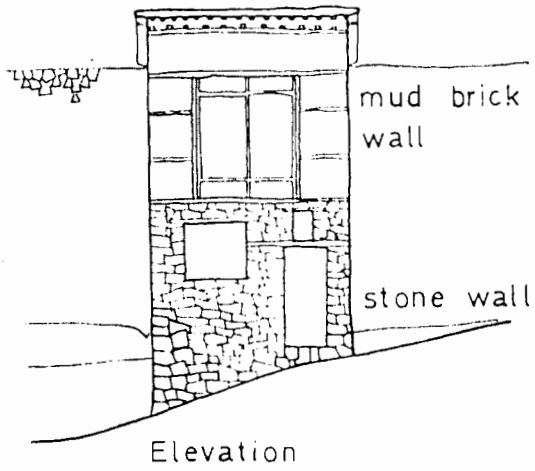
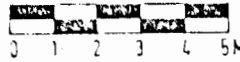


Upper Floor Plan

Ground Floor Plan

Masouleh

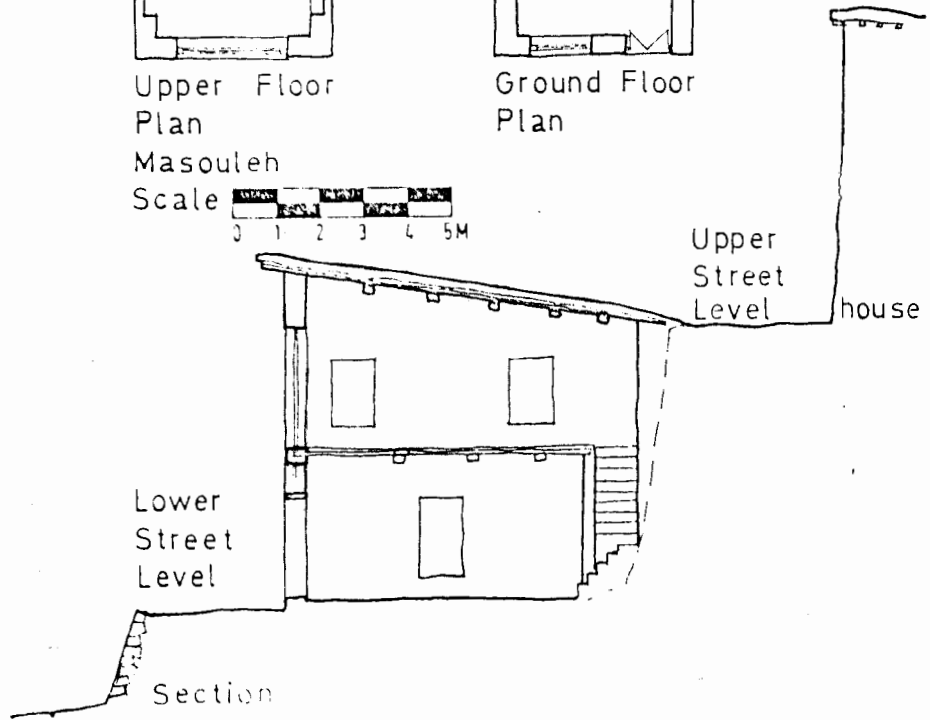
Scale



mud brick wall

stone wall

Elevation



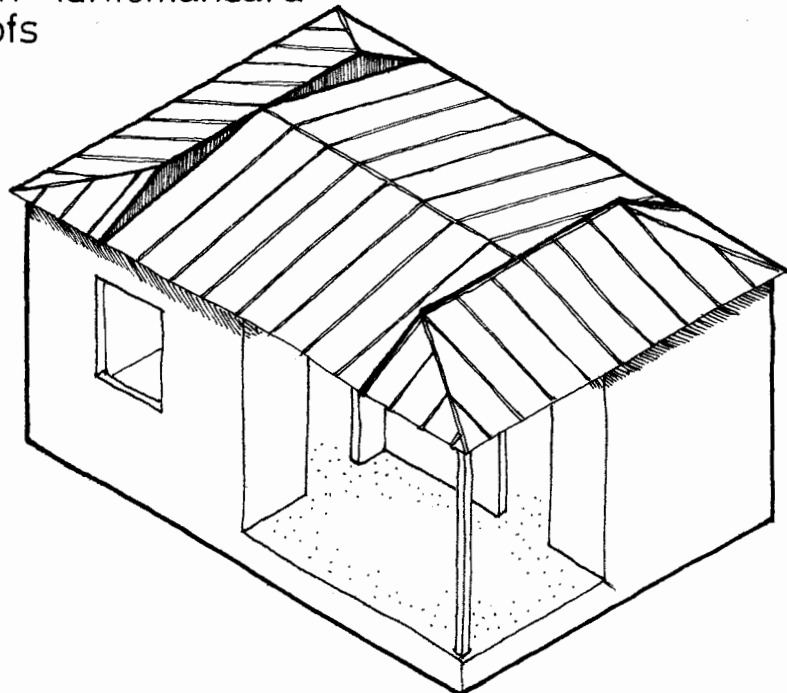
Upper Street Level

house

Lower Street Level

Section

Fig C10 Houses in Turkomansara have unusual roofs



5.2 Walls

Walls, in the same manner as roofs, vary according to the materials available locally and the climate.

Reed walls supported by a timber framework occur in the coastal areas, where reed is more available than other walling materials. (Fig. C.6) This wall type is well suited to the warm humid conditions of the coast, where thermal insulation is less important than inland, where temperatures are more extreme. A general observation is that walls increase in thickness with distance from the coast. Linked to this is a similar transition from framed wall construction near the sea changing to load bearing wall construction in the mountains. This change reflects changes in the availability of walling materials. Loadbearing walls are naturally thicker than framed walls, and so the change required by climatic conditions is facilitated by the change in the physical properties of the wall.

Moving from the thin reed walls on the coast inland, walls of timber lathing with a packed mud infill occur. These walls are thicker than the reed walls but are still supported by a timber framework. (Fig. C.11) However, where timber is less available, packed earth (chineh) walls are used, as in Sari and Fouman plains. The choice between these two types of walling is influenced by variations in local climatic conditions as well as the suitability of the materials.

Log walls, which are loadbearing, coincide with forested areas, and are the major wall type in the foothills and forested mountains. (Fig. C.8) Because of the good thermal properties of timber, these walls provide greater insulation against extremes of temperature than the thin

