بسم الله الرحمن الرحيم

'In the name of Allah
the most beneficent the most merciful'

IN SEARCH OF APPROPRIATE ARCHITECTURE:
A Jamat Khana in Hunza, Pakistan

by

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Bachelor of Arts, University of Pennsylvania
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Submitted to the Department of Architecture in partial fulfillment of requirements of the degree of **Master of Architecture** at the
Massachusetts Institute of Technology

February 1989

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Abstract

In today's world of technological advancement, communication has become easier than ever before. This, along with its benefits, has inflicted severe blows to architecture in developing nations. Concepts have been imitated and technologies transposed without any concern or regard for appropriateness. Changes have been accepted without a care for the past and without any sense of future direction. This indifferent attitude is proving detrimental to the future built environment of Third World countries.

Hunza, a region located in the north of Pakistan and untouched until the last few years, is facing new challenges because of increased communication not only with developed parts of the country, but also with the rest of the world. Its natural beauty and difficult mountain terrain has attracted people from all over the world by way of the newly built Karakoram highway.

In this hazy mist of change in Hunza, the local architecture is being severely affected. People are using new building materials in their own way of construction without any fear or concern.

A search to establish a comprehensive base for an appropriate architecture in the spirit of Hunza is beyond the scope of this thesis, but an attempt has been made in my own way to discover an architecture responding to current needs and using appropriate materials, while keeping in sight Hunza's history, tradition and culture which the faith of the locals, Islam, demands. This thesis addresses these issues by using the design of a *jamat khana* in the village of Karimabad, Hunza, as a vehicle. A community building of this significance may help in providing a forum for local builders, masons and craftsmen where they can revitalize their traditional ideas and search for appropriate solutions -- whatever the need be.

Thesis Supervisor: Ronald Lewcock
Title: Professor of Architecture and
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Introduction

A *jamat khana* is a place of prayer for the Shi'ia Imami Ismaili Muslims, where both men and women congregate to pray in spiritual union. It is generally used twice a day and access is limited to the believers of the faith only, particularly during the prayer ceremony.

The word *jamat* means a group or congregation of people, and *khana* means a house. Hence, *jamat khana* is a house for congregation. Since it becomes a regular meeting place for the members of the community, it is normal for other community activities and affiliated offices to be a part of the jamat khana.[1] The design thesis proposes contains shops as part of the jamat khana complex. This unusual concept for an Ismaili jamat khana is proposed only as a response to the demands of the site and existing situation. It aids in achieving an appropriate building according to the context without compromising the sacredness of the prayer hall.

> This will be a place of congregation, of order, of peace, of prayer, of hope, of humility and of brotherhood.
> --His Highness Prince Karim Aga Khan [2]

This thesis, involving the design of a jamat khana, has been a journey of an opportunity and a challenge -- an opportunity to search for a definition of appropriate and suitable architecture for the Hunza valley, and a challenge to search for an appropriate design solution reflecting the local traditions of the community of Karimabad, Hunza. Two steps have been involved in this exercise. The first has been to understand and study critically and thoroughly the personality of Hunza. This involved not only an understanding of the local people and of their aspirations, culture and tradition; but it also included the history of their building system and the changes it is undergoing; the reasons for these changes and the direction the building industry might eventually take. The second step involved a series of design search processes to determine what kind of solutions might meet the requirements of the program and be suitable to the area. The solution selected as appropriate is one of many that reflect the culture and tradition of the region. The considerations for this design search besides climatic conditions, site, available building materials and available skills, have been the faith (Islam), the culture, the history and the aspirations of the people.

Another primary concern of the thesis has been to raise questions about future building systems appropriate for the Hunza region. In the course of this investigation attempt was made to discover the potential within the society to allow difficult choices and to reflect its hopes and thus to contribute to an understanding of how interventions might be made in the area. The design of the jamat khana has been a vehicle for approaching these issues and is utilized to

show the state of architecture, technically and traditionally, in a particular time and place.

The idea of doing a thesis on the Hunza valley of Pakistan occurred to me in Fall 1986, after I made my first trip to the region, thanks to the Aga Khan Program for Islamic Architecture at MIT. As in many other Third World countries, designers and planners in Pakistan, together with the government, have neglected the plight of the rural villages. This is true for the whole of the Northern Area of Pakistan, which has been like a neglected backyard of the nation. Due to the increase in communication with the rest of the country the people of the Hunza region have become perplexed about the appropriate and proper use of the building system, and a sense of anarchism pervades in the whole region. Construction with new materials is being done at the expense of the old without any concern for the future environment. If the people in Hunza allow this, it is very likely that future generations will lose touch and respect for their own cultural and spiritual values which may be followed by dissatisfaction with the new system in the course of time -- but then it may be too late.

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[1] For a detailed description of the function and the role of jamat khana in the Shi'ia Imami Ismaili Muslim community, please refer to Chapter 2.

[2] Foundation Ceremony of Burnaby Jamat Khana, Canada, July 26, 1982.

Chapter 1

The Village of Karimabad

"We must learn to understand them (monuments of past) well, not simply to preserve them as museums of past glories, but to feel in every part of them -- a stone masonry, a brick dome, a window, an ornament, or a garden arrangement -- that unique spirit, that unique way that made these monuments Islamic. Only then will we be able to impart the same spirit to the technical means and to the forms of today."

-- His Highness Prince Karim Aga Khan[1]

The Hunza district in Pakistan is one of the world's most remote and difficult to reach regions because of its mountainous terrain. This area contains a large number of Muslim population and forms a significant component not only of Pakistan but of the entire Islamic world. The people of the Hunza valley are farmers by occupation. The local culture, tradition, art and architecture of the region add richness not only to the sub-continent but to the whole of the Muslim society. Within this mountainous Himalayan region sits a small village, Karimabad, 70 miles north of Gilgit (which is the hub of the region) and 520 miles from Islamabad. At one time, Karimabad was the capital of the Hunza valley because of its beauty and strategic location. The vernacular architecture and the built environment reflect a unique culture, and the indigenous method of construction makes optimum use of the available building material and expertise.

Karimabad (which used to be called Baltit) sits in a valley formed by two mountains -- Rakaposhi which is 23,400 feet high and Bohajaghur Duansir, 22,170 feet. The village, in the Tropic of Cancer, lies between the 36th and 37th latitude and the 74th and 75th longitude. It is about 5,000 feet above sea level and lies in a high seismic zone. The village has about 600 houses and the population is approximately 12,000. Agriculture is the most common occupation here and in the whole of the Northern Area.

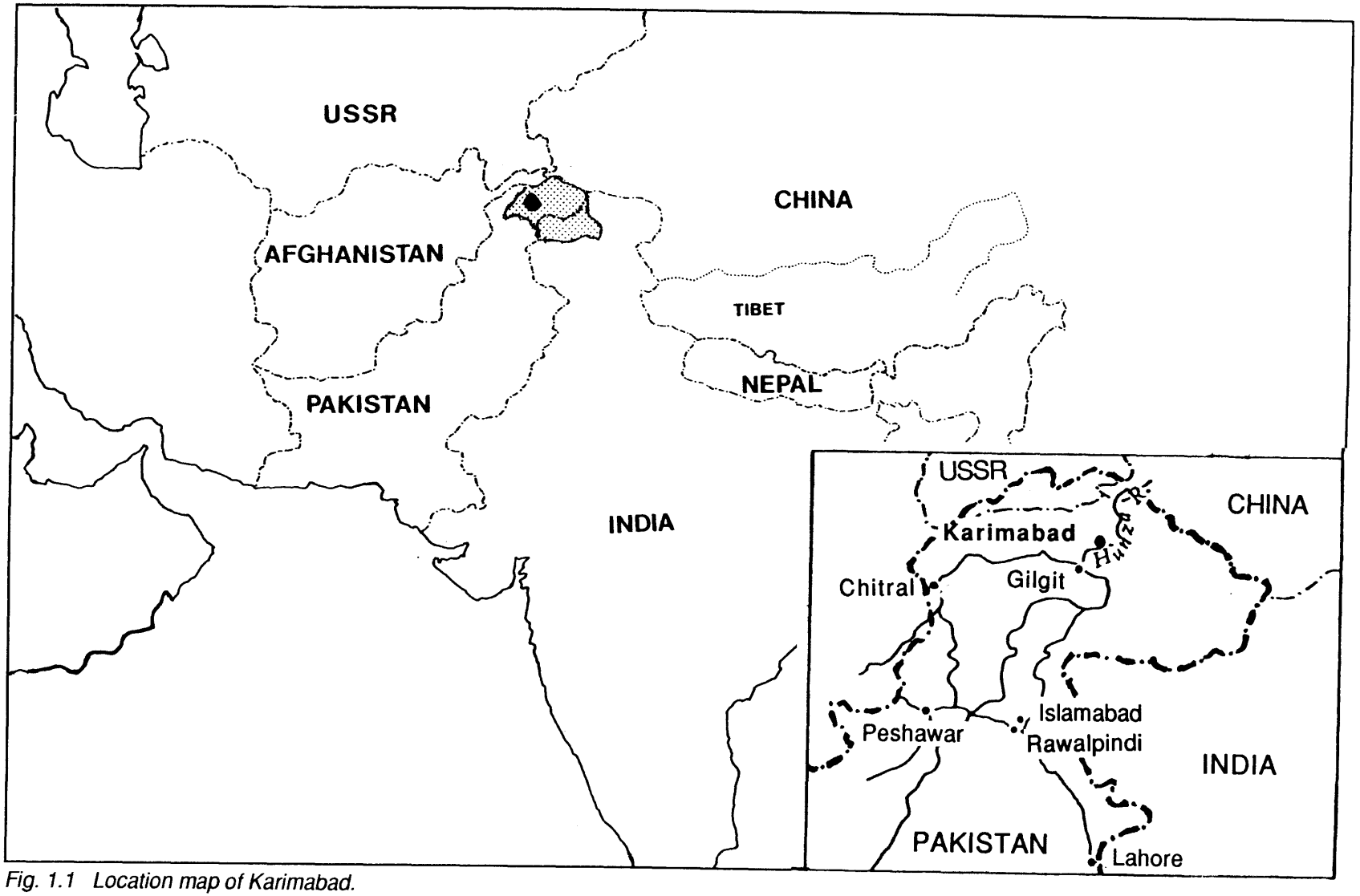

Fig. 1.1 Location map of Karimabad.

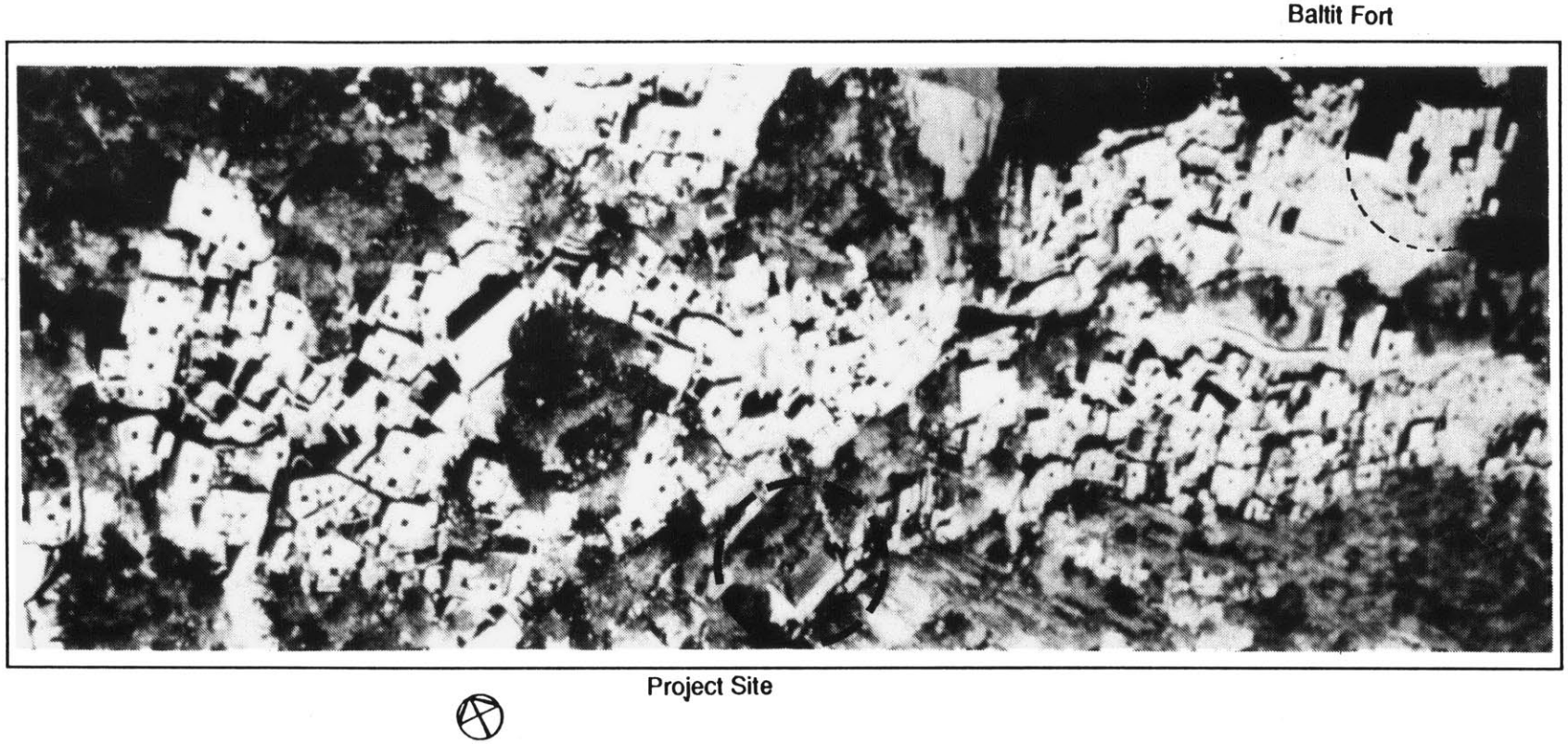

Fig. 1.2 Aerial view of the Karimabad village.

The settlement in Karimabad began 600 hundred years ago when the Baltit Fort was built. It acted as the guardian of the village people, and most of the old houses were built around or inside it. The fort can be seen from the west side of the village only and, as typically found elsewhere, was also used for observation and defense against enemies. The natural integration of the fort, its topography, its location and material in some

way represent a small-scale replica of the mighty, dominating mountain that surrounds it.

