

CAPITAL REGION · 5

Muscat, Mutrah and Ruwi.

6.1.1 Introduction Physical Description

The region covered by what is now known as the capital area runs up to Seeb at the southern end of the Batinah Coast, and is hemmed in to the South East by the mountains which run abruptly into the sea at this point, effectively cutting off the area from the coast further East. The region includes four natural bays, two of which are the respective sites of Muscat, the capital of Oman, and Mutrah, the new and expanding port. The other two bays have smaller fishing settlements around their shores. Muscat itself is completely hemmed in by mountains, which have restricted its growth. This is also one of the factors which accounts for the extremely high relative humidity in Muscat. Mutrah has much the same physical constraints, but the passes into the open area behind are low and accessible, linking Mutrah with the main new area of expansion, Ruwi, situated in a large flat valley which, like Mutrah and Muscat, has practically no vegetation at all except for isolated areas of cultivation. The whole area so far mentioned is dominated by the rocky limestone mountains and the sea.

A narrow valley runs north west through the mountains out onto the slopes leading to the Batinah Coast. The division between the capital region and the Batinah, comes at the point where the cultivated date garden strip ends at Seeb, the land towards Muscat being arid and rocky, but, as with Ruwi, is the site of much new building, including the new airport, hotels, army barracks and the oil terminal. The water supply for the whole of this region comes from wells in the Seeb alluvial fan which acts as a large reservoir collecting water from the mountains *1 and is piped to Muscat, Mutrah and Ruwi.

*1 Taken from Whitehead Report. 1.4.5.B.

6.1.2 Climate of the Capital Region

The region encompassing Muscat, Mutrah and Rui is in close proximity to the Batinah Coast and hence has a somewhat similar general climate. Seasonal prevailing wind patterns at high altitudes are similar as is the daily land/sea breeze system. On the otherhand settlements in the capital region are found in basins surrounded by rough hills, while Batinah settlements extend along the flat coastal plain. Muscat is the best example of this physical situation, with its protected harbour opening onto the sea but the town itself surrounded on three sides by steep rock faces (see Fig 607).

The light coloured stone basin walls around Muscat act as reflectors for solar radiation focusing heat from the sun onto the town. Heat continues to be re-radiated from these hills even after nightfall because of the heat storage capacity of the rock, which has been collecting radiation from the sun during the day only to emit it later. It is for this reason that Muscat is said to consistantly have a temperature 5^o higher than the surrounding country. The heat capacity of the hills around accounts for the small diurnal range in temperature.

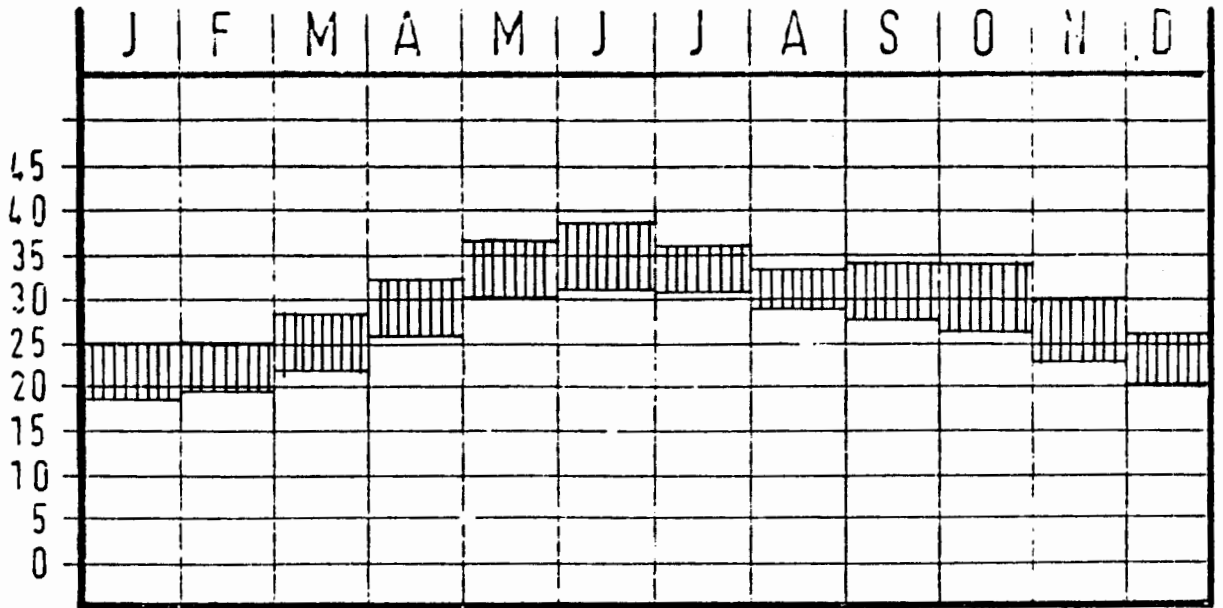
Hills protect Muscat from the cooling effect of prevailing winds, except those which blow from the north, off the sea. Muscat therefore depends to a large extent upon local winds induced by particular micro-climatic conditions. Two systems work together here to produce daily land breeze, sea breeze effects. Because of Muscat's coastal location the daytime onshore and nighttime offshore wind effect caused by the different rates of heating and cooling of land and water, would be expected (described in Section 3.1.2 Batinah Coast Climate).

Temperature differentials at various altitudes exist on the hill slopes themselves and cause local winds which change through a daily cycle. For a detailed explanation refer to Section 5.1.2 Climate of Northern Uplands. Up slope winds occur during the daytime and somewhat weaker down slope winds occur at night. The daily shifts in the valley slope winds corresponds to and encourages the onshore offshore sea breezes, and helps to strengthen the local wind pattern.

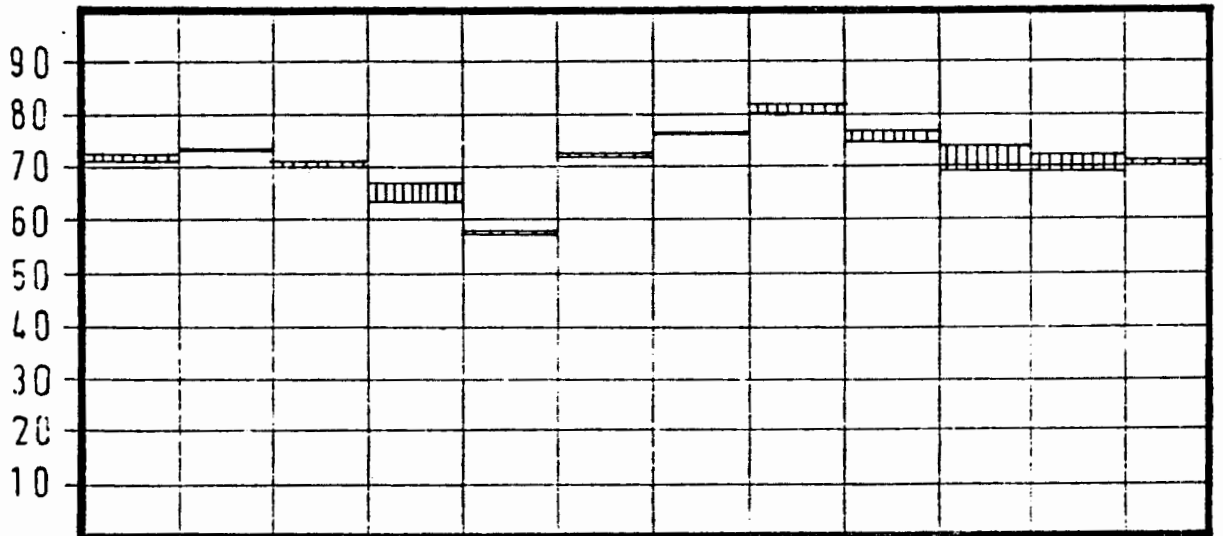
It can be seen from the accompanying climatic charts (Fig 602) that both air temperatures and relative humidities are consistantly high and show little variation over daily or yearly periods. For design purposes the critical months, or those for which cooling devices or systems must be designed, extend from April to October. From the effective temperature chart it can be seen that the comfort zone is usually exceeded during this period.