Fig C 11
TIMBER LATH AND
PACKED MUD WALL

Vertical framing

Horizontal laths
internally

Diagonal laths
externally

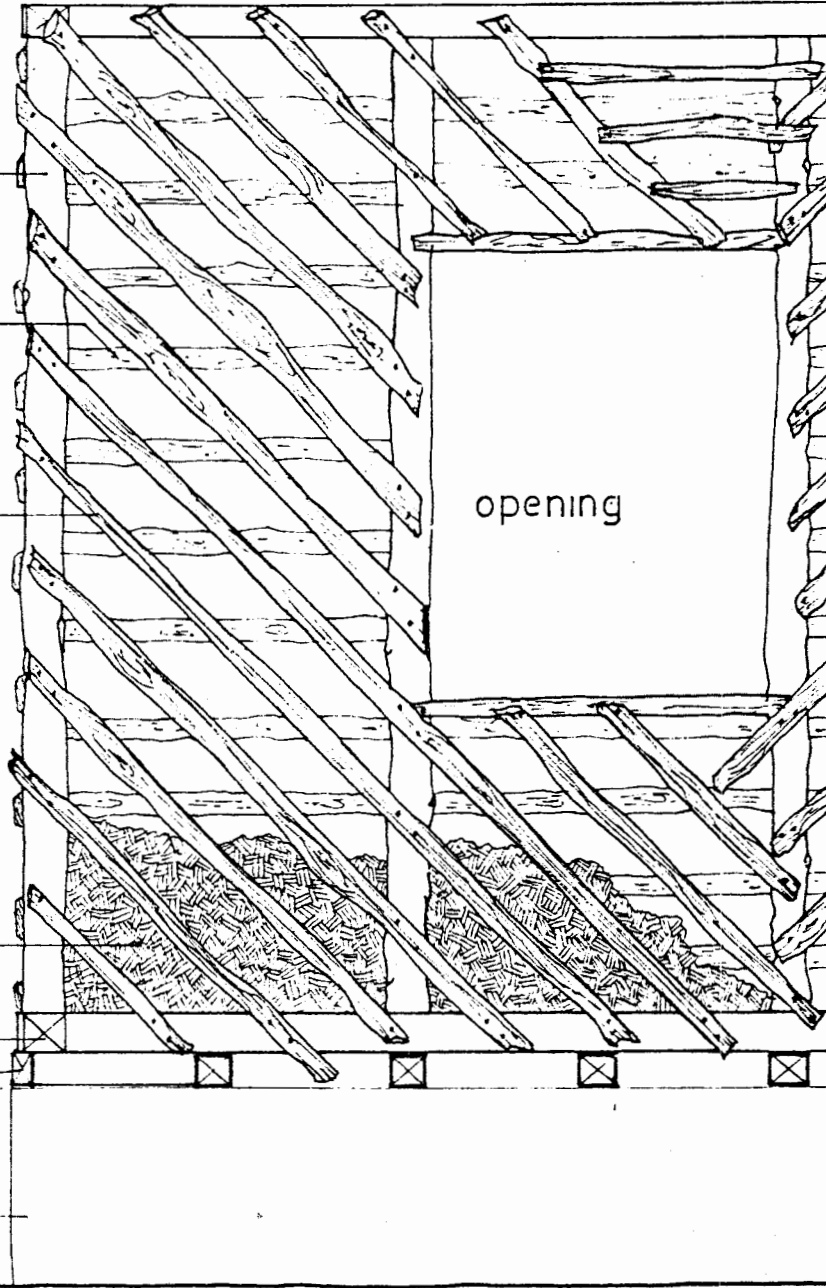
Packed mud and
straw infill

Horizontal framing

Floor joists

Platform

ELEVATION

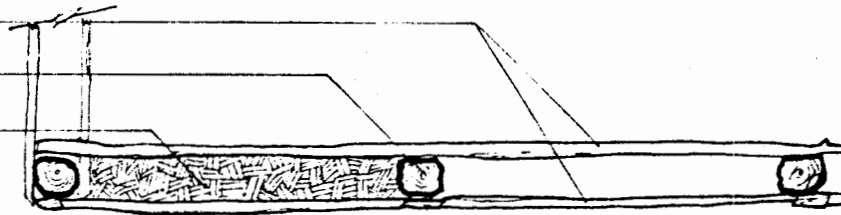


Laths

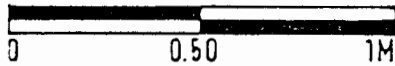
Framing

Mud packing

PLAN



Scale



walls found on the coast. The use of log walls is restricted to areas where timber is plentiful, and thick stone or mud loadbearing walls replace logs where the forests decrease inland. At this point thermal insulation is essential to counteract the cold winters and cool summer nights which occur in the mountains, and the thick loadbearing walls are responsive to both the local climatic conditions and the availability of walling materials.

All the wall types mentioned above require rendering and maintenance. A major potential improvement in building quality and maintenance can be through the introduction of improved renders, using stabilisers to make them more water and impact resistant. In areas where the soil is suitable fired bricks are produced and used for walling. (Astara and Behshar) They have the advantage of being less subject to damage by rainfall and consequently require less maintenance. However, the cost restricts the rural use of fired brick even in areas where it is produced. Similarly concrete block has come into use throughout the coast and plains of the Caspian region for those who can afford it. Although it is less environmentally responsive, concrete block is locally believed to be long lasting and maintenance free.

5.3 Platforms

Houses are built on platforms to raise them above damp ground conditions and the risk of flooding. Platforms are therefore a predominant feature in the coastal and plain areas of the Caspian. Two basic forms of platform exist - those which are raised clear of the ground, which occur in areas where rivers are likely to flood (Sefid Rud delta), and those which are solid. (Fig. C.12) Solid platforms are highest near the coast, and in gen-