The climatic conditions influence many aspects of life and hence are very important. The village has a continental mountainous climate which is very dry -- cold in winter with a few inches of snow, and warm in summer. There is very little rain -- mostly in April through July, so the land is dry. The winds running through the valleys are quite cold in

Fig. 1.3 A cluster of houses as viewed from the Baltit Fort.

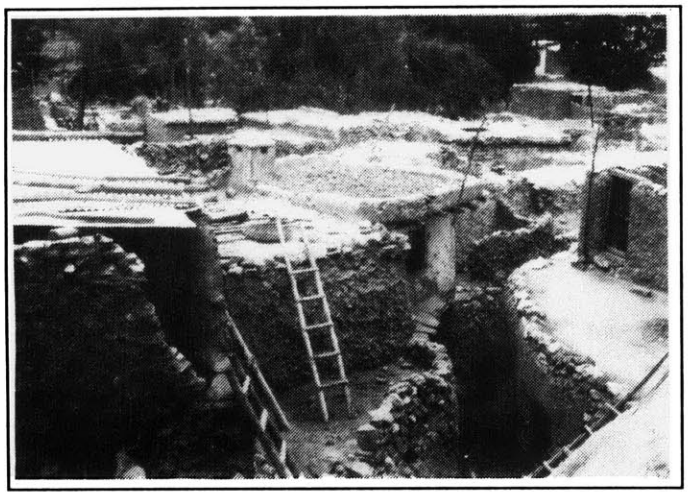

Fig. 1.4 A typical alley of a Hunza village.

winter, and in order to preserve heat, the interiors of the houses are small. This size is also necessary because the village is in a high seismic zone. Furthermore, to limit the thermal exchange between the outside and the inside of the building, there are very small openings in the walls (at times none) and only one in the roofs. This characteristic forms the basic architectural feature in the houses of the region.

Generally, the entire region, including Karimabad village, lacks a traditional energy source because the quantity of wood available is very small because of deforestation, and importation of natural gas and oil is quite expensive. Sun is the only natural source of energy available. A small mountain stream, called Barbar, runs through the village and can possibly be used to generate power and run small mills.

The rural architecture in the village is an immediate result of the above factors. The basic housing unit, located on the alluvium, traditionally consists of a single square room with one entrance and one opening in the roof. Until a hundred years ago, the family size varied from 5 to 15 persons per unit. Today the family is smaller, but several households live in one unit. In the past all the chores were carried out in this single room, but today the kitchen has been separated from the main room and there is additional space for storage. In summer the verandah provides double living space. Some houses have courtyards in which residents keep their animals and grow fruit trees.

The house is unhealthful because there are not enough openings. This rudimentary solution to preserve the interior temperature and the seismic problems has proved to be a source of toxic diseases. The small openings do not provide sufficient ventilation for the smoke which is produced by cooking. In winter the women and the children spend most of their time inside the house and men go out only occasionally. Hence the villagers are exposed to little direct sunlight and fresh air in the winter. Moreover, the inadequate openings allow very little natural light inside.

The water supply for the village is a mountain stream called Barbar. It meets not only the drinking and domestic needs of the villagers, but also the irrigation of the fields. The villagers have constructed artificial wells which act as water reservoirs for every neighborhood. Very few (4 or 5) of the new houses have plumbing connections with an overhead tank. These tanks get their supply from the same stream.

Another primary utility, electricity, has been very recently introduced. For the majority, electricity is supplied only two or three days of the week. A special connection with a power station provides an electric supply everyday, and only the affluent homes, public buildings and hotels have such an arrangement.

The people of Karimabad and the surrounding region are very religious and conscious of their tradition and culture. Every village has mosques

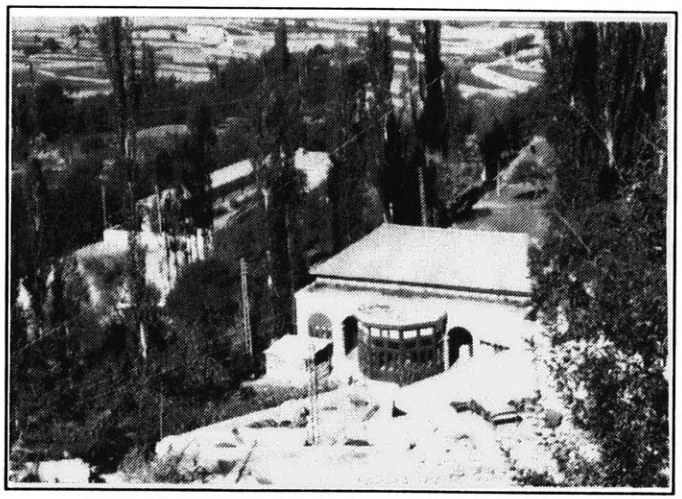

Fig. 1.5 The central jamat khana in the Karimabad village.

and jamat khanas for prayers, and they also serve as community centers for social and cultural purposes.

Karimabad is undergoing some rapid changes both economically and traditionally. There are two reasons behind these changes. First is the village's proximity to the Karakoram Highway, an important engineering achievement completed about ten years ago. This highway crosses the Himalayan mountain belt between Pakistan and China and represents what at one time was the silk trading route. The villages near the highway, including Karimabad, have begun to enjoy a great deal of commercial activity. Secondly, in 1977, the Pakistan government ended the tribal ruling system of the region and the rule of the Mir of Hunza also came to an end. The people gained some freedom to leave the village, and the younger generation has begun moving to more developed parts of the country. Today it is common to find that at least one man of each family has gone to the city either for education or a job. Upon return, he tends to act as a catalyst for change, both in the household and in the village as a whole.

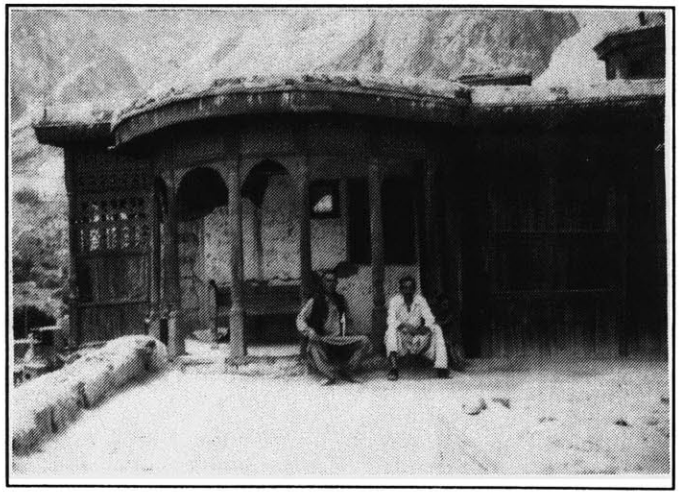

Fig. 1.6 One of the bays of the Baltit Fort.

To clearly understand Karimabad's history, one must analyze the role of the Baltit Fort in the village. The settlement of the village began some 600 hundred years ago when the fort was built. Its history is not precisely known, but the existing structure, which is quite large and composed of many additions, developed in several stages. It is also

believed that the artisans who built this structure came from Baltistan, a district in the southeast of Karimabad. When the Prince of Hunza married to the Princess of Baltistan, the fort was part of the dowry. The father of the princess sent an army of masons to build two forts --- one in Altit

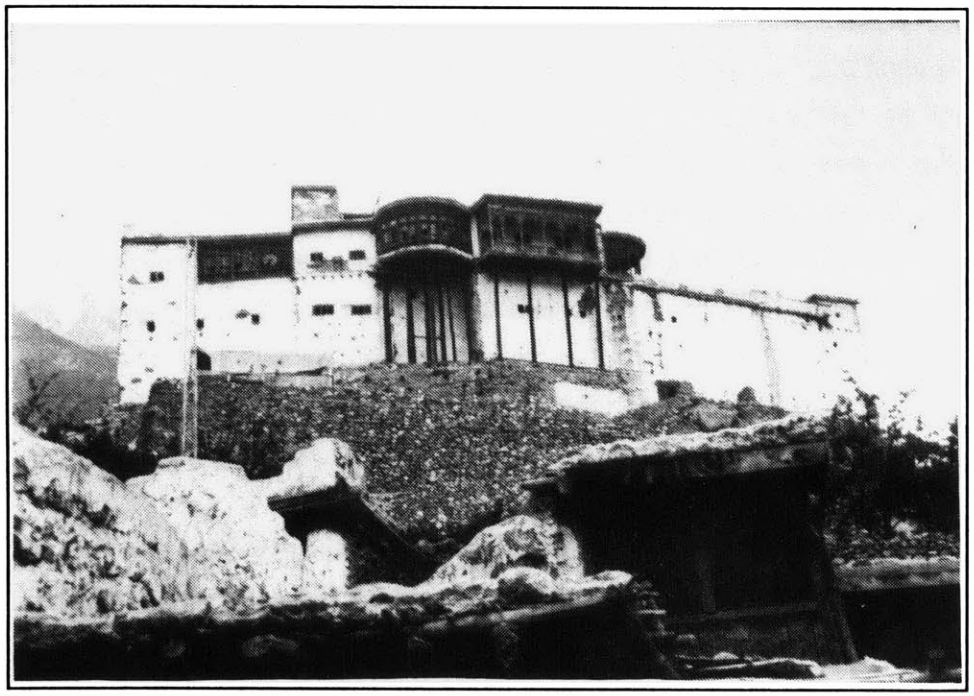

Fig. 1.7 View of the Baltit Fort as seen from the houses below it.

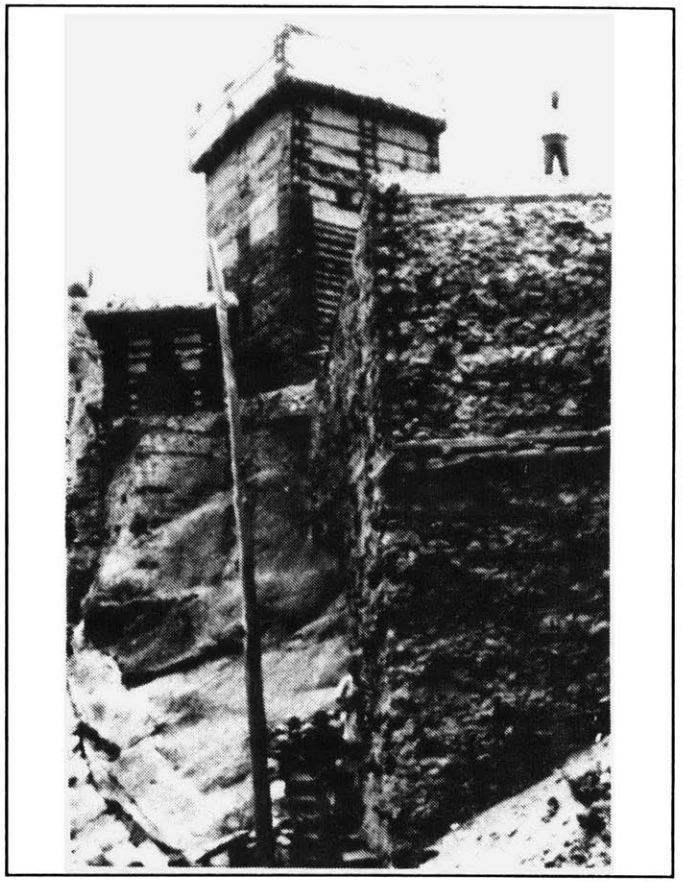

Fig. 1.8 The Altit fort located about one mile from Karimabad village.

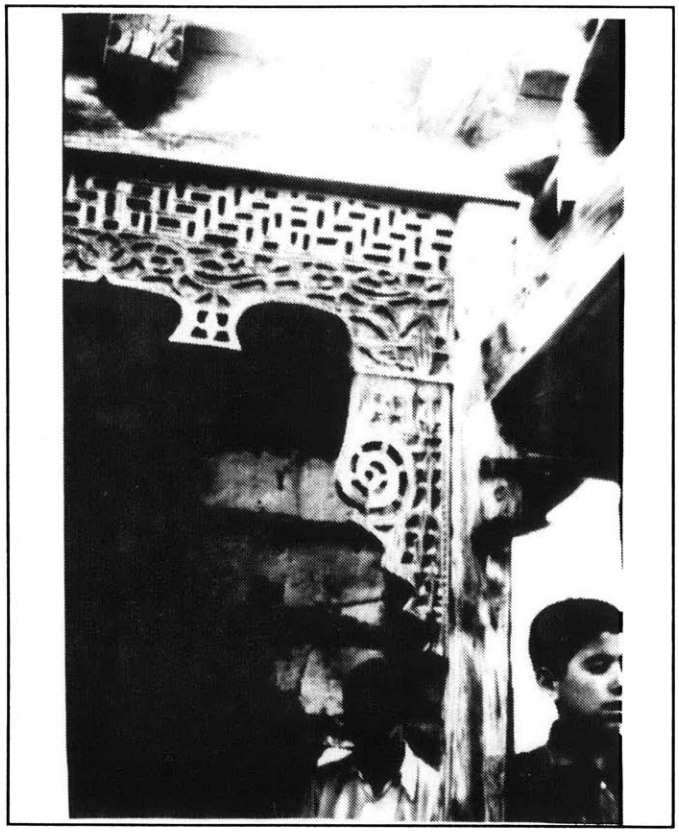

Fig. 1.9 Carved timber screen in the Altit Fort.

and the other in Baltit i.e., Karimabad. It was designed to house and protect the villagers and their animals when necessary -- for example, during a siege. This explains why the fortress has so many small rooms and large storage areas. This monument has strong associations for the people now as it reflects the art, the taste, the culture and the craftsmanship of the people and also reminds them of their history and heritage.

Next to this fort, the people have strong affiliations with the jamat khanas in the village which fulfill not only their religious need but also act as catalysts in their social and cultural activities. Currently, there are eight jamat khanas in the village located homogeneously. Their history is not precisely known but the existing ones in the village show the attention and reverence they receive from the people in terms of construction and maintenance. The size and capacity of jamat khanas grew as increase in population and changes in communal activities took place. Today, the village requires a new facility, to accommodate their religious activities and the changing administrative structure of the community in the region.

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[1] Aga Khan Award for Architecture, *Architecture & Community: Building in the Islamic World.* New York: Aperature Publishers, 1983. p. 11.