fig. 602
MUSCAT

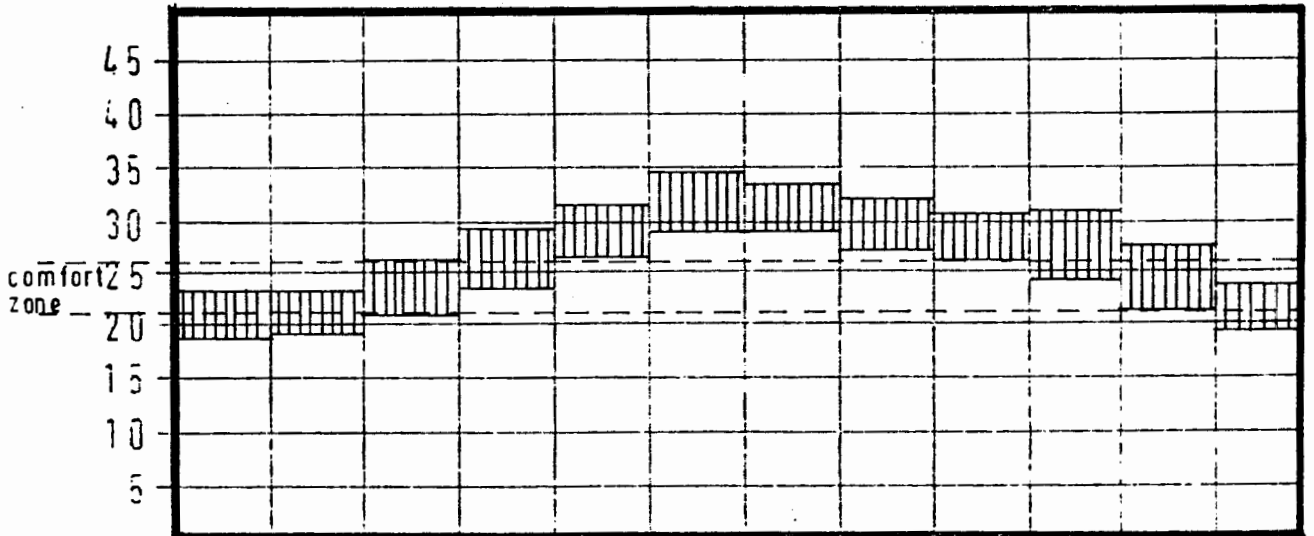
AIR TEMPERATURE °C



RELATIVE HUMIDITY %



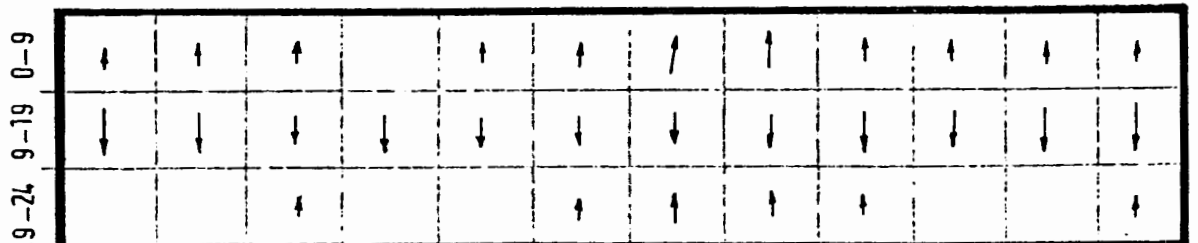
EFFECTIVE TEMPERATURE °C



WIND

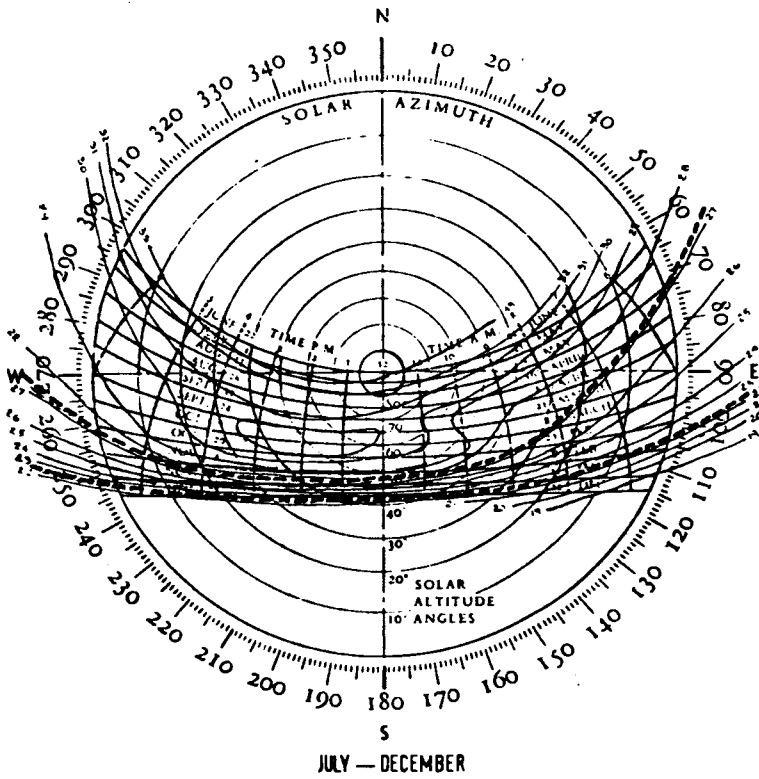
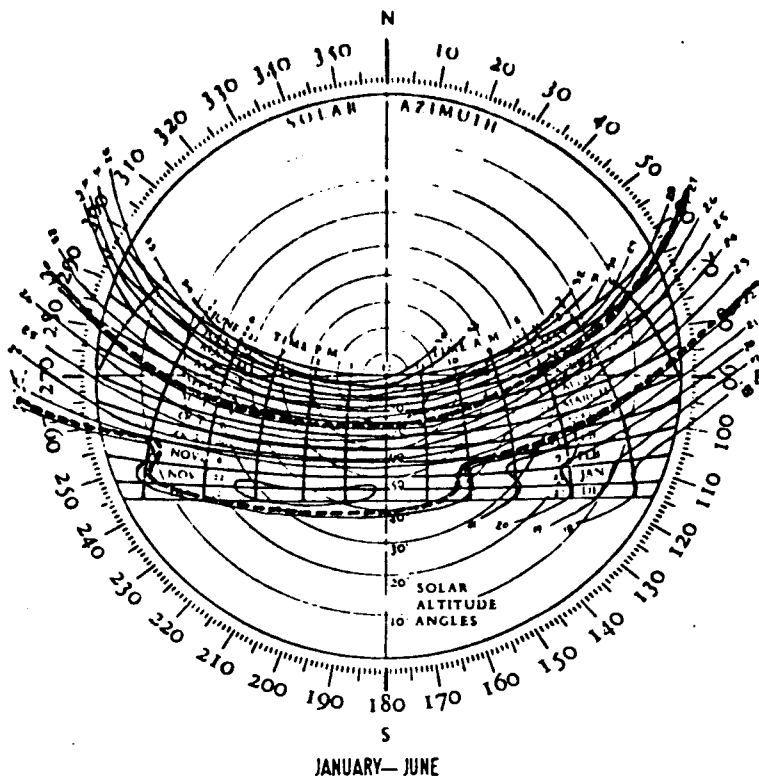