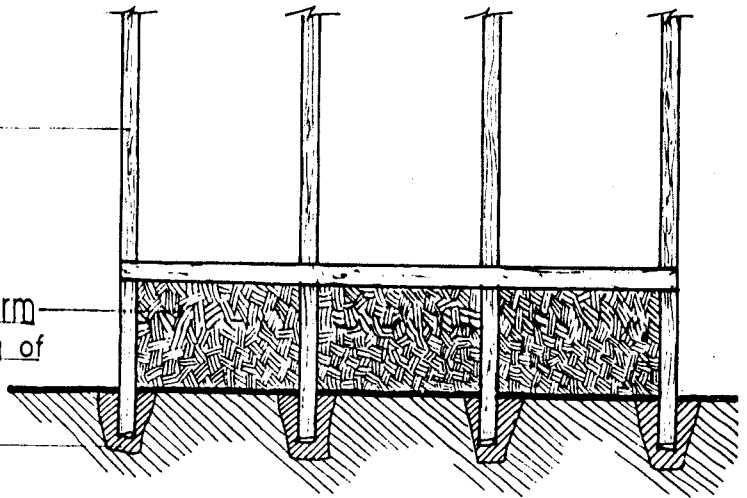
PLATFORMS

A

Framing

Packed earth platform
built within framing of
building

Lime/mud mortar

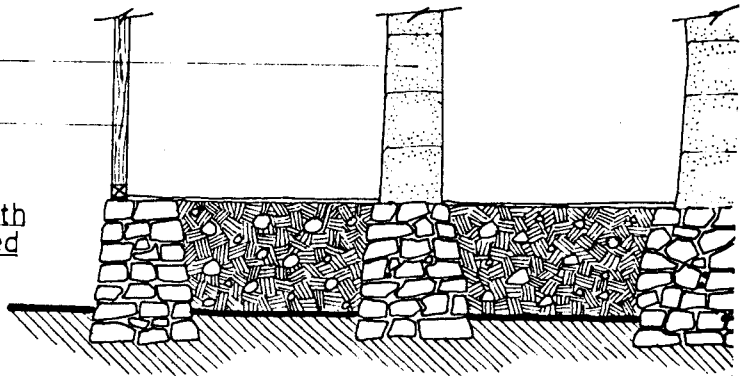


B

Chineh walls

Post at front of
aivan

Solid platform with
stone piers, packed
earth and rubble
infill.

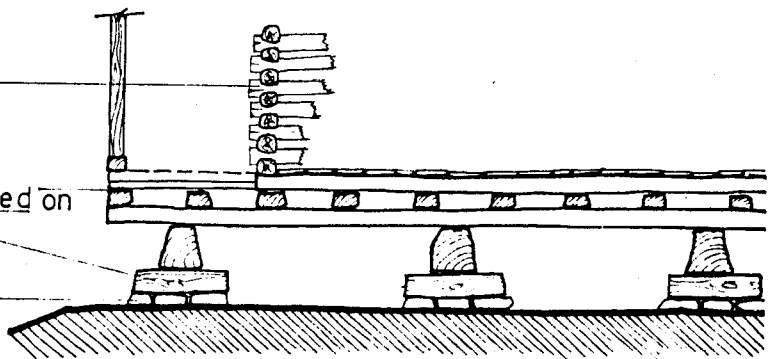


C

Log walls

Raised timber
platform, supported on
wooden blocks

Stone plinth



Scale

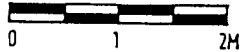


Fig C 12

eral get lower towards the foothills, corresponding to the areas with drier and better drained ground.

Platforms are not a predominant feature of mountain dwellings, but visually the levelling of ground below the main structure of the building produces an effect similar to the platforms of the plains.

5.4 Orientation

Orientation of houses also alters from the coast to the mountains. To take maximum advantage of the sun's warmth in winter, houses in an ideal situation face south, with windows primarily on the south wall. However this ideal orientation is not always the most practical. On the coast houses tend to be oriented towards the south-east, turning the back of the house towards the prevailing, north-westerly storms. Moving inland onto the plains, a south facing orientation is more practical, since the houses are less exposed to bad weather. The situation is notably different in the foothills and mountains, where topography becomes a dictating factor. Houses primarily face downhill, with their backs turned toward the slope behind. This is not an ideal situation and where the site is sufficiently open towards the south, a south facing orientation is chosen.

6 House form

Any typology of house form can only be a generalisation in a region demonstrating varied natural conditions, economic and social patterns and different ethnic and tribal backgrounds. However, some basic features are common to the whole area, with the exception of Masouleh, which is built on a steep hillside and has houses unique to its own position.

There is a basic type of shelter which is generative of all the other house types. It consists of two fundamental spaces necessary for the house in the Caspian region: an enclosed room and a roofed but unwalled verandah (aivan). The room provides an enclosed space for use during the cooler less humid months and in some areas for sleeping at night; the verandah is a shaded semi enclosed roofed space in which most daytime activities take place, especially during the warm humid summer months. (Fig. C.13)

These two spaces are found in almost all house types in the region but the ratio of room area to verandah and their relationship vary according to the climate and lifestyle requirements within each sub region.