Chapter 2

Religion

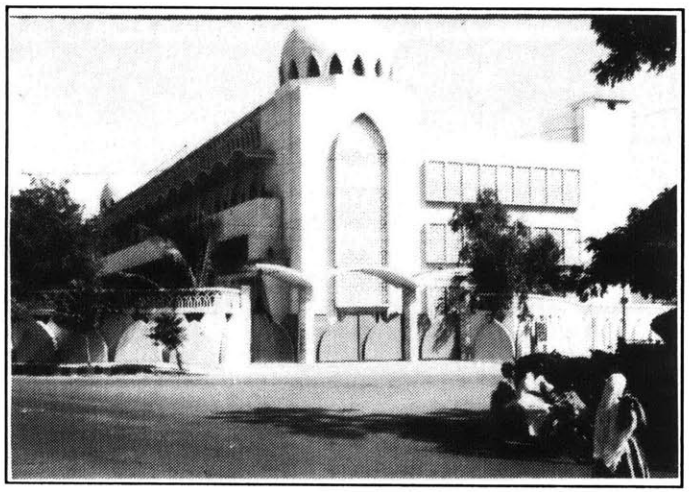

Fig. 2.1 The Garden Jamat Khana in Karachi, Pakistan

Religion -- may it be eastern or western, or past or present -- has been the major force in governing the culture and tradition of a society. It acts as the spirit of a body which is the society of a place. A difference in religion is easily reflected in the culture and tradition of the people; same is true for the people of the Hunza region.

As mentioned in the previous chapter, the religion of the people in Hunza, including the village of Karimabad, is Islam. The whole of the Karimabad population is of the Shi'ia Imami Ismaili Muslim sect. For the approximately 12,000 inhabitants of the village, there are eight jamat khanas, i.e., places of congregational prayers. The term *jamat khana* originally meant a place to pray. With the passage of time, more social institutions and offices developed within the community and eventually became attached to the physical facility of the jamat khana. So today with numerous kinds of organizations and institutions, the term *jamat khana* refers to the whole complex of which the prayer hall still is the most significant space. The jamat khana being proposed in this thesis is a complex that will functionally replace the existing central jamat khana of the village, which is simply a prayer hall.

In order to clearly understand the role of a jamat khana in the life of an ordinary Ismaili Muslim, and also to help understand the culture of the people of the Hunza region, it is essential that the Shi'ia Imami Ismaili faith of Islam be discussed briefly.

Islam proclaims to be the faith that was revealed to Prophet Muhammad ibne Abdullah of Arabia in the late sixth and early seventh century A.D. Its followers today number around 0.9 to 1 billion. Of its two major divisions, the Sunnis form the large majority while the Shi'ias (or Shi'ites) are a minority. The Shi'ias tend to be found more frequently in non-Arab countries but except in Iran, Iraq and Bahrain they are a minority. Within each division are many smaller groups and interpretations. The Ismaili Tariqah (interpretation) is part of the Shi'ia Tradition.

The primary philosophical difference between the Shi'ias and the Sunnis concerns the leadership, particularly in spiritual matters, of the Muslims after the death of Prophet Muhammad. During his lifetime Prophet Muhammad was both the secular and the religious leader of his followers. During the last 8 to 10 years of his life he saw his followership rise from a few thousand to tens of thousands. Justification to both his secular as well as religious responsibilities made him, at the same time, a Prophet and head of government. It must be understood that a highly structured or formal form of government did not exist in Islam at that time and hence the Prophet's role as secular head of the Muslims is generally not likened to a head of government.

Upon the death of Prophet Muhammad, issues concerning the continuation of that leadership arose. By and large, the Sunni Muslims maintained that after the Prophet's death each Muslim was left to interpret and practice his faith according to his understanding. The guiding light in this instance was to be the holy book, the Quran, revealed to the Prophet, his life, sayings and teachings. Historical

evolution of this division of Islam has created institutions and mechanisms for generating a common interpretation for sections of the population.

The Shi'ia Muslims, on the other hand, believe that the successor to the leadership of the Muslim community both in spiritual and temporal matters was the Prophet's cousin and son-in-law, Ali. This leadership was to continue thereafter by heredity through Ali in the Prophet's family, which according to the Prophet consisted of five closely related members in his lifetime. This family is called Panchtan Pak and in the Shi'ia belief the successor -- called the Imam -- was to be a descendant. This became the fundamental concept of Imammate, i.e., the belief that an Imam inherits both forms of leadership. The Shi'ia division, historically, split up into many sub-groups, mostly over questions of legitimate heirship. The Ismailis are probably the only group today that claims to follow a living, manifest Imam whom they claim to be the direct descendant of the Prophet and Ali.

The Shi'ia emphasis on leadership in both spiritual and secular matters of human life comes not only from their particular traditions and understanding of the Prophet's life and teaching but also from the fact that the Quran has addressed all aspects of human life. In a very (historically) contemporary context, the Quran relates directly to physical, socio-cultural, economic, political, intellectual and emotional issues of Muslims. The Ismaili tradition maintains that the Imams have always fulfilled both these roles. Prominent examples are the Fatimid Caliphs of North Africa and Egypt and of course the more recent Sir Sultan Muhammad

Shah Aga Khan III. This interpretation mandates that the Imammate involve itself in matters of material and spiritual significance to the followers. Another natural consequence of the interface between religion and material life is that the value structure of society becomes closely inter-woven with religion, and hence the two are inseparable. In Islam, humanistic values such as honesty, integrity, kindness, care, hard work, etc., are considered pious virtues.

The Ismailis, numbering around 15 to 20 million, live in more than 25 countries around the world. They are almost invariably tiny minorities in the countries of their residence. Only a small fraction lives in countries where open practice of faith is permitted. Within this group a very substantial proportion lived, until very recently, in areas dominated by Sunni Muslims. A natural result was introversion and isolation. It has been only in the past two to three decades that this attitude has begun to change in any major way.

A place of congregation for the Shi'ia Imami Ismaili Muslims assumes a very significant place in the life of the community. Ismailis call their place of congregational prayers a *jamat khana* or house of congregation. It is usually a property of the Imammate and access is restricted to members only, particularly during prayer. However, prayer is not the only activity performed there. In fact, the jamat khana is also a social and cultural center in many ways. The latter two functions stem primarily from the fact that the Ismaili interpretation of Islam sees faith as encompassing material life. Also, as mentioned, this belief sanctifies as religious all material activity that is humanitarian in nature.

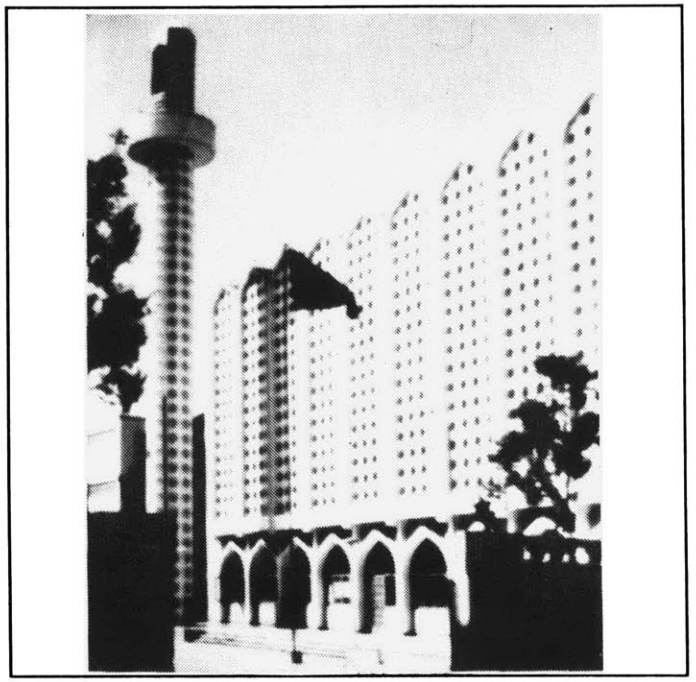

Fig. 2.2 The Prince Aly S. Khan Jamat Khana in Karachi, Pakistan.

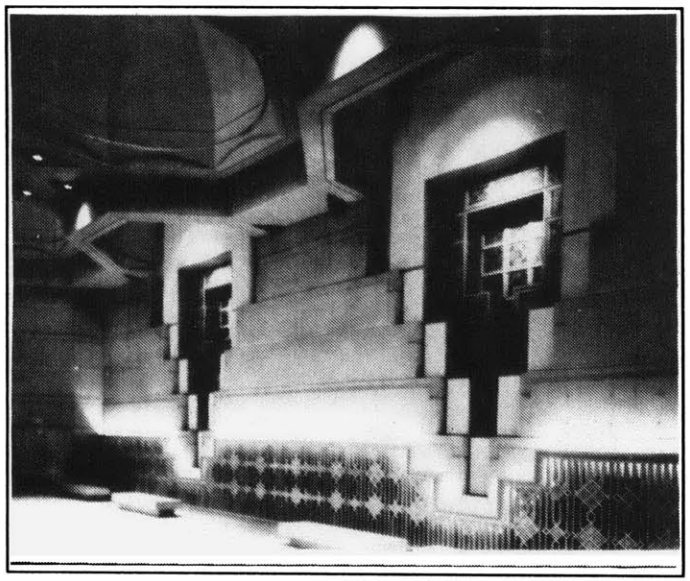

Fig. 2.3 Interior view of the Burnaby Jamat Khana prayer hall, located in British Columbia, Canada.

Thus a jamat khana in many ways acts as a spiritual and socio-cultural nidus for Ismailis in most parts of the world. The secular role is generally much stronger in the developing world, where public social institutions are generally not very well-developed. In these areas the jamat khana tends to play a very vital role in the community life of Ismailis. The administrative functions of the community are often performed from the same physical premises. It is, therefore, not uncommon to find various community administrative offices in jamat khanas. Such offices may be national, regional or local councils, various boards that look into and attempt to influence health, education, recreation, religious education and family and societal life, class rooms for education, etc.. Thus, Boy Scout movements are jamat khana based in many locations in India and Pakistan as are bands and orchestras. Not only are marriages solemnized, but services of arbitration in family and business disputes are offered, too. Employment assistance services, educational seminars and short courses, economic advice and health check-ups, the list is as varied as it is long. Furthermore, glorification of voluntary services as relating to religious values, generates a phenomenal resource of volunteer manpower which is then channeled into community and general societal development.

The primary function of a jamat khana, however, is spiritual. Hence, the most prominent part in any jamat khana is generally the prayer hall. In accordance with the almost ubiquitous Muslim tradition, seating inside the prayer hall is on a covered floor, except of course for people with special needs, for whom a few chairs will generally be provided. Genders are generally segregated without

formal partitions, each occupying approximately one half of the space. Two priests, the *mukhi* (chief) and *kamdia* (deputy) and their female counterparts (*mukhiani* and *kamdiani*) manage the various rituals and prayer ceremonies. Managing does not necessarily mean performing or leading the services. It simply means that the *mukhi* and *kamdia* will authorize and regulate the performance. They are also responsible for the physical administration of the jamat khana and will sit on most administrative bodies that run the other social functions described earlier. Thus, while they are not preachers they will look after religious education activities in their jurisdiction. And, while they are not health professionals, they will sit on health committees, etc.. The entire social organizational structure is of a complex, matrix type, but the executive officers of the jamat khana (as the *mukhi* and *kamdia* are often referred to) have considerable authority and respect in the community.

Thus the jamat khana is an integral part of the life of individuals and of the Shi'ia Imami Ismaili Muslim community, as a whole. Its design and architecture must consider its many dual functions -- spiritual and temporal -- as well as the surrounding in which it sits.

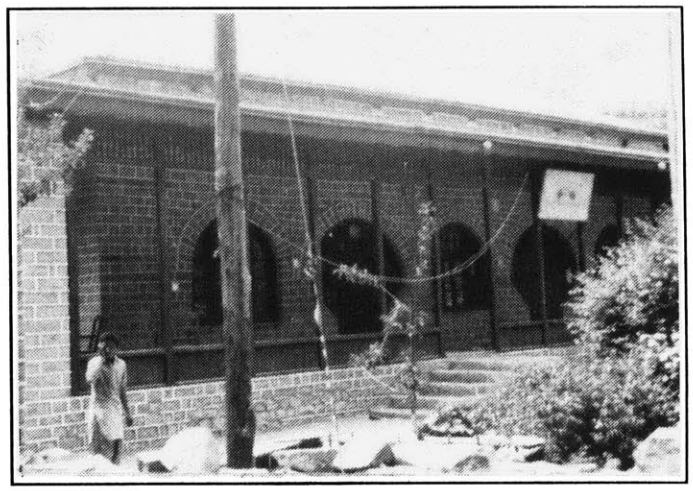

Fig. 2.4 One of the jamat khanas in Altit, Hunza.

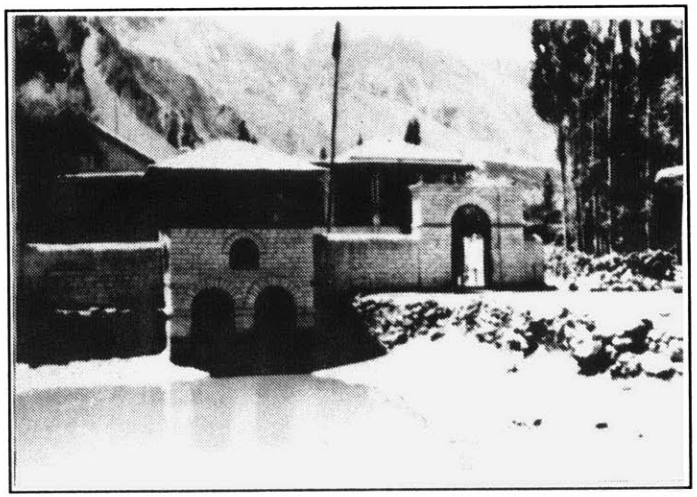

Fig. 2.5 A jamat khana in Alyabad, Hunza.

Chapter 3

Architecture

To design any building, it is essential to study and understand the character and personality of the built environment of the surrounding region. This section, therefore contains background information about the various types of architecture that exist in the Hunza region in general and in Karimabad in particular. It also includes information about introduction of cement and steel in the region, and how an increase in communication affected the local building industry.

Building Materials

For years most Hunza families have had some member who through necessity learned how to work with stone or timber. These artisans and masons were and still are responsible for constructing the vast majority of buildings in the rural parts of the Hunza. Because builders learn from one another, most of the buildings and houses are built using a similar design and construction method. The best examples of indigenous architecture in the Northern Area of Pakistan are found in the housing sector, which forms 99% of the local architecture of the Northern Area. The ingenuity of the locals is apparent from the way they have moulded their houses in response to the availability of materials, climatic conditions and culture.