hours



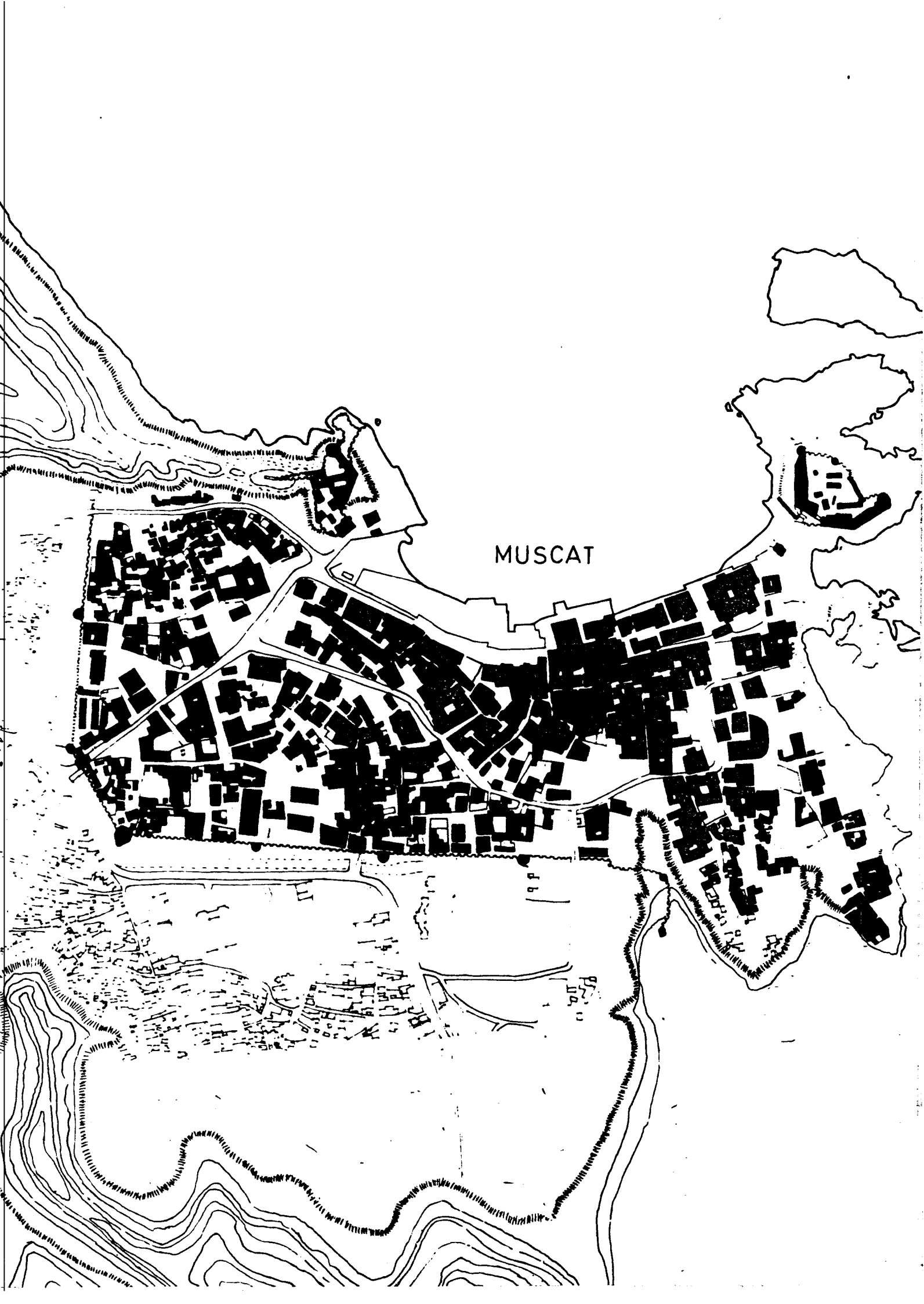
RAIN mm





SOLAR CHARTS WITH TEMPERATURE OVERLAY
MUSCAT

Fig 603



MUSCAT

6.1.3. Social Economic Factors

Muscat and Mutrah are the two major established towns in the north of Oman. Their traditional importance derives largely from their location. They lie next to each other in two twin bays, strategically placed at the mouth of the Gulf. The sea is on one side and on the other sides they are ringed by high hills. Mutrah Bay forms a natural harbour. Thus for a combination of military, trade and communication reasons these settlements were and still are in choice locations. Muscat and Mutrah have been major trading post towns for several centuries now. 16th century Portuguese forts attest to their long standing military importance. When Oman was divided into two states, one a Sultanate along the coastal plain and the other an Imamate in the hilly interior, the Sultan's seat of government was Muscat. Even when unified as one state under the Sultan it was known as 'The Sultanate of Muscat and Oman', reflecting the importance given to the town of Muscat.

In 1970 as a further unifying measure this was changed to 'The Sultanate of Oman'. However, the settlements naturally advantageous location continues to insure its increasing importance. Muscat, Mutrah and the Rui valley immediately beyond the hills ringing these towns, up to Mina al Fahal and Sib have been designated the new capital area. A large proportion of the country's investment has been committed to this area. Mutrah is being developed into a modern sea post, at Seeb there is a new international airport and Rui, not long ago an empty plain is now one vast construction site, with offices, hotels and houses springing up everywhere. Petroleum Development (Oman) have their terminal base and international outlet at Mina al Fahal. Employment opportunities in this area, have increased rapidly. Consequently, there has been a large influx of people from other parts of Oman and from abroad.

There are five main categories of persons in the capital area. Firstly there are the long established influential wealthy Omani families, often occupying major government and business posts. Secondly there is also the long established Indian and Pakistani communities who came over as merchants several centuries ago and still run most of the businesses in the area. Thirdly many Omanis educated abroad are returning to fill professional, management and technical posts. There is also a sizeable expatriate community in higher consultancy or skilled technical jobs. Finally there are large numbers of unskilled workers, mostly from the rural areas in Oman, in service and construction jobs. 1.

1. For an analysis of the development of the capital area and its implications for the rest of Oman see "Proposals on Development"

6.2 Settlement Patterns - Capital Region

The four main settlements in the capital area are Muscat, Mutrah, Rui and Seeb. Seeb is a large village strung along the seafront, west of the other three settlements. Although it has gained a new souk, a school and some new buildings, it essentially retains its village character. The many barasti houses, spaced in irregular rows parallel to the sea, follow the pattern of other coast-line settlements such as Sohar which was discussed in an earlier section.

Oman comes closest to an urban settlement in Muscat and Mutrah. Now with this extending into Rui, the beginnings of an urban conglomeration can be seen.