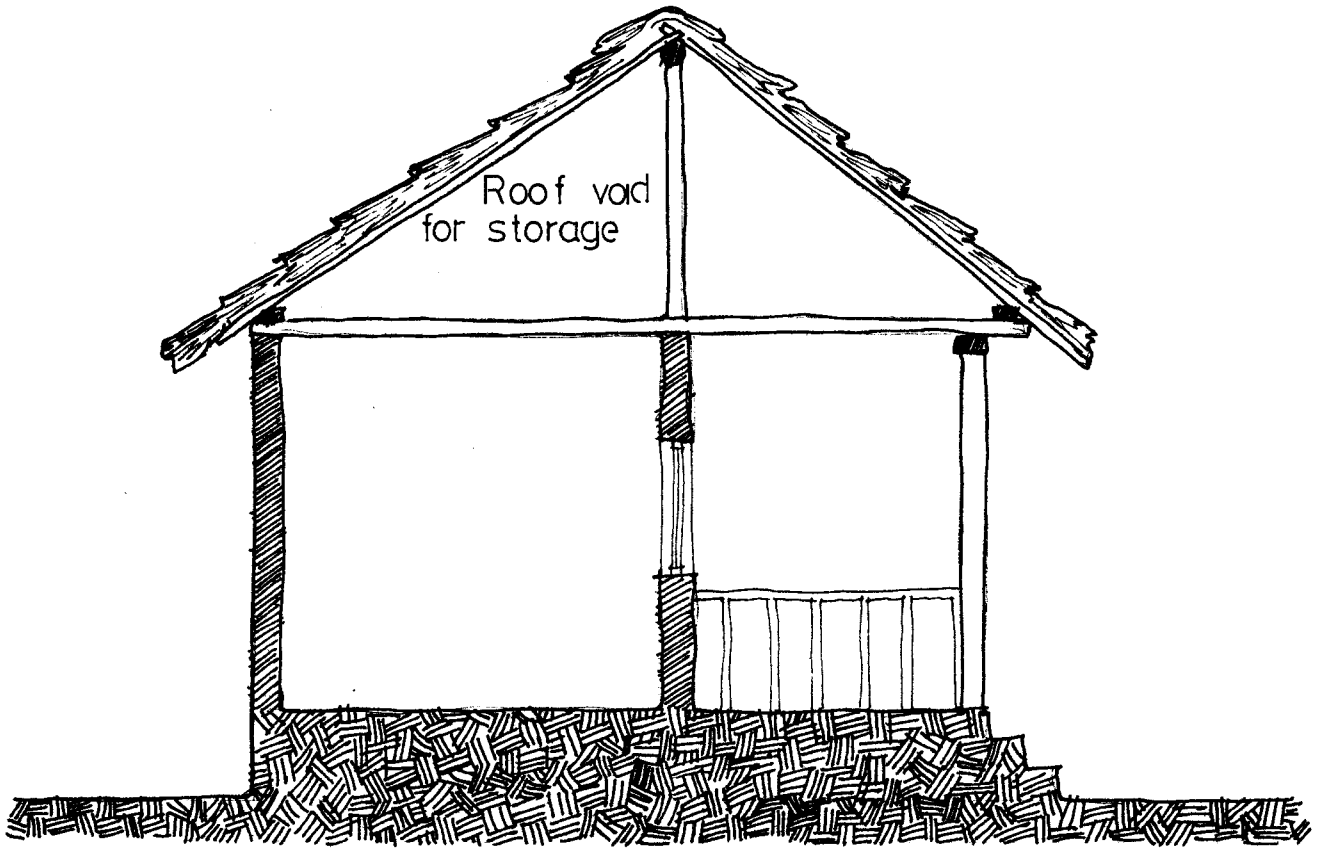
Along the coast, where there are high winds and rainfall, expansion of this basic form is horizontal, with rooms being added side by side and the verandah running across the front. (Fig. C.14) Smaller houses in the Astara region are often 'L' shaped, enclosing the verandah on two sides. (Fig. C.15) Moving inland, the house changes from being single storey and develops upwards. (Fig. C.16) Often the verandah is at the upper floor, with the ground floor being used for storage. (Fig. C.17)

New houses in the coastal areas most commonly adopt the 'L' shape plan, and this is becoming the general regional pattern. Local variation and local response to climate is much less apparent in the more recent buildings.