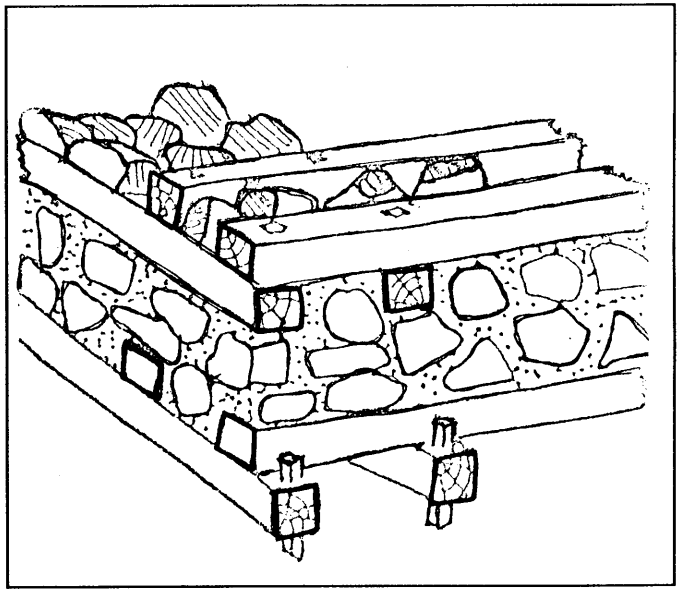

Fig. 3.1 Traditional system of construction with stone and timber.

In the village of Karimabad the primary construction materials, both in public and private buildings, are stone, timber, mud and limestone. It is only recently that cement concrete blocks have been used for construction. So far concrete block construction includes some hotels, a few houses and one school. Stone is

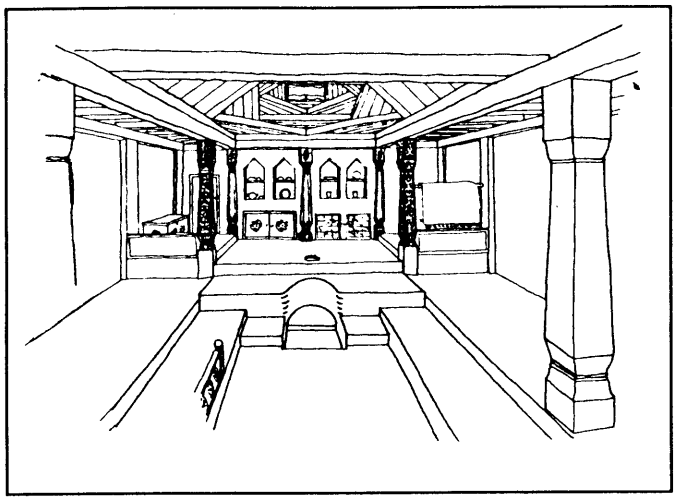

Fig. 3.2 Interior of a typical Hunza house.

found all over Hunza including Karimabad. It is either obtained and cut into manageable pieces on the site or is broken at the source. Mud is primarily used as the mortar material and in special cases limestone is used as the external pointing material. The stone walls are usually 18" thick, and for a single story residential structure they are quite stable against seismic forces. Currently, the stone supply for Karimabad comes from Husainabad and Alyabad villages located about five to six miles away. Masons in a recent study mentioned that a lot of stone is available near Karimabad, but no access road exists for tractor transportation to those sites. If link roads were built, stone acquisition would be easier and cheaper for the village.

Like stone, timber is also a very significant building material for construction in the Hunza region. For the Karimabad village, Poplar, the most commonly available tree in the region, is usually acquired from Chillas, a town south of Gilgit. The primary problem with the use of timber is that the quite oversized timber members that are used as beams and columns are not properly seasoned. Correct instructions for the use of timber can result in economizing, so proper usage of timber is an important factor in the building construction of the region.

The architecture of the region can be categorized into religious, domestic, and institutional.

Religious Architecture

Religious architecture is primarily comprised of mosques, jamat khanas and *Imambargahs*. The quality of construction here is much better than that in the domestic sector. The construction process of these buildings serves as a good example for local builders and masons. The materials used are primarily dressed stones with lime mortar, timber roofs, and timber flooring. One often finds decorative motifs of geometric and floral pattern on timber columns and beams. These styles can be traced to Persian and Ghandaran culture which first influenced Baltistan and later spread into Hunza. Baltistan is regarded as a source of culture, tradition, and architectural style for the Hunza region. Influence from the west of Hunza, notably from Badakshan & Turkistan, is felt to a much lesser extent.

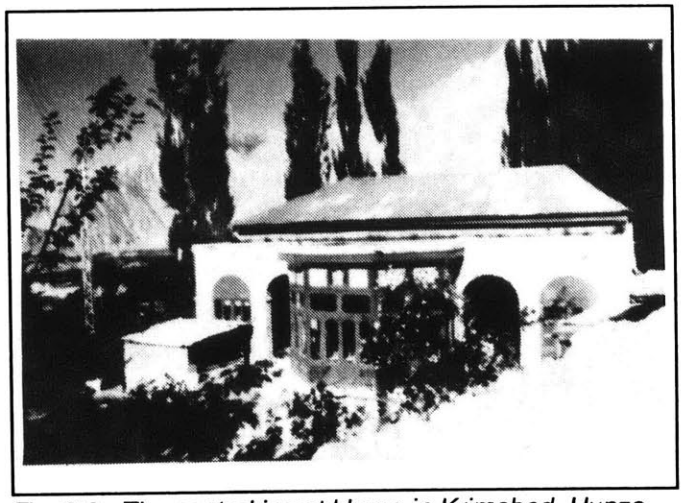

Fig. 3.3 The central jamat khana in Krimabad, Hunza

The builders or masons found in this region are usually not skilled artisans and the most common way they obtain learning or experience is through apprenticeship. Since the public or community buildings are built with better quality dressed stones, limestone mortar, and above all with a lot more precision and care, these structures contribute greatly to educating the young masons and artisans.

Public architecture differs not only in quality but in construction technique from that of residential architecture. For example, the roofing members are of properly cut timber with galvanized tin quite often found on top of it. In jamat khanas (and undoubtedly in some mosques) one does not find columns and thus the weight of the roof is taken by the walls unlike in the residential system. This system in

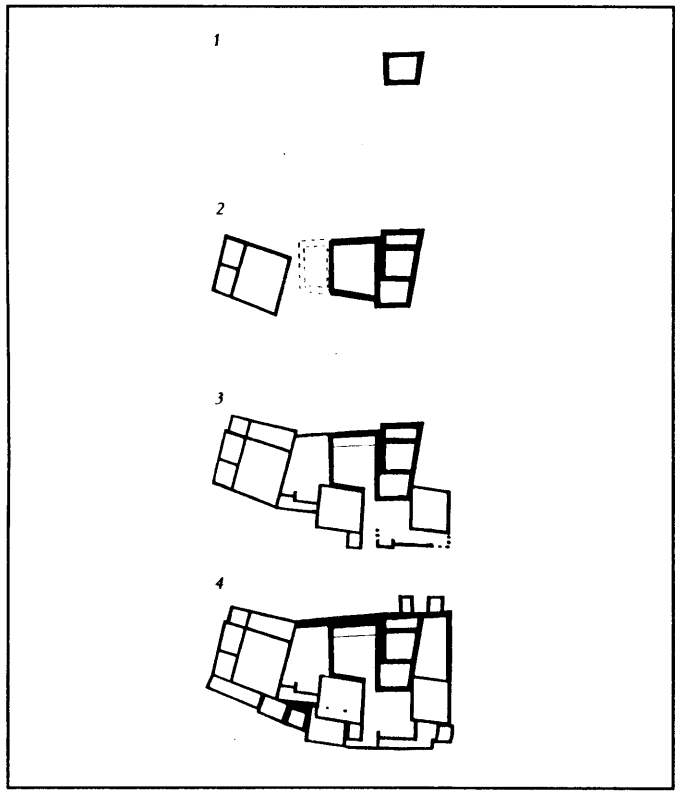

Fig. 3.4 The Fort developed from a nucleus of one, two or three Shingri *towers which were gradually connected by a series of rooms to form the building as it stands today.*

turn creates large spans with pitched roofs and would have probably been introduced during the British colonial rule.

Domestic Architecture

The three kinds of domestic architecture are defined by the income level and social status of the inhabitants: palaces, middle-income houses, and low-income houses. Each is discussed separately below.

I. Palaces

The royal domestic architecture consists of castles or palaces. The village has a castle or fort built for its ruler, called the Mir. In the village of Karimabad, there are two such palaces: the first, called the Baltit Fort, was built about 600 hundred years ago for the Mir of Karimabad while the second was built recently, and is the residence of the Mir's descendant. These structures are often built by the local masons and carpenters, but in special cases, well-known builders are brought from other districts.

The Baltit Fort

This fort sits in north Karimabad on one of the highest point of the village. It is accessible only from the north-west side and was designed to withstand long sieges. As the drawings (Fig. 3.5) show, the fort is composed of many small rooms, and it is believed that the construction of the fort took place in several stages. Didier Lefort, in his Mimar article "The Baltit Fort" [1] analyzes the complex structure of the fort which over time has altered and obscured; for example, its

Fig. 3.5 Floor plans and section of the Baltit Fort.

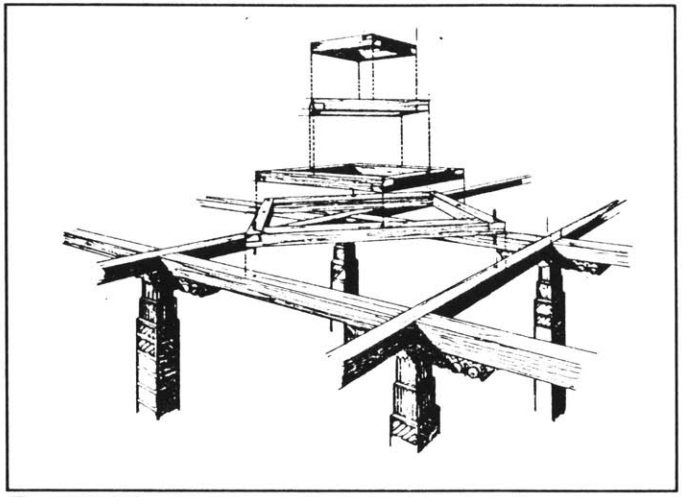

Fig. 3.6 Wooden square frames are placed on top of each other to form a special roofing system. The opening formed is called Sagum.

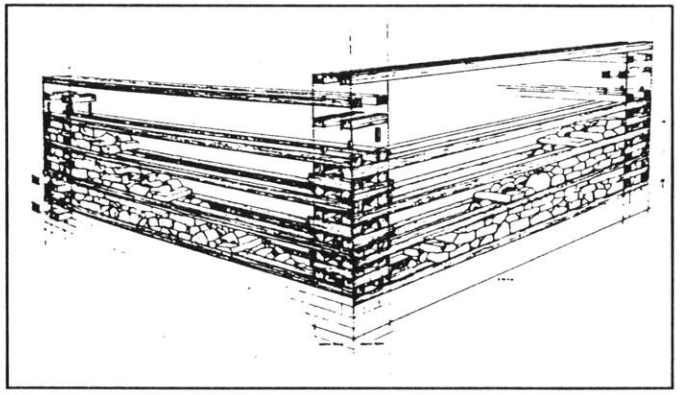

Fig. 3.7 Longitudinal squared timber tie beams are used in the walls.

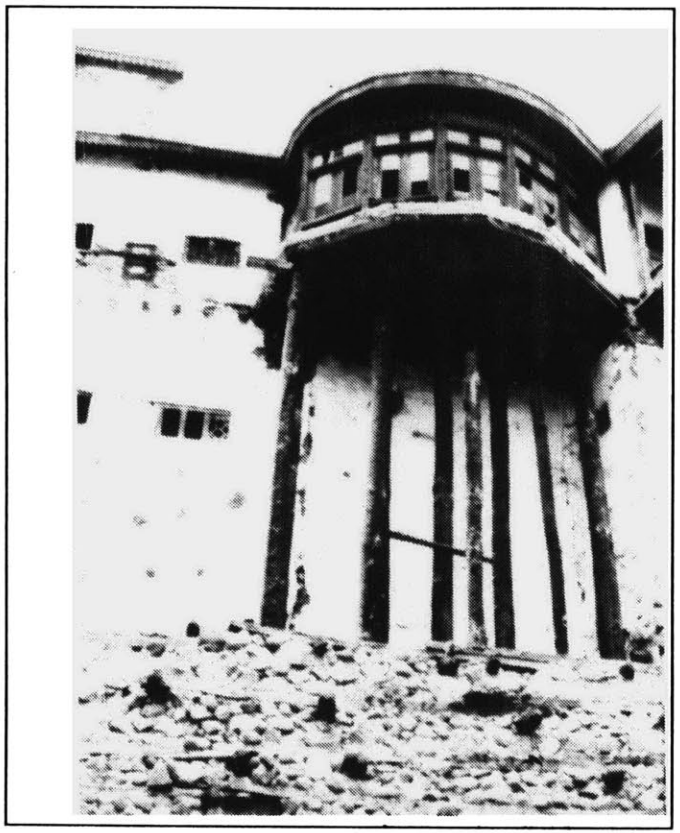

Fig. 3.8 Bay projecting from the southern facade of the fort and is believed to be apart of later additions.

earlier forms, may have included as many as three *shingri* towers which are no longer distinct architecturally. He mentions that the fort basically developed from one, two or three of these towers, which were first joined by a series of rooms, and then surrounded by a layer of defensive walls and guard rooms. Finally, the second and the third stories were added on top of the initial structure. The plans of the fort show us that it is basically composed of small square rooms of which some have roofs with small openings.

These openings are called *sagum* and are constructed in a very ingenious way. A series of square wooden frames have been placed diagonally on top of one another. This arrangement is very clever because it serves several purposes at one time. The frames give more stability to the structure. The layered frames form a small slope on the roof thus easing the drainage. The opening works as exhaust for smoke and ventilation, and finally allows natural light in. Didier mentions that the internal layout of the complex depicts a nucleated village with a very traditional way of life going on there at one time. The internal spatial layout of some parts of the fort resembles a typical housing unit.