Muscat, Mutrah (Fig 605 & 606) have the same physical location, between bays and hills, and being next to each other shared the same locational advantages with regard to trade, communications and military on which they were established. Climatically they are in hot humid areas where both shade and air movement are required. The ideal settlement here climatically is one of narrow shaded streets that nevertheless allow for air movement in them and into the houses. But Muscat and Mutrah have different characteristics. Muscat functioned largely as a seat of power. This was the sultan's residence in the north country, as it was for many of the influential people who lived in Oman, whether natives or foreigners. The Sultan ruled from here. Today it performs basically the same function. Major embassies, government and commercial offices are in Muscat. It is the wealthier residential area. A new palace for the Sultan is nearing completion here. Thus the buildings in the settlement are more widely spaced. They are free-standing, larger, more spacious and well maintained. Thus, while the car can be more easily allowed for and houses more open to air movement, the wider streets are exposed to the sun and uncomfortable for pedestrians. The exception is the souk, which is compact, shops separated by narrow winding alleyways that are shaded and cool. It reflects its clientele by being stocked with a high percentage of luxury and leisure items.

New development has been largely the replacement or conversion of individual buildings that are either physically run-down or for which more profitable uses can be found by the owner. The most common conversions are into offices or upper-income flats. Thus the settlement pattern has not been significantly altered. Influential land-owners have probably resisted greater densities and comprehensive redevelopment. The established land use of government and upper-income residences has been continued.

Mutrah, on the other hand, is the major trading centre of Oman. It is settled largely by Indian and Pakistani merchants and shopkeepers. It is much more densely built on with shops, houses and offices closely packed together. There is a much larger population in an area roughly the equivalent of Muscat. Streets are narrow and to the scale of the man, the cart and the camel. In terms of shade this remains an advantage. Otherwise, especially where the car has begun to penetrate and with increased population pressure the general result is one of congestion. Even those roads that have been recently built for the car are difficult to negotiate, crowded as they are with pedestrians and all types of vehicular traffic.

The houses are grouped together closely both physically and socially into community clusters. The most identifiable grouping is the residential cluster built by the early Indian merchant community for themselves and within which most of the merchants and their families still live. The guiding principle is security and an identifiable separation from other ethnic groups. Thus there are only two access gates into this area. These gates lead into narrow alleyways from which the houses are entered. The houses are two or three storeys

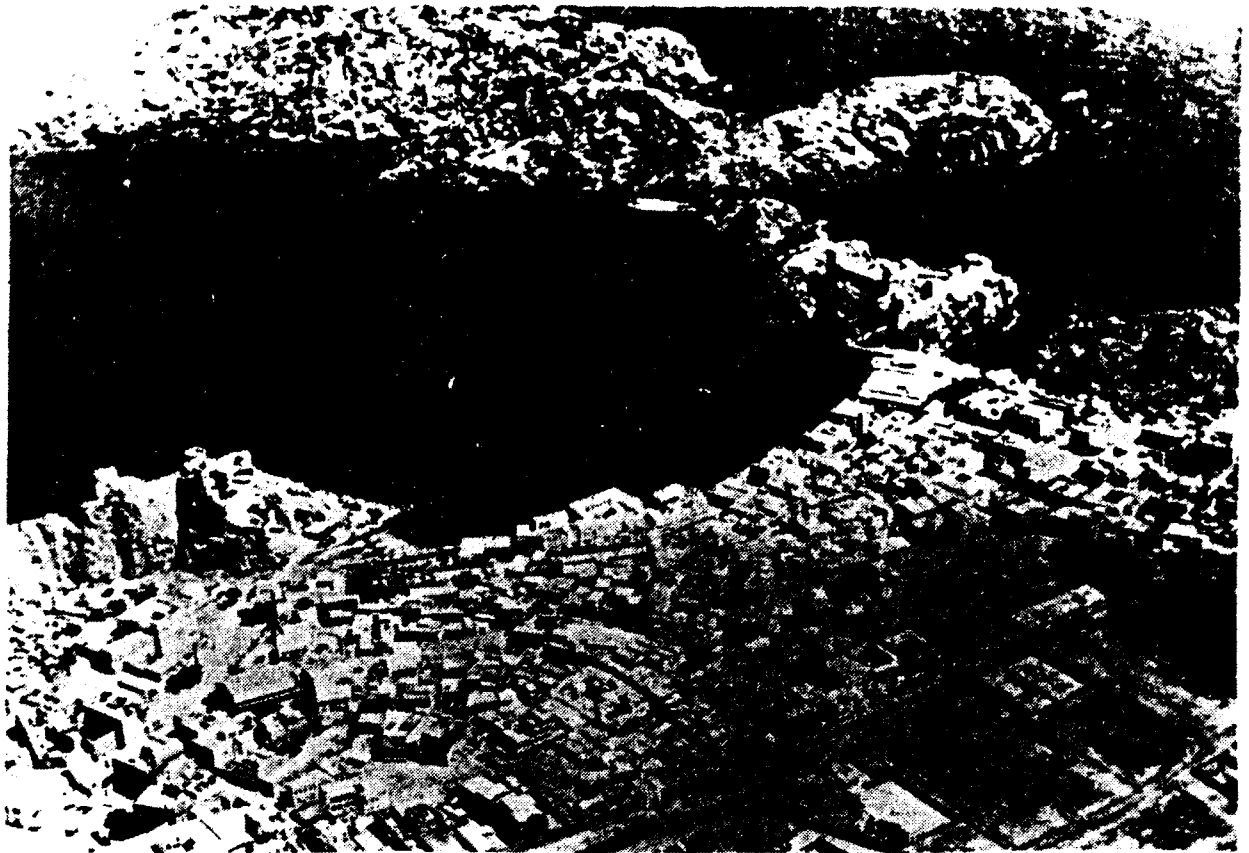


Fig 605 Muscat.



Fig 606 Mutrah.

high and form a protective wall around the area. The house walls that face the outside of the area do not have openings on street level.

The built environment in Mutrah is in a much more difficult condition than Muscat for a variety of reasons. Being more densely built and intensively used it suffers greater wear. Ownership has been in the hands of businessmen and it may be argued they are less concerned with appearance and prestige than governing families are. However the many fine houses built many years ago by the predecessors of these same businessmen must modify this argument to a point. A major reason for the lack of maintenance of existing buildings must stem from the uncertainty felt by the owners about the future of their property in any redevelopment plans the government may have for the area. We personally had these fears expressed to us by several persons in Mutrah. The redevelopment that has taken place has also contributed to this rundown of Mutrah. New road links cutting through the town not only mean the inevitable demolition of existing houses but also damage to houses that suddenly find themselves adjacent to a busy road. One house, for example, had only a partially paved road running in front of it. Cars raised so much unaccustomed dust that often the large windows facing this road and the direction of the sea-breeze had to be kept shut. Openings on this face, specially designed for air-movement within the house had also been blocked as a result. Thus the house could not function as efficiently as it had originally been designed to.

The corniche and two way traffic link cutting Mutrah off from the beach front provides another example (Fig 608). The beach originally functioned as a lavatory for Mutrah residents, a common use for most settlements by the sea. The corniche has left only a small strip available for this purpose. With no alternatives provided this has undoubtedly greatly aggravated the insanitary conditions that must be now developing within Mutrah.