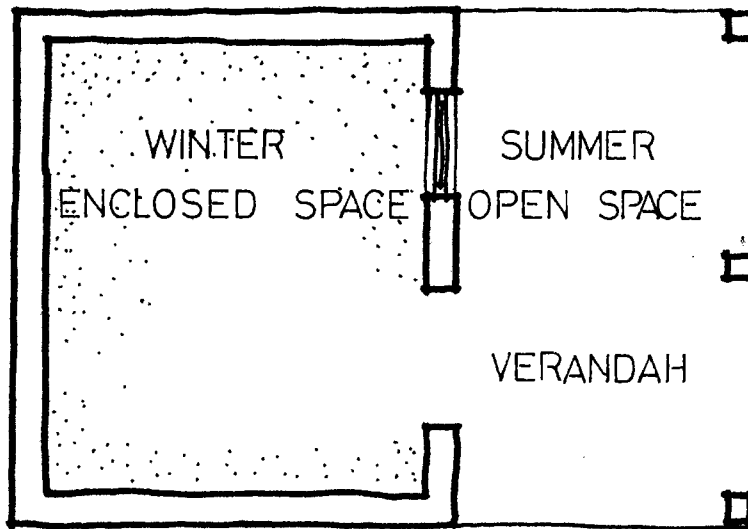
7 ANALYSIS AND CONCLUSION

The development and pattern of rural building in the Caspian Region depended largely upon house occupiers building and maintaining their own houses. This was an understood and accepted pattern. The time involved

Fig C 13 BASIC GENERATIVE HOUSE FORM

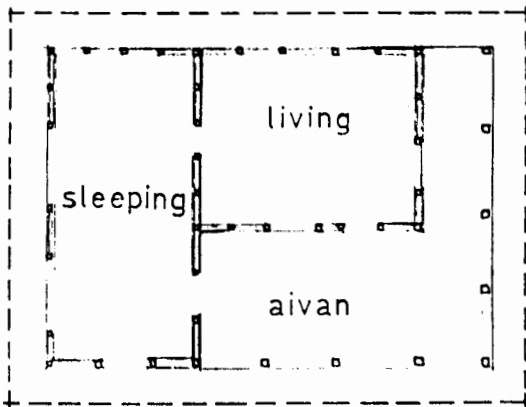
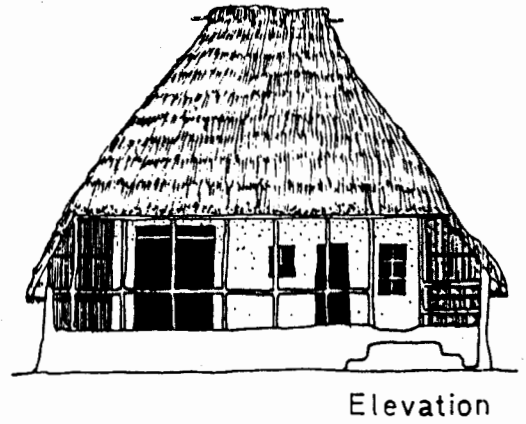
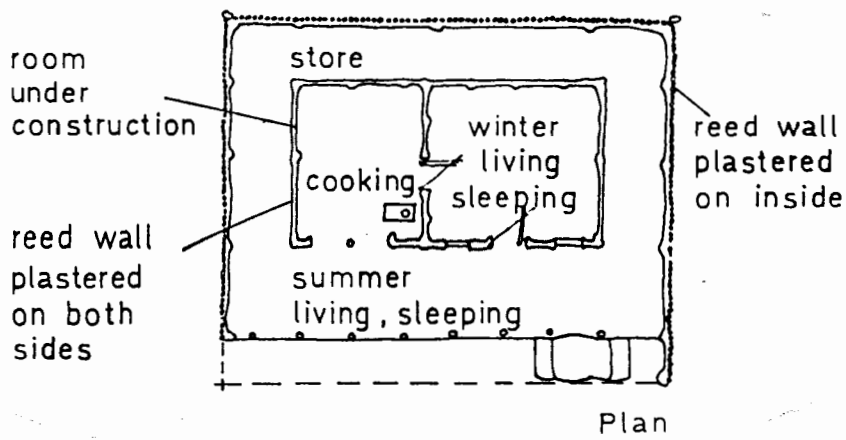