II. Middle-Class Housing

The houses in the second category are owned by middle class people. For the village of Karimabad, this category includes less than 5% of the total number of houses. These houses are often constructed with dressed cut stones, limestone mortar and carved wood columns. The openings are of high quality timber and

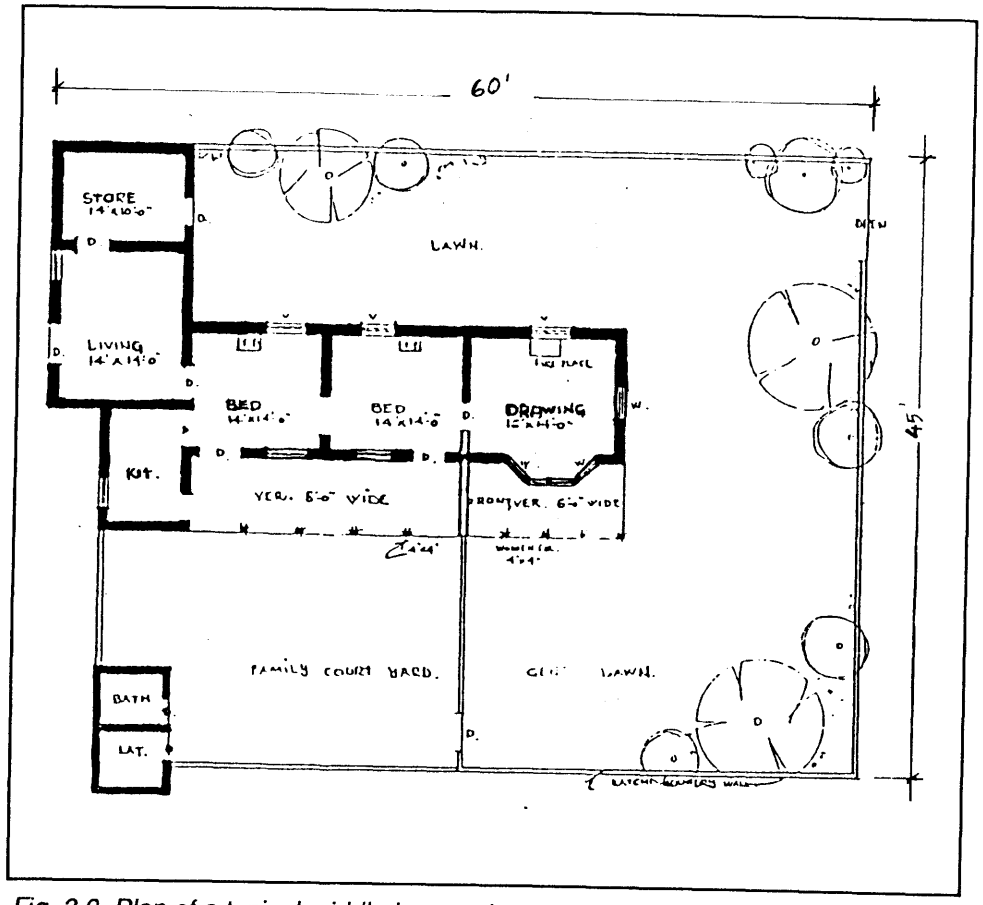

Fig. 3.9 Plan of a typical middle-income house.

often with glass windows. Roof construction is quite similar to that described in lower class houses, but chimneys or ventilators are added in some cases.

The layout of houses is quite similar to that observed in urban areas, and various indoor activities are segregated into different rooms.(See Fig. 3.9) The toilets here are usually located outside the house in the corner of the yard. Often these houses have interior water pipe connections through which water is supplied from overhead tanks.

iii. Lower-class houses

The most commonly observed house pattern is that of the low income people of the region. This type comprises about 95% of the residential architecture in the whole of Hunza. Historically, the pattern consisted of a big, approximately square-shaped room with a fireplace in the center. Although no longer commonly built, this room is used for cooking, dining, sleeping, praying and storage activities. The segregation of spaces for the various activities in the room is achieved by varying the floor levels within the room by 6 to 9 inches. The floor is either made of compacted earth or, in affluent houses of wooden planks. The level changes are achieved by the help of plinth level beams which are connected to wooden columns holding the roof. Houses with this traditional layout system are being replaced by decentralized plans in which separate rooms have been allocated for different activities.

The inhabitants have an extended family system, and the average size of the family varies from 8 to 13 people. Most commonly the houses have two stories -- the upper for summer and the lower for winter. Since winter is cold, the lower levels of the house have no openings in the wall, only one in the roof, called *sagum*.

The low-income category has two types of houses, (i) the Shino Gout (house) and (ii) the Khajunoo Gout (also known as Hunzakut Gout). Both categories are primarily based on the same design concept but with minor differences in the layout. *Khajun* means people of Hunza, and hence Khajunoo Gout means the house of the Hunza people. For this study both the types will be considered as one.

A typical house consists of the following spaces:(Fig. 3.10)

1. Shom: The Shom is the entry area of the house where shoes are kept and is regarded relatively less clean area. On ceremonial occasions the Shom is used as a dancing area by a man and the family sits around the fire to watch.
2. Dhambor: Across from the Shom is the Dhambor which is used for storing grain and other food items for winter.
3. Maun: The central cooking area, called Maun, is the most commonly used space and the whole plan revolves around it. The fire used for cooking also provides heat to keep the house warm in winter. Above the fireplace is the square opening for ventilation.

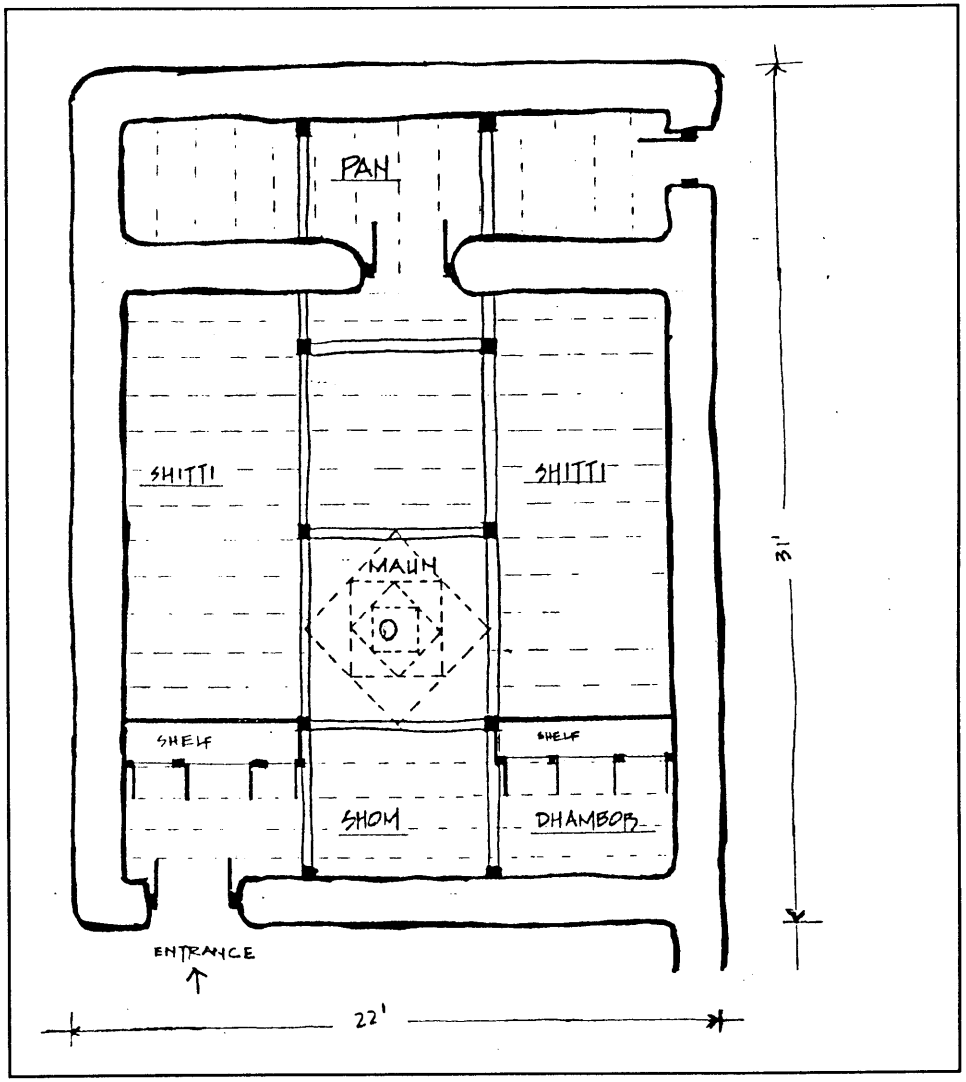

Fig. 3.10 Typical plan of a low-income house.

4. Shitti: On either side of Maun is the Shitti used for sitting and sleeping and is raised 6 to 9 inches higher than Maun. There are special seating areas for senior family members and newly married sons.

5. Pan: Pan is the storage area.

Roof Structure:

There are basically two types of roof construction systems.

1. Gasirkum: In the Gasirkum system, diagonal timber frames are put one on top of another as shown in Fig. 3.6. This set of frames forms a square opening called *sagum* and sits on four columns. This roof arrangement is the same as described in fort roofing system. The four columns are connected at the plinth level by horizontal members. Traditionally to avoid water leakage in the roof, the villagers used a bark of long trees called *halli* on top of the branches. Today, instead of *halli*, plastic sheets are used because they are cheaper. Finally, *gara*, which is a mixture of mud and water, is applied on top. It is believed that in olden days *gara* was prepared by mixing mud with apricot juice to form a more durable roof which needed less maintenance. Moreover, there used to be a special method of compacting this *gara* in order to produce a good quality roof. In some cases straw was mixed into *gara* to give more stiffness and binding to the mud. It may be noted here that the slope of the roof is a critical factor in preventing the mud from washing away and still allowing proper drainage. In most of the cases the absence of eaves has created some drainage problem.

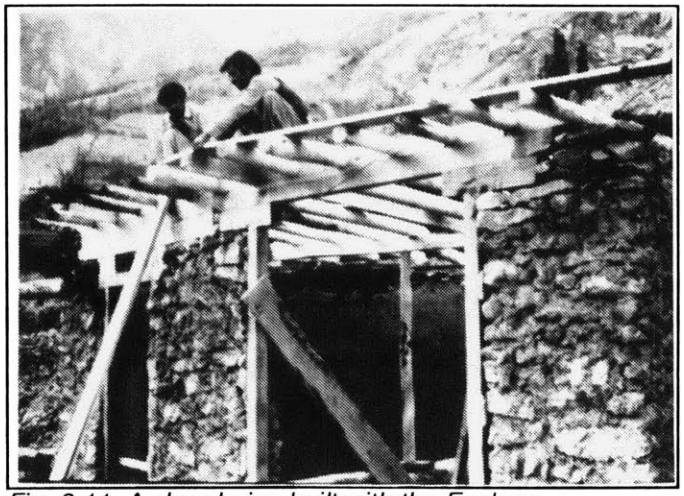

Fig. 3.11 A shop being built with the Faskum system using oversized timber rafters.

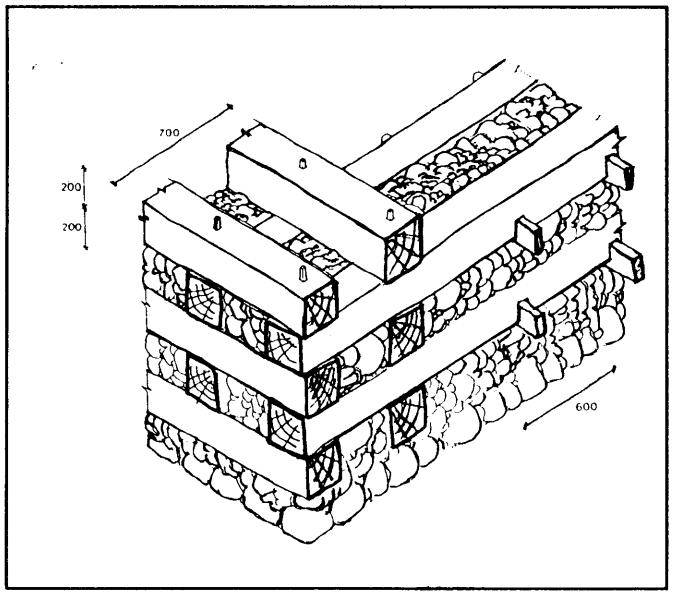

Fig. 3.12 Traditional wall construction with transverse timber ties through the width of the wall.

In this construction system the outside wall acts only as a curtain wall however, it is quite expensive as it takes a lot of labor, requires a special kind of wood, requires more wood than usual and takes more time to construct.

2. Faskum: The Faskum system is simply laying horizontal rafters on the wall to take most of the load. This system is not as sturdy as the previous system because of the following: (a) the roof rests on the walls which act as the load bearing member. The collapse of the wall, in case of earthquake, will cause the roof to fall also. (b) The columns supporting the roof are not connected to timber beams at plinth level which help the structure to sway with the lateral earthquake forces by means of a pin joint. (c) The roof structure itself does not make use of any diagonal bracing (as in the case of Gasirkum) which makes it relatively cheaper but less strong.

Roof Covering: In both roofing systems, a very similar method is adopted for covering the roof. Wooden planks of about 1/2" to 1" thickness are laid on the beams or rafters and *halli* is laid on top to avoid water seepage.[2] The *halli*, is covered by a mixture of mud, water and wheat waste. This mixture is called *gara* and is usually 8 to 10 inches thick.

Walls: The most traditional way of constructing walls was by laying alternate courses of sun dried mud and timber. The function of timber courses was to tie the structure together probably as protection against earthquakes. With the passage of time stone replaced these mud bricks and timber courses were laid

less often in the wall. In the Hunza region, houses built about hundred years ago did not take into account to full extent the use of timber course in walls probably due to the scarcity of wood and its increasing cost.

Institutional Architecture

Institutional architecture primarily consists of schools and government rest-houses. Karimabad village contains schools made of cut and dressed stone walls and timber roofing system. The Aga Khan Karimabad Girls Academy built recently has used hollow cement concrete blocks and reinforced concrete. This has given the village people a new exposure to the use of cement blocks. Currently, another school is under construction in the village but with dressed stones.