It is still not too late to develop a plan for Mutrah that would allow the car only where strictly necessary. A system of cul-de-sacs servicing the souk and residential areas would be better than roads cutting through the town. Redevelopment plans need to first carefully assess what exists and how these can be improved. New plans and buildings need to draw on what can be learnt from the existing settlement pattern and houses so that Mutrah will develop consistently with its environment.

The high hills surrounding Muscat and Mutrah may have once been a military asset but today they merely restrict further expansion (Fig 606). Thus the most active development area is the Rui valley immediately inland of these hills. A comprehensive redevelopment plan has been drawn up for this largely virgin site by a Swedish firm. Today it is being rapidly built upon with a wide variety of construction types, from pre-fabricated structures to concrete tower blocks. The buildings going up so far represent the overspill of Muscat's land use rather than Mutrah's. Multi-storey government ministry buildings, offices, embassies, hotels and high-rise apartments for top government officials. In addition housing is also being built for the new professional class, both local and expatriate, that has grown with Oman's development.

Another growing urban class resulting from development in the capital area are the unskilled often rural emigres' providing the necessary labour for the construction projects as well as filling the lower echelons of government and commercial posts. Their built environment is in something of a twilight zone. The biggest concentration live between Mutrah and Rui in a shanty settlement of barasti, concrete block, hessian sheets and any urban waste that can be translated into a building material. Some ingenious structures result.



Fig 607 Muscat - Surrounding hills prevent extension of settlement.

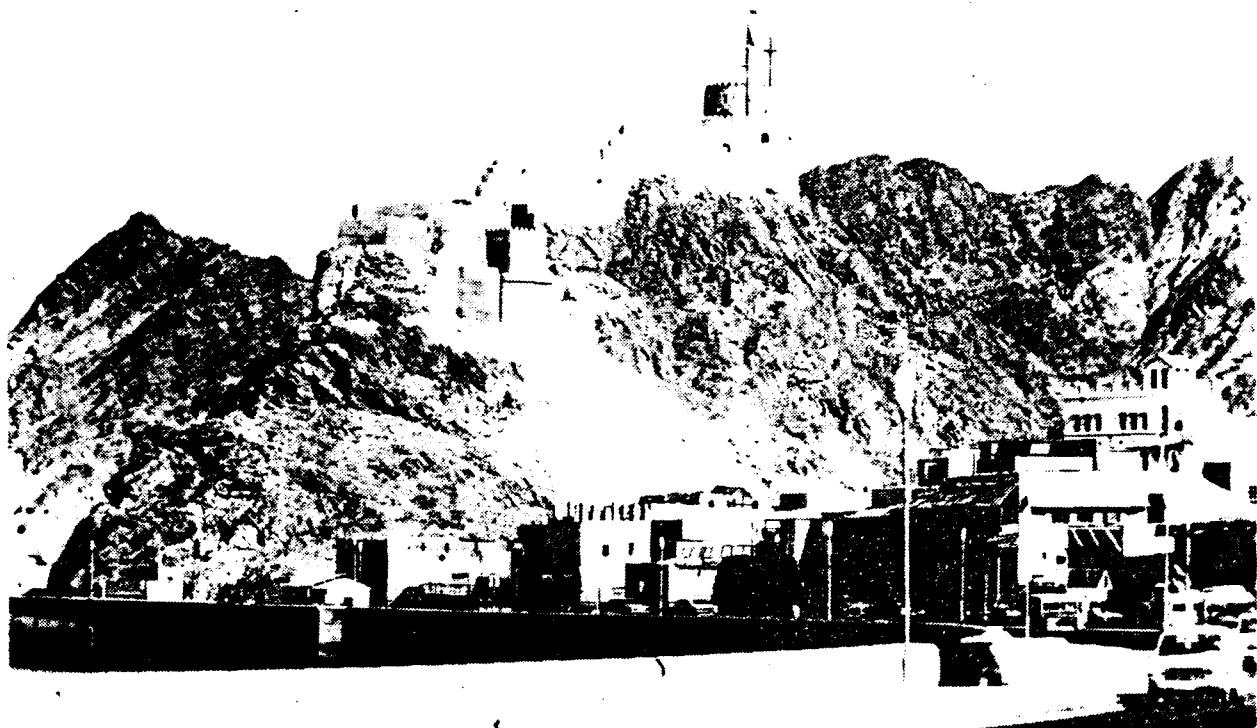


Fig 608 Muttrah corniche

Nevertheless with little spare money to invest and no security of tenure to encourage investment, their environment remains ramshackle and rudimentary. The location of the shanty settlement has a certain logic lying as it does between Muscat and Mutrah on one side and Rui on the other. Thus both jobs and shops are reasonably close for those for whom transport is at a premium. This location too is by no means assured as it lies adjacent to the new Mutrah harbour and cold store site. Plans for the expansion of these projects would dislodge the settlement.

At the lowest rung of shelter are those many encamped under trees that can be seen all over Rui. Besides the basic lack of money their situation may also be because they are recent arrivals who have not yet been able to build any more of a shelter or that they are seasonal labourers, in Rui for a short time and therefore do not think it worthwhile to do so.

These groups of shanty and 'tree' dwellers are the single most numerous class, providing the essential labour for Oman's development, the poorest and the most in need of some sort of housing aid. Land, located with proximity to places of work and essential shopping, as priorities, with basic services, security of tenure, organised provision of building materials and technical advice and help could go some way in meeting this area of urgent need. (This argument is also discussed in context within 'Proposals on the Built Environment').

6.3 House Form

6.3.1 Climatic Influence on House Form in the Capital Region

The climatic differences and similarities between the Capital Region and the Batinah Coast have been discussed in the introduction to the "Climate of the Capital Region" in section 6.1.2. This suggested that there are similar atmospheric conditions of wind and high humidity and temperature in the two regions, but areas such as Muscat have climatic problems which are intensified due to their location in "basins" protected by hills around. Population pressures also differ between the two regions and have an effect on how climatic problems are dealt with. In regions having high humidities as well as high temperatures one would expect to find a somewhat scattered settlement pattern which would allow for air movement around and between buildings. Because of high population and the scarcity of available land for building a relatively dense settlement has evolved. Therefore other means must be found to encourage air movement and cooling. The courtyard house is one example. (Fig 609). Muscat and Mutrah also have some examples of interesting designs for window openings which facilitate air movement and help to keep interiors cool.

Typical windows in the indigenous houses of Muscat and Mutrah have multi-level openings. The function of these windows is not clearly seen without an understanding of the climatic performance of the whole house. Windows of one of a typical house on the beach front of Mutrah are illustrated (Fig 610). The walls of this house are limestone and because of their thickness and thermal capacity the temperatures of the wall's internal surfaces remain relatively constant throughout the day (refer to section 8.3.2 for details of heat transfer through limestone walls).