SECTION



PLAN

Fig C14 FRONT VERANDAH HOUSE



Floor Plan
Fig C15 'L' SHAPE PLAN

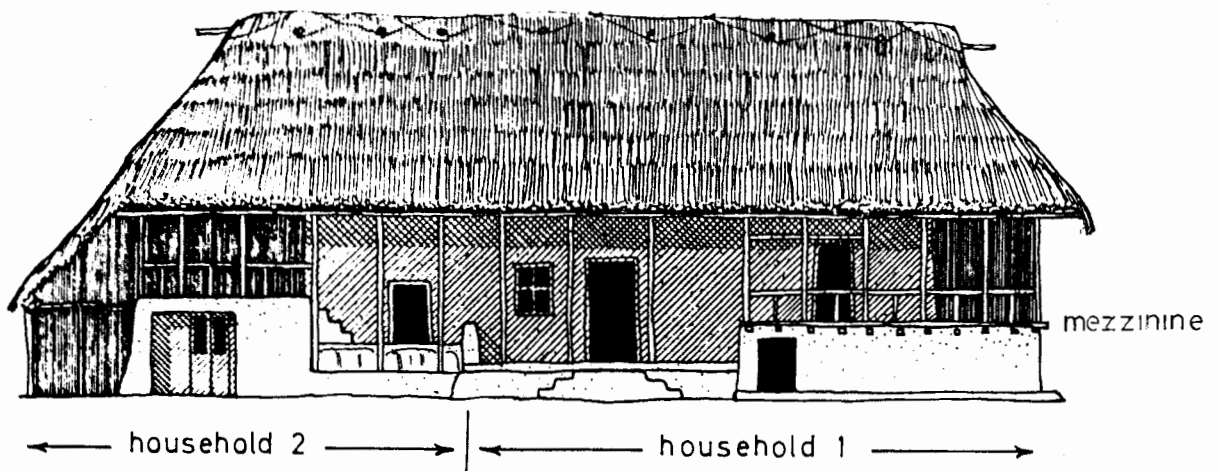
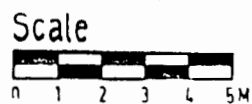
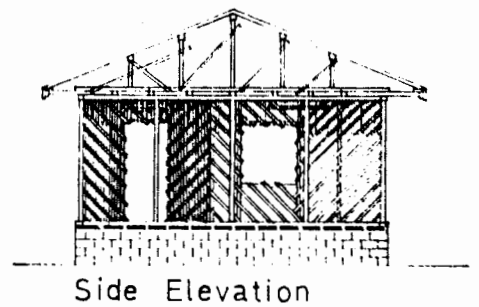
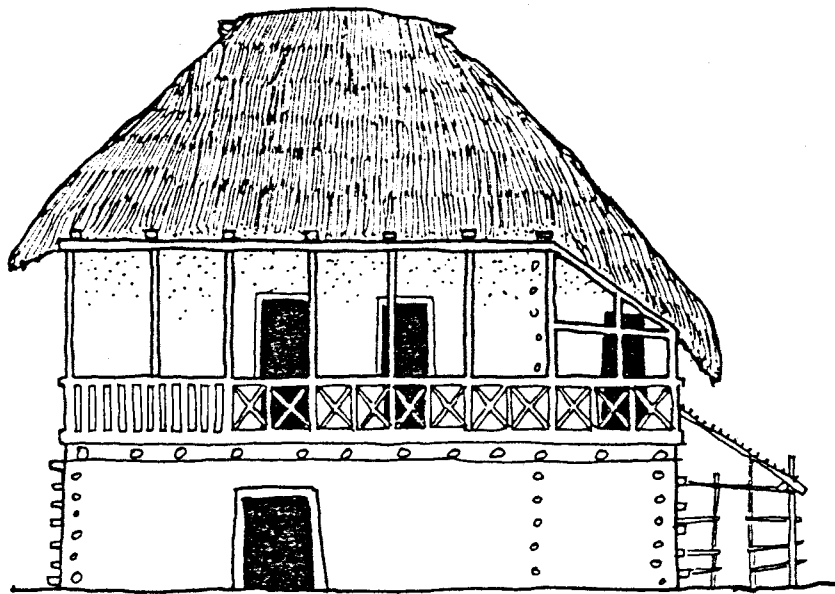
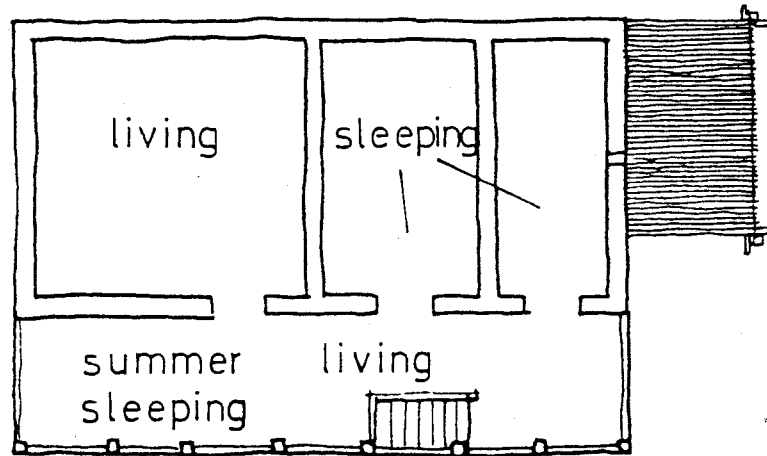