Summary

In general, the indigenous housing system of Karimabad expresses originality, consistency and coherence. Though it does not tackle the seismic problems fully, it has a sense of ingenuity. The use of timber beams at plinth level, and the arrangement of square frames in the roofing system is a proof of this ingenuity. The division of spaces between open, semi-open and private space is depicted in its basic natural form. The simplicity in the use of building materials, the economization in the use of interior space, the layout of houses in the formation of clusters, the relationship of these clusters in the formation of village, and above all the hierarchical arrangement between the residential and communal structures reflect the culture, the tradition and the way of life of the people. This originality, however simple it may be, is not ordinarily available in this present age.

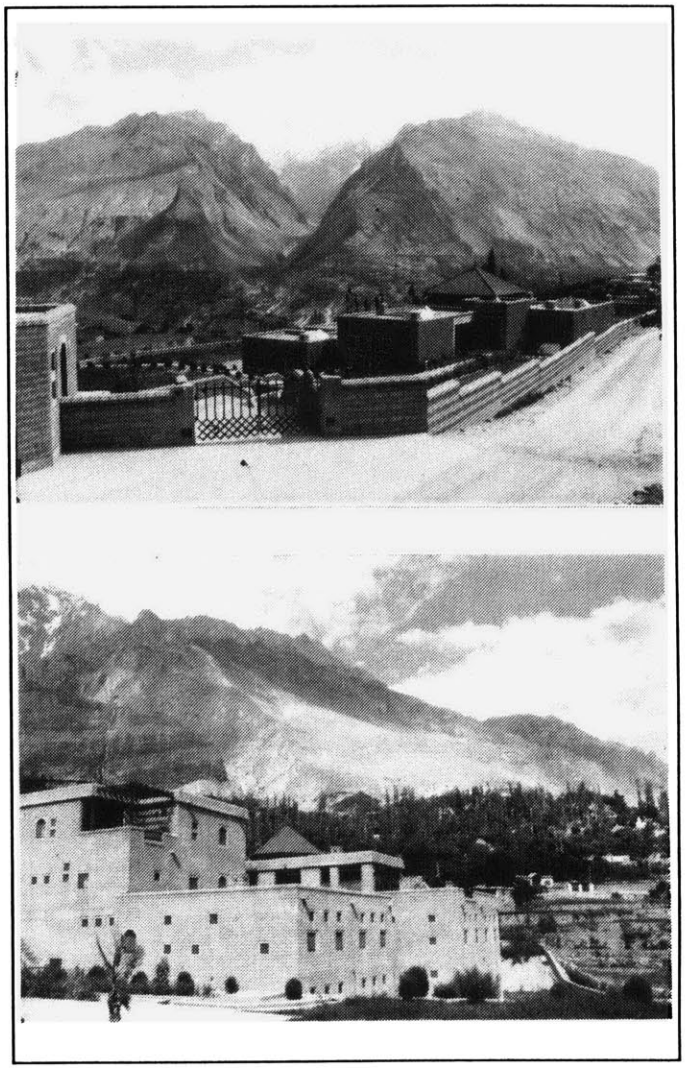

Fig. 3.13 Views of the Aga Khan Karimabad Girls Academy.

The domestic and non-domestic architecture of Hunza, including Karimabad, has different construction system and quality. Interventions from outside agencies have so far dealt with non-domestic architecture and hence the quality has been maintained; but the introduction of cement concrete blocks to this category has, so far, had bad affects on domestic sector in the region. Not much improvement has been achieved in the overall indigenous housing architecture of the region, because the recent construction is an economized version of traditional system using inferior materials to save cost, and also because of the use of new materials without any know-how. If the traditional architectural characteristic of the Hunza region has to be preserved, proper instruction system regarding the change and use of appropriate construction technique, alternate to the old system, is desperately needed in the region, without which the character and personality in the future may not be what is left today.

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1 Lefort, Didier. "The Baltit Fort" in *Mimar 20*. Singapore: Concept Media Pte Ltd. 1985.

2 Though no longer used, *halli* is a bark obtained from a tree. A recent study showed that *halli* is not available in Karimabad and is imported, when needed, from the Nagar village which is located about a mile and a half away.

Chapter 4

The Change

Change is coming to these areas, with new roads, communications, ideas,and markets. Our children will know a world that is different from today's..... Take for example, the new field of tourism. Your hills and villages are beautiful. They are natural resources that can attract people ... but they are fragile; they can be destroyed by careless development and ugly new buildings. Village Organizations will need to plan, and train people, to preserve and develop their natural resources of beauty and simplicity that are unique in the world.

-- His Highness Prince Karim Aga Khan [1]

Changes usually occur because of two reasons: (1) new expectations that evolve in the world every day, (2) pressures such as human, political, social or economical that somehow must be met.

Like those in other Third World countries, the Hunza people have a normal thirst for images of modernity and material progress and for the symbols of power. The rapid process of change is not only in their built environment, but in their culture and values as well. Gilgit, which used to be a center of traditional building systems merely 50 years ago is today a growing town with concrete block construction and no sense of direction regarding the future. This town has committed its future to a built environment insufficiently thought about and insufficiently prepared.

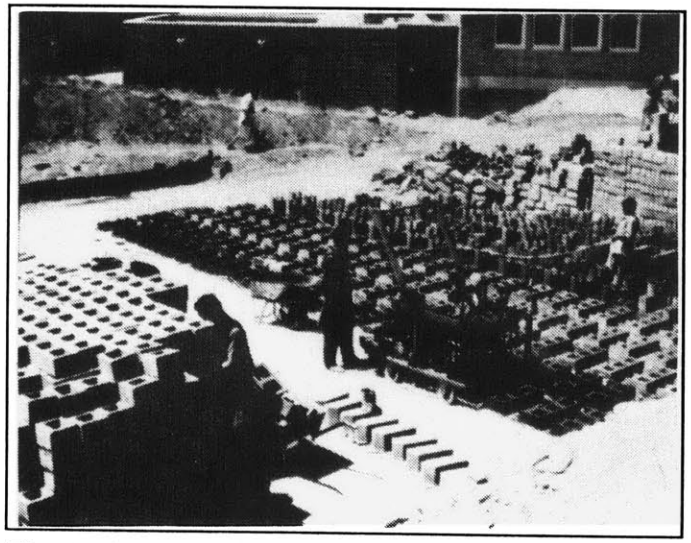

Fig. 4.1 Production of cement-concrete blocks in Karimabad.

Karimabad, with its close proximity to the Karakoram highway, is in the early stage of destroying its traditional heritage and architecture. The introduction of cement concrete block technology is having a great impact on the village's built environment. New shops, especially hotels, are being built with concrete blocks along the main roadway in the village. This irregular and rapid growth is acquiring the shape of a mini-bazaar of concrete structures. The recently inaugurated Aga Khan Girls Academy, built with reinforced concrete, has increased the exposure of the new building system to the people.

Surrounded by all these situations, and in the absence of any system of guidance and instruction, especially for housing construction, the people of Karimabad are bound to experiment with new building materials at the expense of the erosion of

their traditional houses and building systems. Concrete blocks, galvanized tin sheets and steel are taking place of stone, timber and mud because of two reasons (1) ordinary citizens tend to see new materials as a symbols of modernism and progress, whether they are suitable to the region or not. (2) Relatively easy availability of and easier construction process with new materials.

In the absence of proper guidelines, directions and knowledge of quality of cement blocks, the changes could prove to be harmful to the future of the village.

> Things will change, and no doubt they will change radically. It is the responsibility of people like yourselves --- the planners and designers of our built environment --- to mobilize your intelligence and your technologies to ensure that they do not change for the worse.
> -- His Highness Prince Karim Aga Khan [2]

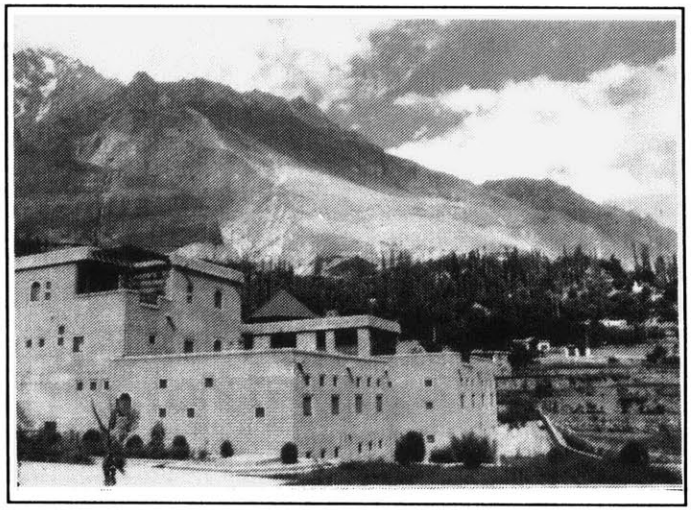

Fig. 4.2 The Aga Khan Karimabad Girls' Academy.

Factors responsible for change:

Primary factors responsible for these changes in the Karimabad village are:

(1) Increase in communication with developed parts of the country. The opening of Karakoram highway about ten years ago, which connects these remote areas with Islamabad and Rawalpindi. This physical link has been the primary source of information and communication.

(2) Change from feudalism to capitalism. Most of the villages, until 1974, were ruled by the local Raja or Mir, who completely controlled the lives of the villagers. People could not make any major decision about their education, housing or business without the consent of Mir or his office bearers. Since the abolition of this rule, people have been governed by the Government of Pakistan.

(3) Decrease in local labor as more people are attracted to city jobs or education, because of the recently established highway.

(4) Desire for change and progress. People who travel to more developed parts of the country, develop aspirations to have sanitary facilities, pipe-borne water, household appliances, use of an advanced building system, etc..

(5) Scarcity and rising cost of local building materials like timber, and easy availability of alternate materials like cement regardless of difference in cost.

(6) Intervention by some governmental and non-governmental organizations which have introduced new systems to the region without any guidance for the villagers who are eager to adopt this new technology.

Architectural Changes:

The following changes have taken place in the vernacular housing architecture of Hunza.

Walls: Cement concrete blocks are beginning to be used for construction by affluent home owners and business-people, as they are easier to handle, require less mortar and above all represent a symbol of progress as compared to stone. Older people realize the advantage of using stone versus cement blocks and continue building in stone. Usually, the trend has been to replace the 18" stone wall with a 8" cement concrete block wall. Making and laying concrete block course may be faster than acquiring and cutting stone, but an 8" concrete wall has less bearing capacity and is more vulnerable to earthquake forces than a regular 18" stone wall or a nicely dressed 8" stone wall. Moreover, concrete block wall has much less insulation value than that of a stone and mud wall. Calculations have shown that stone wall is about as expensive as concrete wall, depending on how far stone has to be transported.[3] A detailed cost estimate is included in Appendix 2. Lime, locally available, is also being introduced for mortar and interior plaster. It may be repeated here that only the affluent families can afford to make houses of cement concrete blocks in Karimabad, as stone is locally available for house construction.

Change in Interior Design of Low-income Housing: Additional rooms are being added on the periphery of the main central space (Maun) to accommodate different activities. Due to the addition of these new rooms, cooking area is no longer in the central room. This makes winter heating for the whole house more expensive and difficult, but allows more privacy and induces a healthy environment. The removal of livestock from the immediate proximity of the main space makes heating more expensive, as it contributed to the insulation

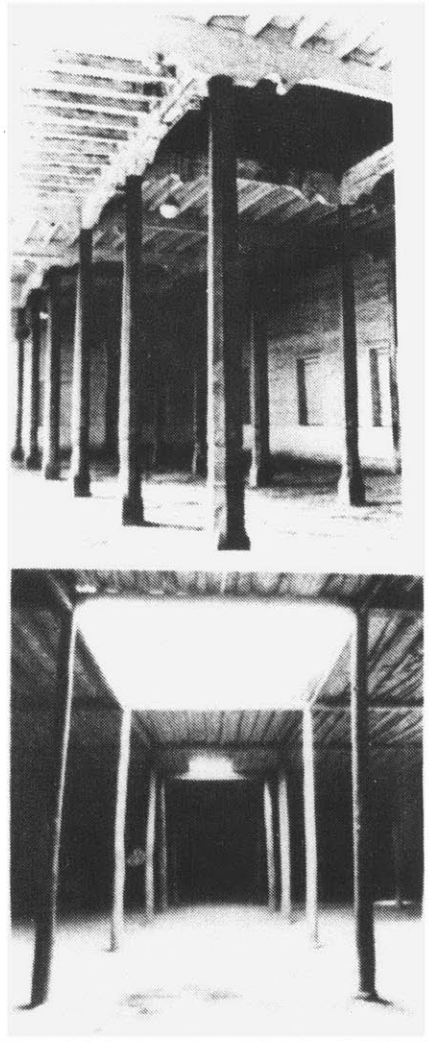

Fig. 4.3 The Aitika Mosque in Kashi, China (above) and the Amin Mosque in Turfan, China, represent the traditional system of construction.

of the whole space. Wall openings, allowing more natural light and ventilation, are being introduced without consideration of seismic shear forces. Some recent houses have adopted a typical urban interior layout which deviates completely from the traditional living system.

Change in Domestic Roofing System: The traditional Gasirkum system is being replaced by the simple Faskum system which does not offer enough structural stability to withstand earthquake forces. This is primarily true where the builder/owner belongs to a younger age group. Moreover, polythene sheets are being used very widely, instead of *halli* to avoid water penetration as it's much cheaper to acquire. It is believed that these polythene sheets are not good for the roof timber because of the high difference in winter temperatures between the interior and the exterior, which results in condensation and causes the wood to deteriorate. Bituminous sheets available in Punjab province are being introduced slowly, primarily by those who understand the disadvantages of polythene sheets.

The institutional architecture of the region has also undergone a lot of changes. Historic evidences reveal that, like the Baltit fort, mosques and other buildings used to have flat roof. With the change in the political system, especially during the British rule, pitched roofs were introduced in communal buildings. All the jamat khanas visited in Hunza have pitched roof system, whereas, traditional mosques in south-western China still have the flat roofing -- maybe because of inadequate communication with other regions.

Advantages & Disadvantages of changes:

(1) As imported materials like cement and steel are being used in the new building industry, the local economy flow is directed outside the region, which in turn affects the general economy of the region.

(2) A sudden influx of new materials and technology and an absence of skilled labor and technical know-how has resulted in low quality and sub-standard structures which are much less likely to take earthquake forces than the preceding ones. The low quality of construction has been primarily because of the absence of skilled laborers who now want to work in more developed parts of country for better remuneration.