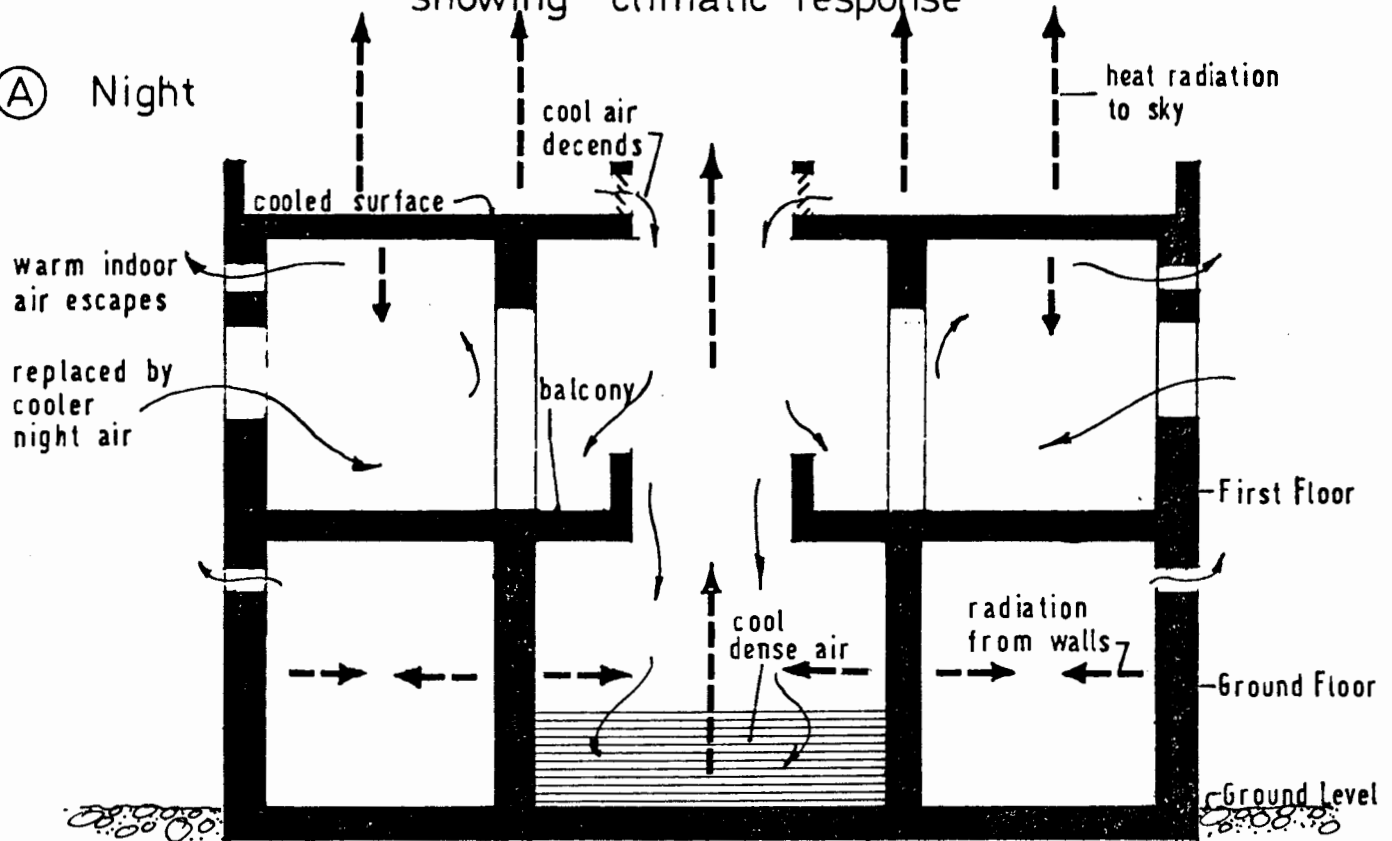
The outdoor temperature fluctuates throughout the day and for some times it will exceed wall temperatures and at others it will be lower. In the hot season it is therefore advantageous to isolate the dwelling's interior from outside air temperatures when the wall temperatures are below air temperature by closing window shutters. When wall temperatures exceed air temperatures window shutters are opened to equalize indoor and outdoor air temperatures. On the other hand during the hot season when the air is humid as well air movement must be encouraged in order to aid the body's cooling mechanism. Muscat and Mutrah receive daytime onshore sea breezes which aid in cooling. Windows must be designed in a way so as to allow for air passage into the dwelling when it is advantageous, but to exclude solar radiation which would raise indoor temperatures. Shading devices such as the wooden 'awning' type construction shown in Fig. 611 is one example and the lattice window (Fig. 612) is another. The lattice windows of Muscat and Mutrah are generally elaborate, finely detailed gypsum panels set into the wall. Lattice windows and screens are described in some detail in Section 3.3.3.

Their purpose is generally to allow for daylight, air movement and a view while excluding glare and solar radiation and maintaining visual privacy. In the houses of the Muscat Mutrah area, lattice openings are usually found in the upper portions of the window or as high window and ventilation openings. Because of the air's high moisture content the sky reflects a great deal of light and skies are much brighter than one would find in dryer regions. Because of the glare problem of bright skies the high windows opening to the sky are generally lattice work. Openings high up in rooms are also necessary to allow for the escape of warm air which collects in the upper reaches of a room due to convection principals.

Fig. 609

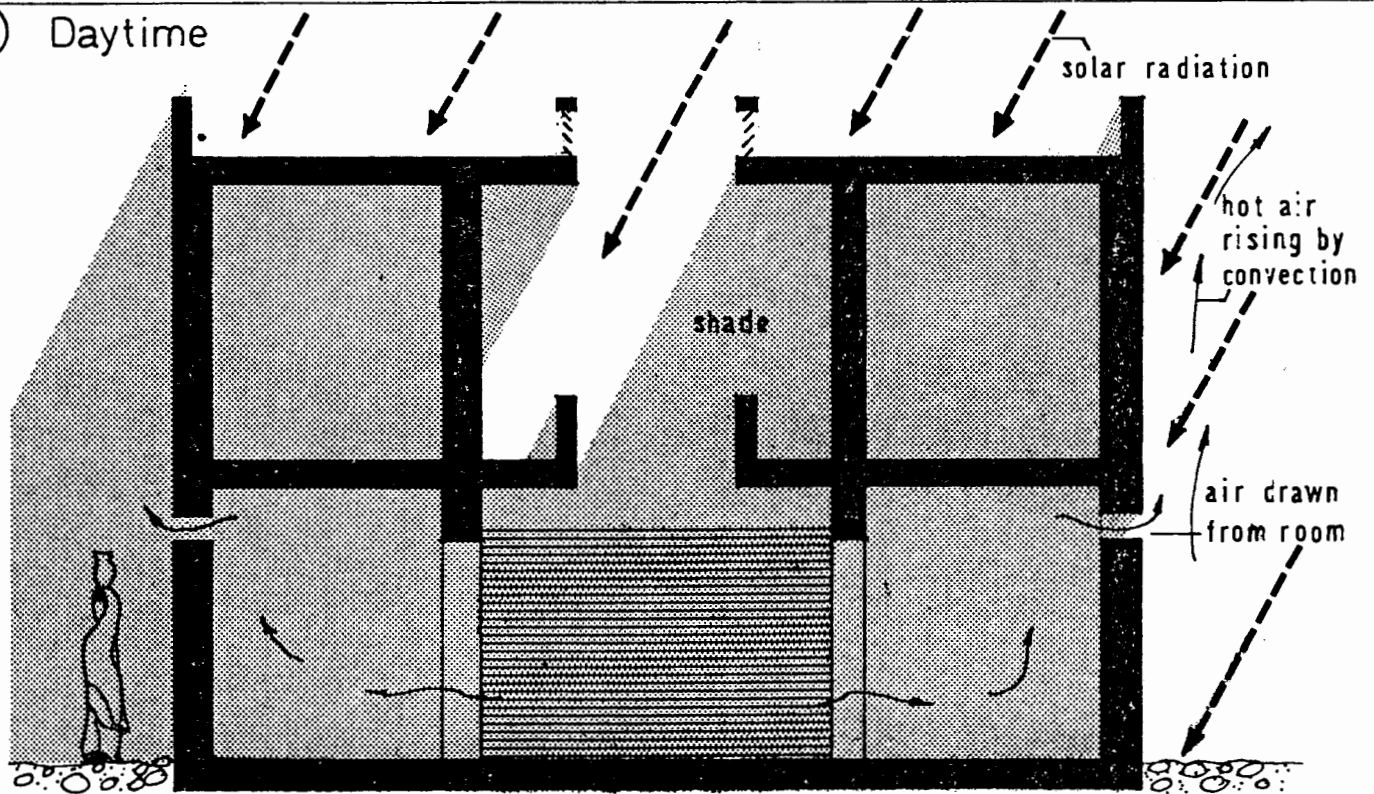
Section of Typical Courtyard Town House in Muscat (schematic) showing climatic response *