Fig C16 MEZZININE HOUSE

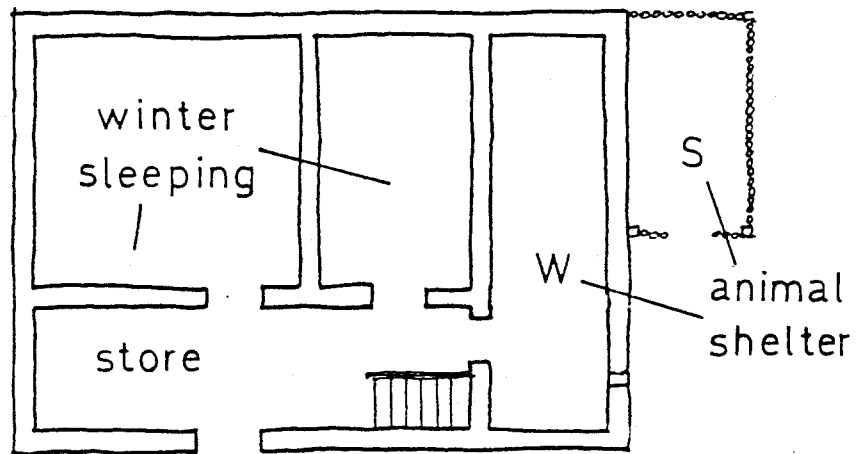
House Maklavan



Elevation

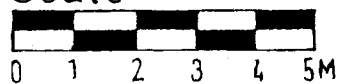


Upper Floor Plan



Ground Floor Plan

Scale



was not considered time wasted. A noticeable change occurs when, through alteration to the life style and economy of the family, time is valued in terms of money. People are less prepared to spend time on the upkeep of their buildings, but prefer to pay someone to do it for them, or use materials which will hopefully remove the need for maintenance. Hence, there has been a growing shift to the use of cement blocks, which are believed to be long lasting and maintenance free. Unfortunately the quality of the blocks produced is usually poor and deterioration is noticeable. Roofing materials have shifted from those locally available to a widespread use of galvanised metal sheeting, which also performs less well than is commonly believed. The overall quality of building is deteriorating. The locally available materials are ideally suited to the local conditions, but they do frequently have problems. Thatch roofing, whilst being cheap and thermally excellent, deteriorates and requires replacement. This can be largely overcome by using simple preservatives. Various methods have been suggested. The tile industry, in the Astara and Behshahr areas, could be made more viable than it is already. Much of this can be achieved through improving the production and transportation systems.

The walling materials, especially the timber frame walls, are still popular because they are cheap, and last for many years. Given the high incidence of earthquakes, the use of timber should be encouraged. Overall, the use of timber has been restricted because of forestry control. Careful use of the forestry resources should be encouraged, but equally, selective use and replacement of trees will do more to ensure the continued existence of woodland in the area. Replanting is essential. The controls have not reduced the cutting of trees - it has continued

in a less noticeable form. Predominantly it is small timber that is taken whilst mature trees are left. This will only become noticeable in years to come when new growth is less.

Especially in the coastal areas, materials and design of houses which do not allow for air movement to combat the heat and humidity of the summer will provide inferior housing which will then need the additional expense of mechanical cooling.

A Careful use of the resources of the Caspian Region would enable the majority of the building needs to be met with local materials and skills, providing income and employment to a region, that, as with much of Iran, is becoming increasingly dependant upon the urban centres.

The trend has been towards increasing migration from the rural areas to the towns and from the Caspian to the larger industrial centres south of the Alborz mountains. In consequence, less money circulates within the local economy; skills are forgotten and the level of regional self sufficiency drops.

The condition and changes in the built environment are a reflection on the changing pattern in agriculture and production. It is in the advantage of the area to stimulate the use of its potential.