(3) The architecture of the poor, even when built with indigenous materials, has become progressively of low quality as artisans and masons only want to work with new materials.

Summary

In the community or public sector, cement-concrete block technology has become more and more common as it is presented by the dealers as cheaper than stone and also as a sign of progress. Fortunately, this lose of quality is not gone unnoticed, recent study reveals that people who are familiar with both the systems are beginning to recognize the difference between the two systems especially concerning heating and stability.

[1] Speech at the conference of the Village Organizations held in Baltistan, Pakistan. November 20, 1987.

[2] Aga Khan Award for Architecture. *The Changing Rural Habitat.* Singapore: Concept Media Pte Ltd. October 1981.

[3]Hasan, Arif. "Evaluation Report on Self-Help Housing Construction in the Northern Areas of Pakistan". Karachi: 1985. (Unpublished report).

Part II

Search for an Appropriate Architecture

The journey of love is a very long journey,
But sometimes with a sign you can cross that vast desert,
Search and search again without losing hope,
You may find sometime a treasure on your way.
---Mohamad Iqbal

Chapter 5

Concepts and Search Process

For Muslims the relationship between a person's life and his or her physical surroundings is a particularly critical matter. For us there is no fundamental division between the spiritual and the material: the whole world is an expression of God's creation and the aesthetics of the environment we build are correspondingly important.
--- His Highness Prince Karim Aga Khan [1]

The word search, as used in this thesis, is defined as the stages through which the design progressed on its way to being discovered. This process had two steps: (1) The formation of concepts and ideas in accordance with the established criteria, which later acted as the focus or objective of the study. (2) The means or ways to express the concepts established in the first step through a physical form called architecture. The second step has been more challenging and difficult to achieve and discover. The primary criteria for this physical form has been not to simply imitate the traditional construction system of Hunza, but to develop a search for an optimal solution -- a solution that does not discard old values and traditions, but that also makes use of currently available materials and that meets people's aspirations for future progress.

What is Appropriate Architecture?

> "..... I don't mean a soulless mimicry of the past traditions of architecture, but a generation of new design, using the aesthetic and practical bases of these traditions."
> -- His Highness Prince Karim Aga Khan[2]

Appropriate architecture can be defined as an artifact not only responsive to the climatic conditions, physical environment, earthquakes, or to the availability of the site, but something which is an evocation partly of the faith (Islam), partly of the culture, partly of the history of the village

and the region, and partly of the aspirations of the people. These qualities give a building a sense of belonging and identity, not only to the area and the region but also to the people and culture. All these characteristics are present in the Northern Area and are firmly rooted in its people, culture and traditions, and must be reflected in the new jamat khana in a harmonious way.

It is an inescapable fact that one always knows when one is in the Himalayan region. The elements of identity like flat roofs, stone, mud and timber, small openings and windows, wood detailing, and terracing structures, are part of an architectural vocabulary for the Hunza region. The search and definition in this thesis has also been about such elements which give an identity to an architecture of a certain region. The appropriate architecture for the jamat khana needs to transform and adopt these elements according to the program, site, and building materials used. It cannot be a facade hiding the new functions behind a shallow imitation of the past. Nor can it be an outdated or unrealistic system of organization and human relations. The village and its people are changing and these changes have to be acknowledged and reflected in the new architecture, and in doing so, the lessons of the past should not be forgotten.

Search Criteria

The design should address the following criteria:

(1) Before starting the design search for a new jamat khana in Karimabad, Hunza, every effort must be made to understand and learn how the traditional form and system of the region evolved, so that the eventual design can be relevant to the future and appropriate to the traditions of Hunza which would allow man to grow according to the guidance of Allah to the fullest maturity of which his spirit is capable.

(2) Hunza valley possesses a strong culture and tradition which is expressed both in its architecture and the lives of the people. These links with historic heritage should be maintained in the new design, yet not denying to them those contributions which modern technology can make in improving the quality of their life without losing the culture and heritage. Thus the architecture should be sympathetic to both the spiritual and aesthetic heritage of the Karimabad village.

(3) An equilibrium has to be found and formulated between, the ideas that are coming from the more developed parts of Pakistan and the expressions of local traditions.

(4) Modern construction system may be integrated with traditional systems to take advantage of those features which offer greater seismic

stability to buildings.

(5) The search process should carefully address the questions about what technologies can be employed in the changing habitat of Karimabad? What building materials should be used and how valid are they in terms of cost and availability in the region? Whose expertise should be employed: should it be the traditional masons and craftsmen or skilled steel binders and concrete workers? How is this use of expertise related to the future of the building industry of the Karimabad village?

(6) Like other Third World countries, Pakistan's greatest resources is its people. Therefore, if people are to appreciate and feel part of the project, they must be involved in its development. The construction of the jamat khana should utilize local craftsmanship and community people whenever possible and also provide them with an opportunity to learn new skills.

(7) The project should not only be built to meet the current cultural needs of the villagers for a jamat khana, but also to establish a durable semantic and aesthetic frame of reference that would serve this generation and possibly the ones to follow as well.

(8) The design should incorporate kinesthetic experiences like air currents, touching of the skin, the sound of moving water, touch of varied

surfaces and textures, richness of color and the play of light and shade upon vision, and the scent of plants in a garden.

Conceptual Considerations:

(1) Designing a community building of this scale and size in Hunza valley is a major intervention in the area. The built product might very easily become the center of attraction for the whole of community. It is not a monumental structure, but can be called an opinion-making structure for Karimabad village. It is essential that whatever is done should be done carefully, as it is quite likely that any innovative idea will be imitated by many people in future constructions. Therefore, the choice of building material, the choice of structural system and above all the design should be carefully made, bearing in mind that the building may act as a learning experience not only for the masons, artisans and builders, but for the whole community in the region.

(2) Some of the Fatimid mosques used T-shaped plan, probably to reflect or signify a particular activity in the prayer hall. Today, in many Ismaili jamat khanas in Pakistan and elsewhere, certain portions of the prayer hall are reserved for specific activities or services. This characteristic can possibly be reflected in the design

(3) Because of the scale, the roof of the of the prayer hall can be broken up to be more sympathetic to the surrounding built forms. This concept

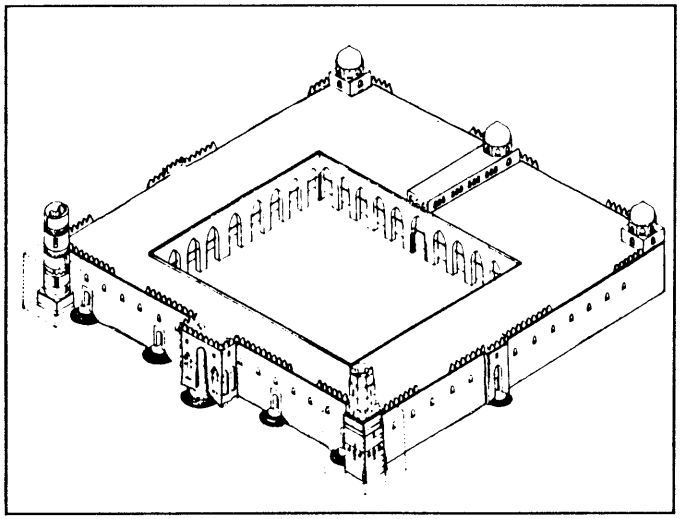

Fig. 5.1 Mosque of al-Hakim in Cairo.

becomes more important when the building is easily noticeable from other parts of the village.

(4) The nature of the village and the site demands that the contours be respected and the height of the structure be kept as low as possible.

(5) Since the prayer hall is the most sacred and important part of the project, it may be provided maximum isolation and privacy from other activities of the project and of the village. The service of offering prayer in the jamat khana, just as any other place of worship, demands that the interior be an experience in itself. It may use natural elements to remind a believer of God's creations and blessings, and may not be overpowering and distracting.

(6) The use of natural light in the jamat khana can be used to symbolize the presence of divine light (Noor) on earth, embodied in the Imam, for spiritual guidance of a believer on the right path.

(7) The structural system should be sturdy in view of the prevalent seismic conditions and yet it should at the same time be local to the area. The jamat khana building would be required to act as a shelter in case of a major disaster, such as an earthquake.

(8) Electricity and heating can be introduced in the jamat khana project

by using the Barbar water channel which flows by the site. Also the electricity generated by the channel can be used to operate a stone-cutting machine for this construction.

(9) Stone masonry might be preferable over the use of concrete blocks for several reasons, one of which is better insulation. For proper energy conservation either an insulated or a double wall can be used. In winter the absence of a proper heating system may necessitate the building envelope have proper insulation. A crawl space can be used for similar purpose.

(10) The Square, a basic form of geometry has been widely used in the region. This concept is further reinforced by the use of octagonal patterns in timber carved screens, as in the case of the fort. These existing patterns can form the basis for decorative geometrical design.

Site:

The site of the jamat khana is on a slope facing south. The slope is recessed at the site because it was previously occupied by a jamat khana building. The flat portion of the land measures 180 feet by 72 feet. Two pathways meet at the south-east corner of the site and hence makes it an important location. The Barbar water channel from the mountains, serving the village, passes from the south and along the length of the site. The ground is rocky and the surface is muddy in parts.

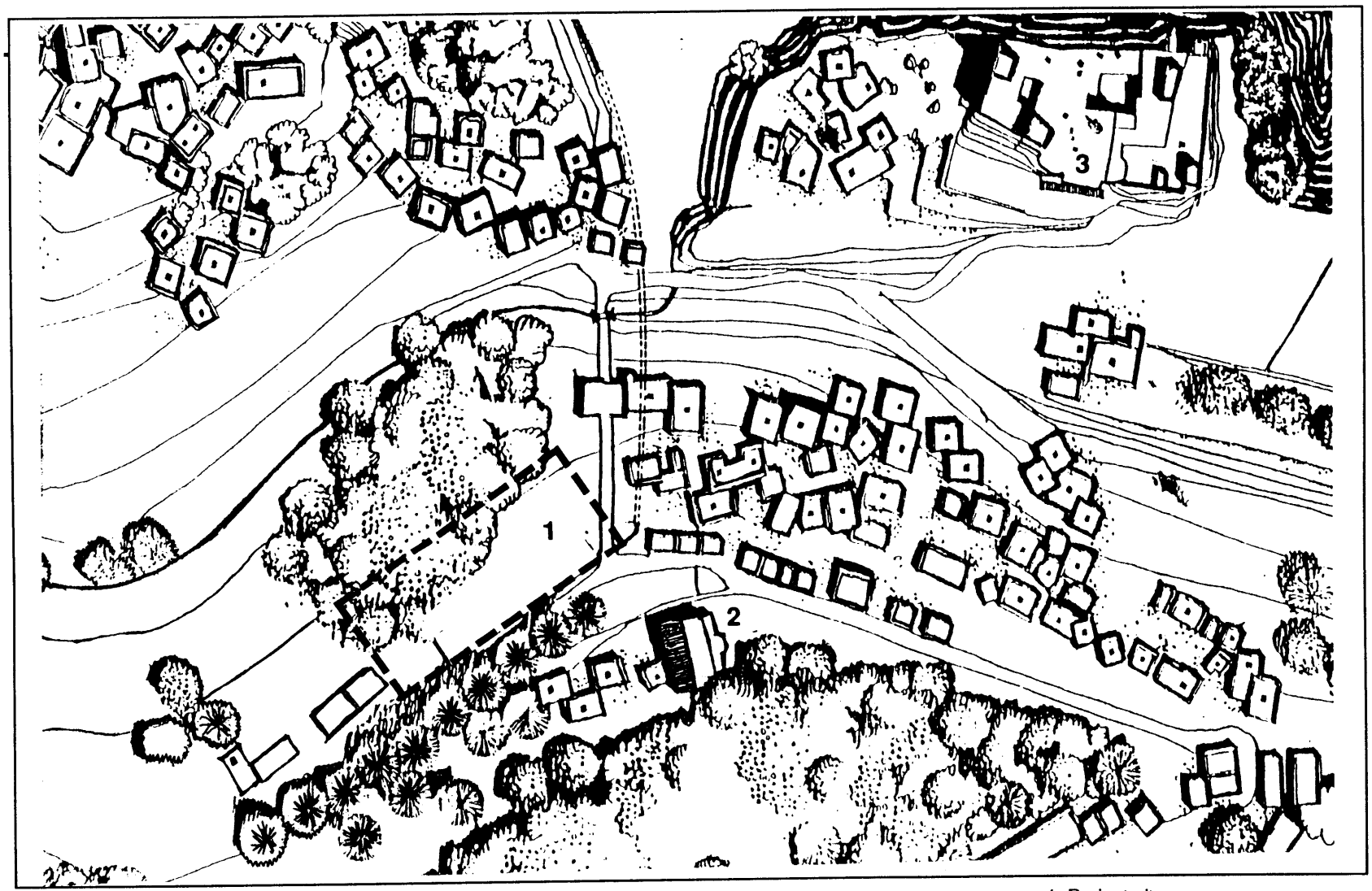

Fig. 5.2 Plan of the village showing the location of the site.

1. Project site
2. Existing Central Jamat Khana
3. Baltit Fort

Fig. 5.3 The project site with the old jamat khana building. Photo taken in June 1986.

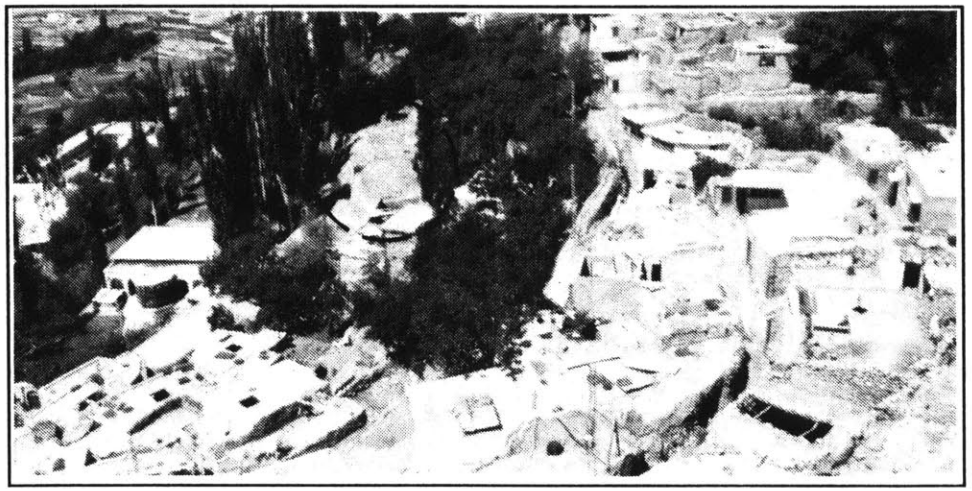

Fig. 5.4 The site after the demolition of the jamat khana building. Photo taken in August 1988.