(A) Night

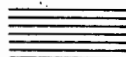



Heat is radiated to the night sky from horizontal surfaces such as roof and courtyard, therefore these become cooler. Cool dense air from the roof falls and collects in the courtyard. First floor is open at night.

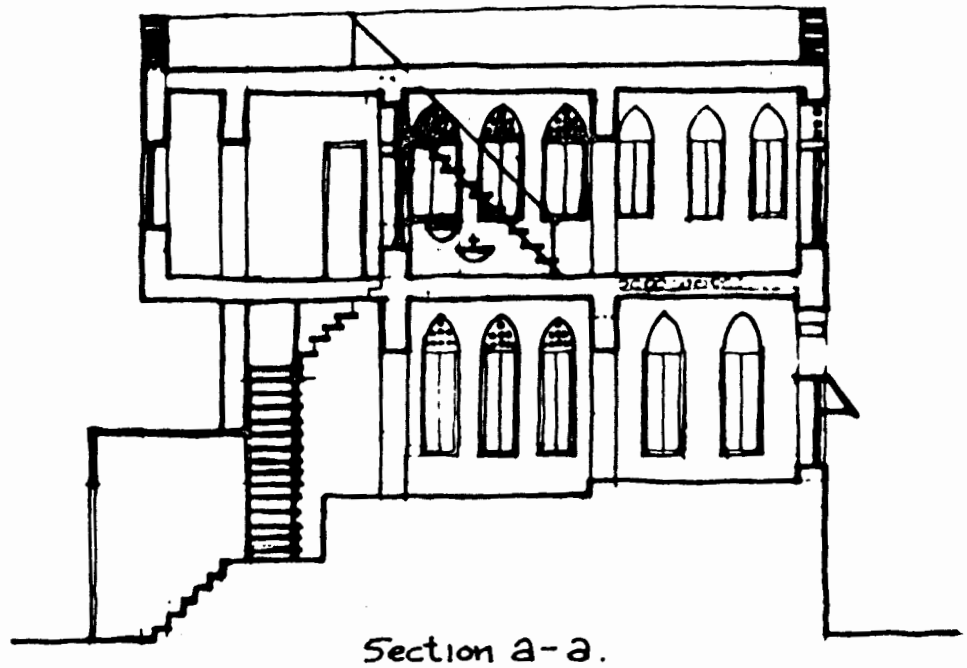
(B) Daytime



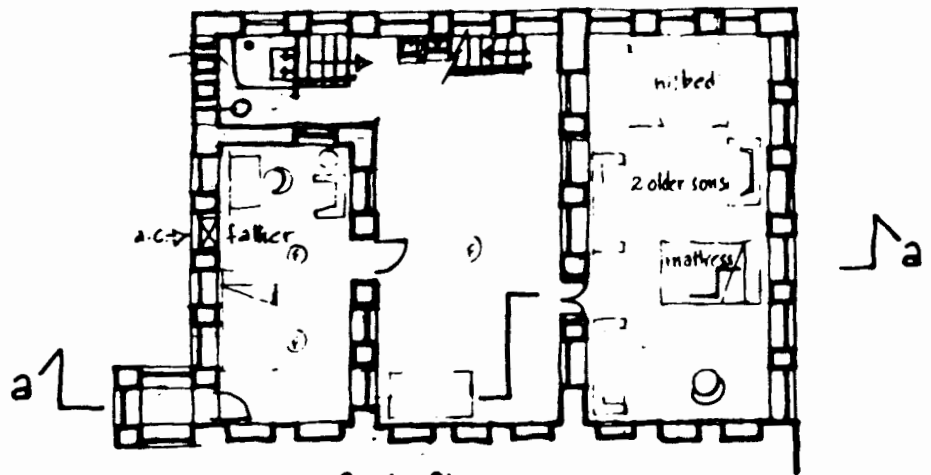
The courtyard remains shaded from solar radiation, while the cool air trapped in the courtyard cools the adjacent rooms.

-  Cool Dense Air Pocket
-  Heat Radiation

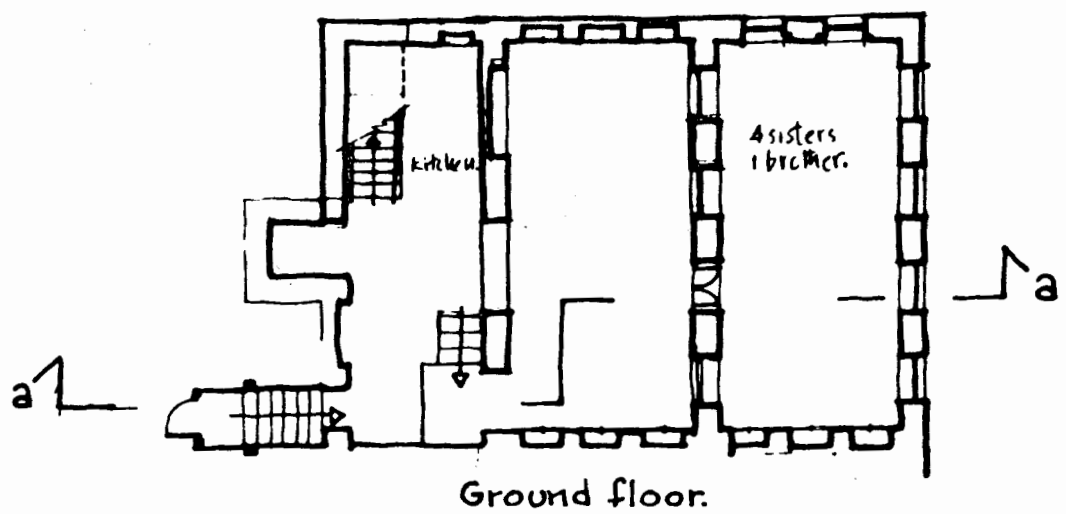
* Note - External air movement is not considered.



Section a-a.



first floor.



Ground floor.

House of Haji Ali Najmani
N

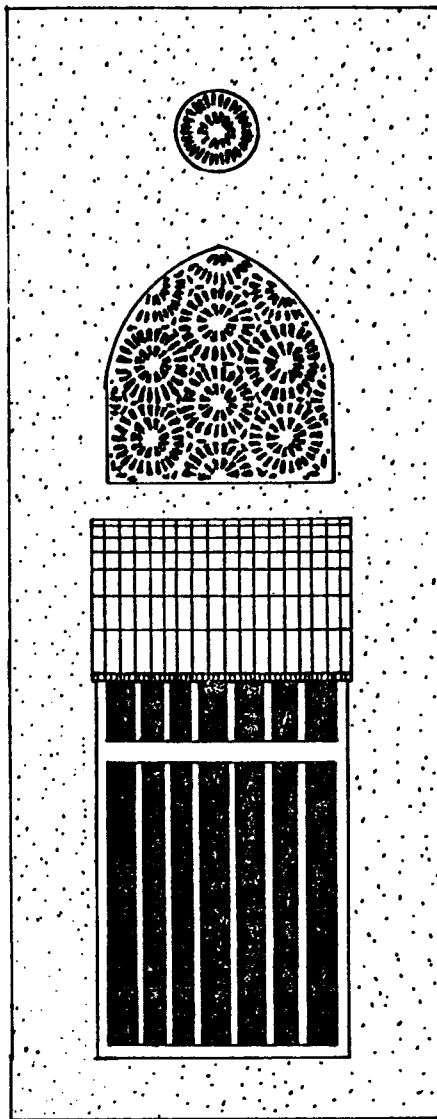
Fig 610 Mutrah town house on bay front.

Another example illustrating a sophisticated window design is the elaborate detailed windows of Bait Mughub (Fig. 613) (Eastern perimeter of Muscat) which have incorporated an evaporative cooling system, illustrated in Section The cooling unit employs a porous unglazed water jar, which is placed in the window opening so that air entering the room passes over it. Water seeps through the water filled jar and keeps the outer surface of the jar permanently moist. Air passing over the surface causes the water to evaporate, absorbing heat energy, thus cooling the air and providing a supply of cool water for drinking. Shading devices and lattice windows are also used to prevent solar radiation from entering the room. The quantity of air entering the room is controlled by opening or shutting any of the shutters which are incorporated into the window design. (The highest lattice opening of the window allows for the ventilation of hot air which will collect in the upper portions of the room.)

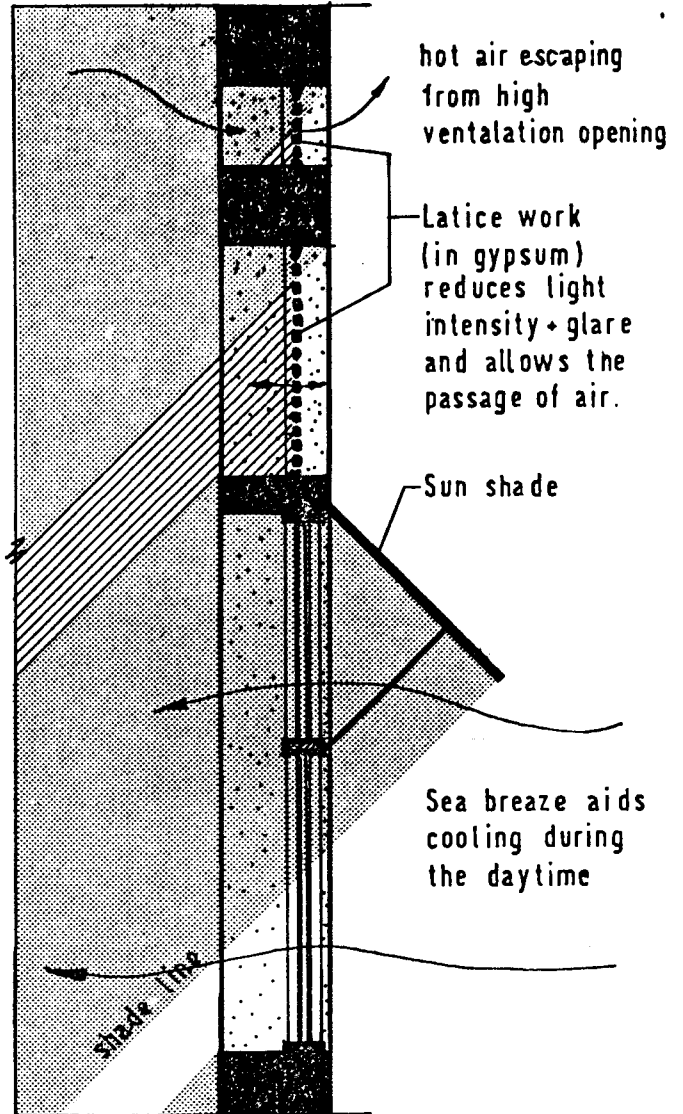
This same evaporative cooling system (using porous water jars) can be found employed in the design of windcatchers of some buildings in the Sind region of Pakistan. A similar but more sophisticated windcatcher using trays of wet charcoal rather than water jars, designed by Professor Hassan Fathy for one of his schools in Upper Egypt, produced a drop in temperature of 10°C. ¹.

The high rate of evaporative cooling could not be expected in Muscat because the humidity is much higher than in Upper Egypt and a high rate of evaporation depends on relatively dry air.

1. Gournia a Tale of Two Villages. pp 115 - Hassan Fathy 1969.



Elevation



Section

Fig. 611
Window Details - from Najwani House - Mutrah bay front
(Multi-Level Openings) showing function of lattice work and ventilation system.

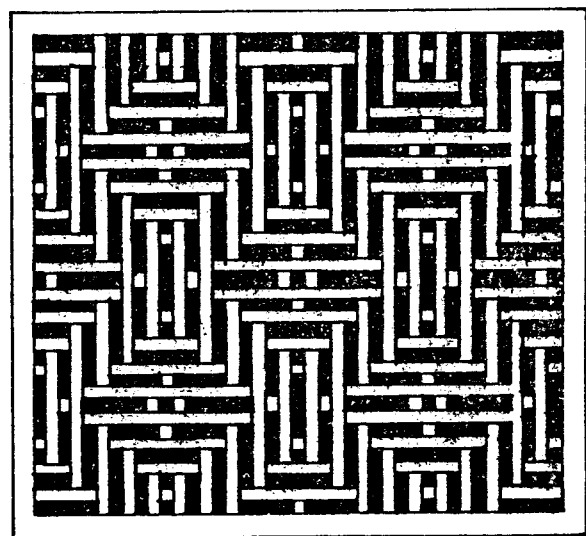
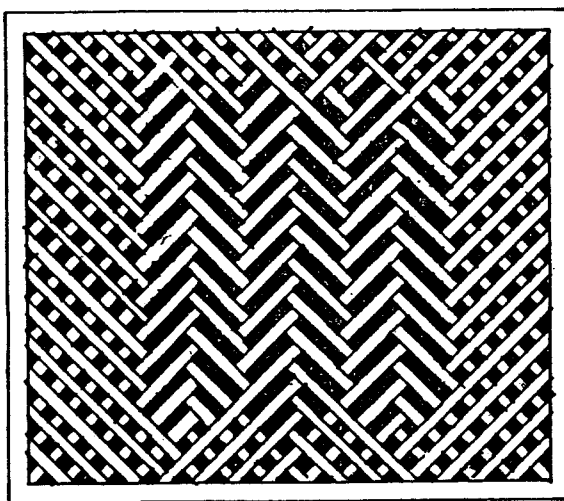


Fig. 612
Lattice Windows - from houses in Muscat town centre.
Made of small wooden pieces each having a square section, fixed by peg connections.

Fig 613
Bait Mughub
Muscat
Window detail
incorporating
evaporative
cooling system