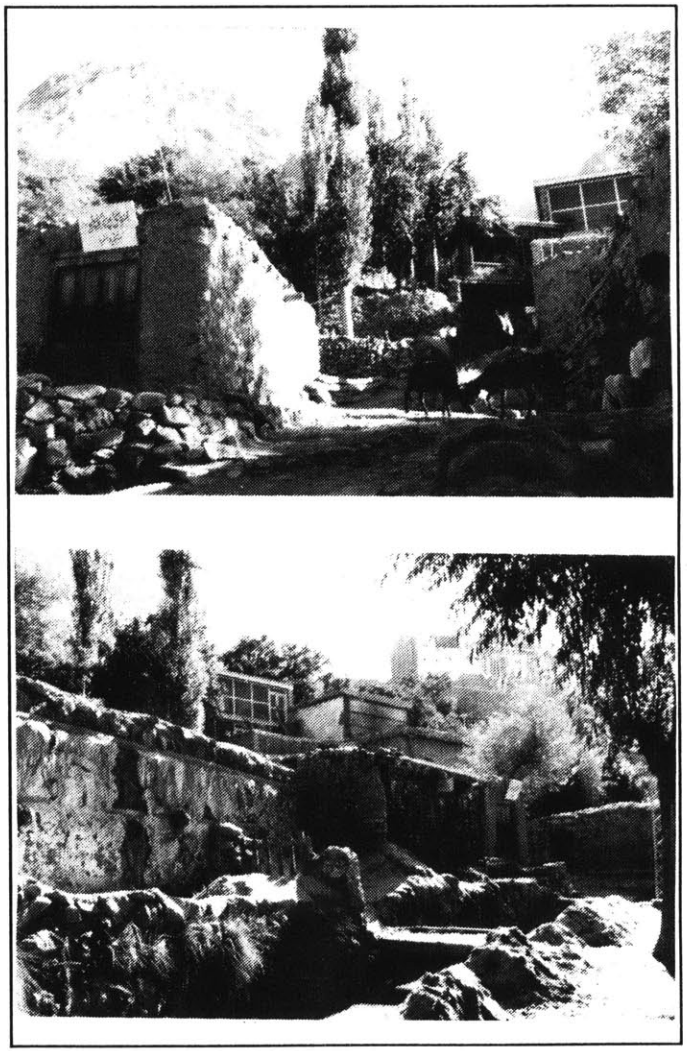

Fig. 5.5 (Top) Looking north towards the east pathway from the south-east corner of the site. (Bottom) Looking east from the southern pathway.

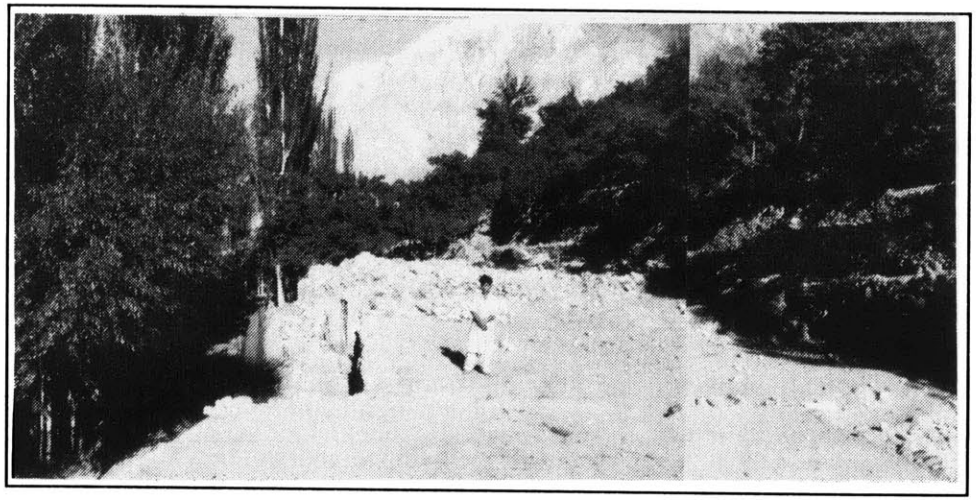

Fig. 5.6 The flat portion of the site as seen from the east.

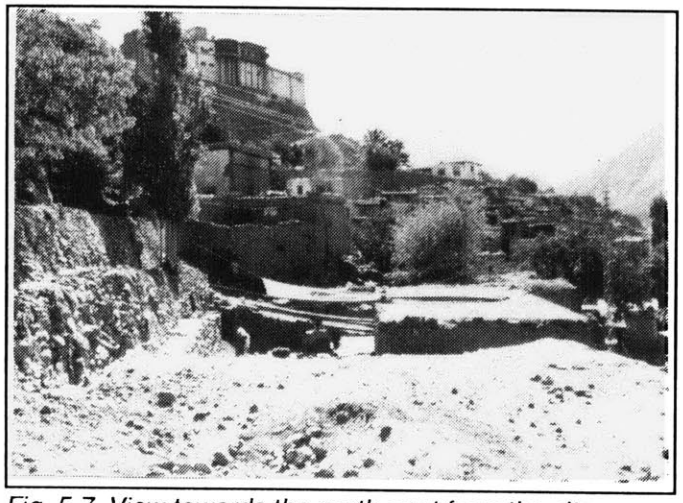

Fig. 5.7 View towards the north-east from the site.

The Program:

There are four activities that will be conducted in the jamat khana complex:

(1) Prayer Activity

-- Prayer hall capacity: 640 persons @10 per sq.ft. ... ..6,400 sq. ft.

- - Entry foyer and vestibule .....1,536 sq. ft.

- - Shoe area (each for men and women) .....450 sq. ft.

- -

(2) Reception Activity for His Highness the Aga Khan

- - Conference room .....640 sq. ft.

- - Offices (for the *mukhi* and *kamadia*).....256 sq. ft.

- - Kitchenette and toilet as appropriate.

(3) Administrative Activity

- - Office for Tarikah Board. .....320 sq. ft.

- - Office for Education Board. Four person capacity .....320 sq. ft.

- - Office for Health Board. Four person capacity .....320 sq. ft.

- - Office for Regional Council. Four person capacity .....320 sq. ft.

- - Office for Local Council. Four person capacity .....320 sq. ft.

- - Office for scouts/volunteers (men).....256 sq. ft.

- - Office for guides/volunteers (women).....256 sq. ft.

(4) Commercial Activity

- - Shops as site allows

Design Search Process:

The search process for an appropriate design of the jamat khana has been educational involving several stages, each one of which has yielded greater clarity and simplicity in the articulation of design and towards the goal to be achieved. It has been a challenging opportunity to develop a design relying mostly on the memory of the site, the photographs and drawings obtained during the visit to Karimabad in August 1988. This restriction has been the source of some limitations, but, at the same time, it has encouraged me to face the challenge with an added thirst and zeal to search for an appropriate solution more rigorously and persistently.

The site planning and program placements were quite important in this project to make the complex respond to the low-key housing structures by which it is surrounded. That the prayer hall must be oriented towards Mecca, i.e., west, was one aspect in the design search which was decided from the beginning. This required the placing of the *qibla*[3] wall of the prayer hall facing west so that the entrance courtyard is on the east--facing the intersection of two pathways. This arrangement worked better for access to the prayer hall which could be through the courtyard from the two walkways, one to the east and the other to the south.

There were various design stages involved in the search process for an appropriate building that responded to the criteria and concepts mentioned earlier. The design features developed in each of these stages

are as follows:

First pass, week two:

- - A simple courtyard scheme enclosed by a two storey structure. The prayer hall was on the second floor and the offices underneath it and in the courtyard.
- - Access gate to the courtyard from the east walkway.
- - Site contours and the intersection of the two walkways ignored.
- - Stone and reinforced concrete considered as possible building materials including the roof-bearing member inside the prayer hall.

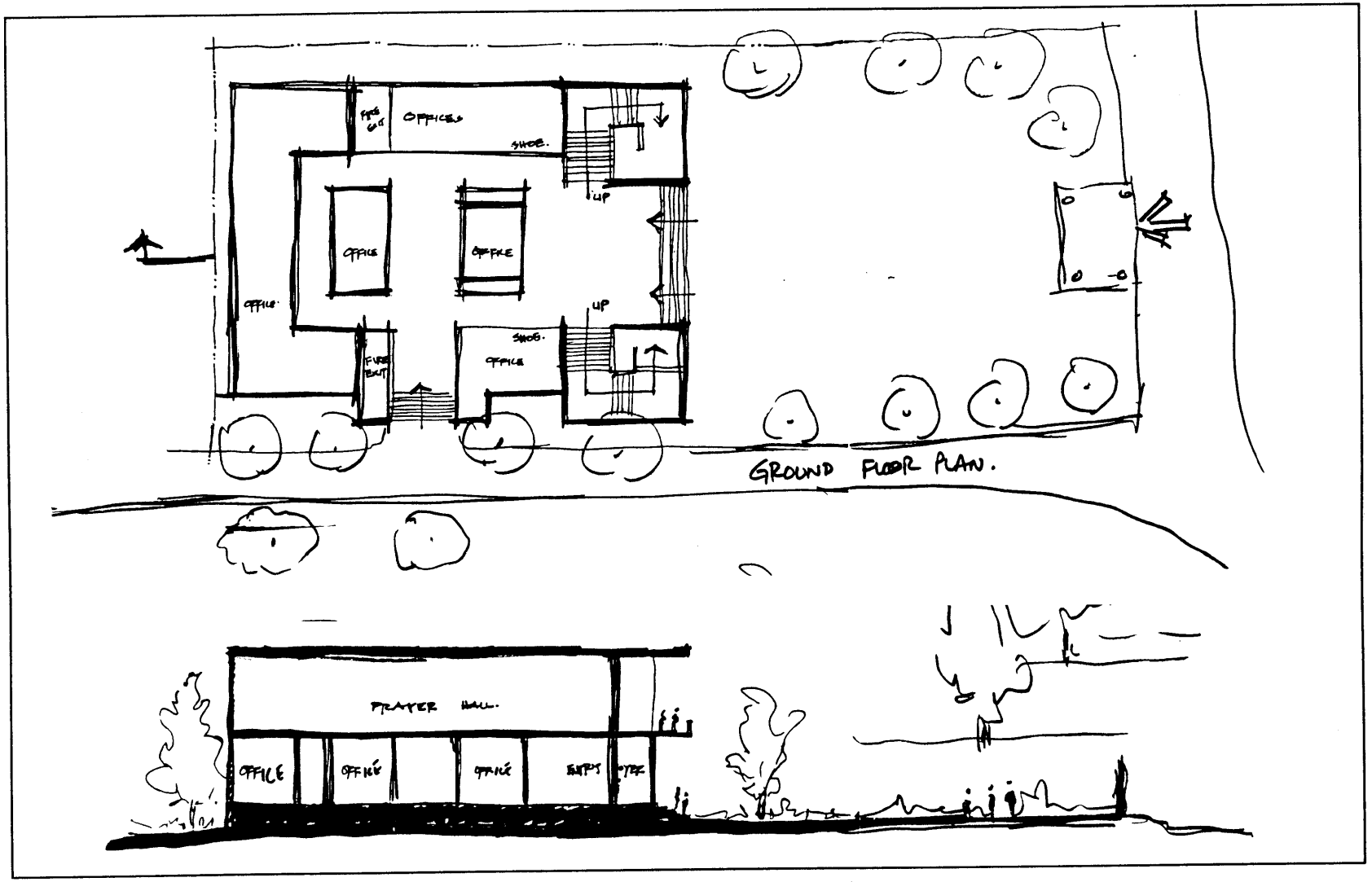

Fig. 5.8 Plan and section of the first pass.

Second pass, week three:

- - Prayer hall moved to the ground level making the whole structure single storied and simplifying the scheme. The reasons were, that in the two storey scheme, there would be inadequate light in the lower level, and that lowering the scale of the building would make it more sympathetic to the surroundings and also less vulnerable to earthquake.
- - The prayer hall sized to accommodate five bays of 16' x 16' in either direction, with entry foyer to be one bay deep.
- - Some regard expressed for the site slope by taking advantage of it and placing some of the offices higher on the northern slope with the remaining ones in the courtyard. Both set of offices rest on the ground so that they are seismically more secure.
- - New level below the main courtyard and in the slope added to accommodate shops -- a new concept for jamat khana complexes in Pakistan. Access to the courtyard from the two paths. Intersection of the paths needs to be addressed.
- - Prayer hall roof to be directional towards Mecca with a stepped-down section as shown. This has been done to break up the roof form and respond to the surrounding built environment.
- - Bearing system for the roof inside the prayer hall to be masonry arches. This was done in an endeavor to respond to the use of local stone in the surrounding houses, and to provide employment and encourage the persistence of local trades.

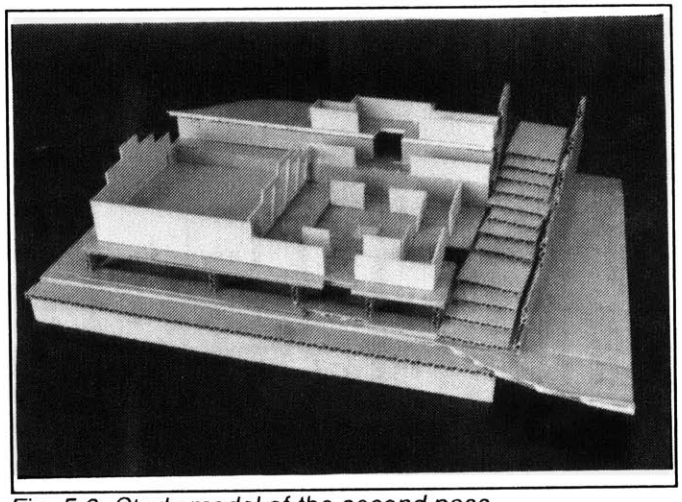

Fig. 5.9 Study model of the second pass.

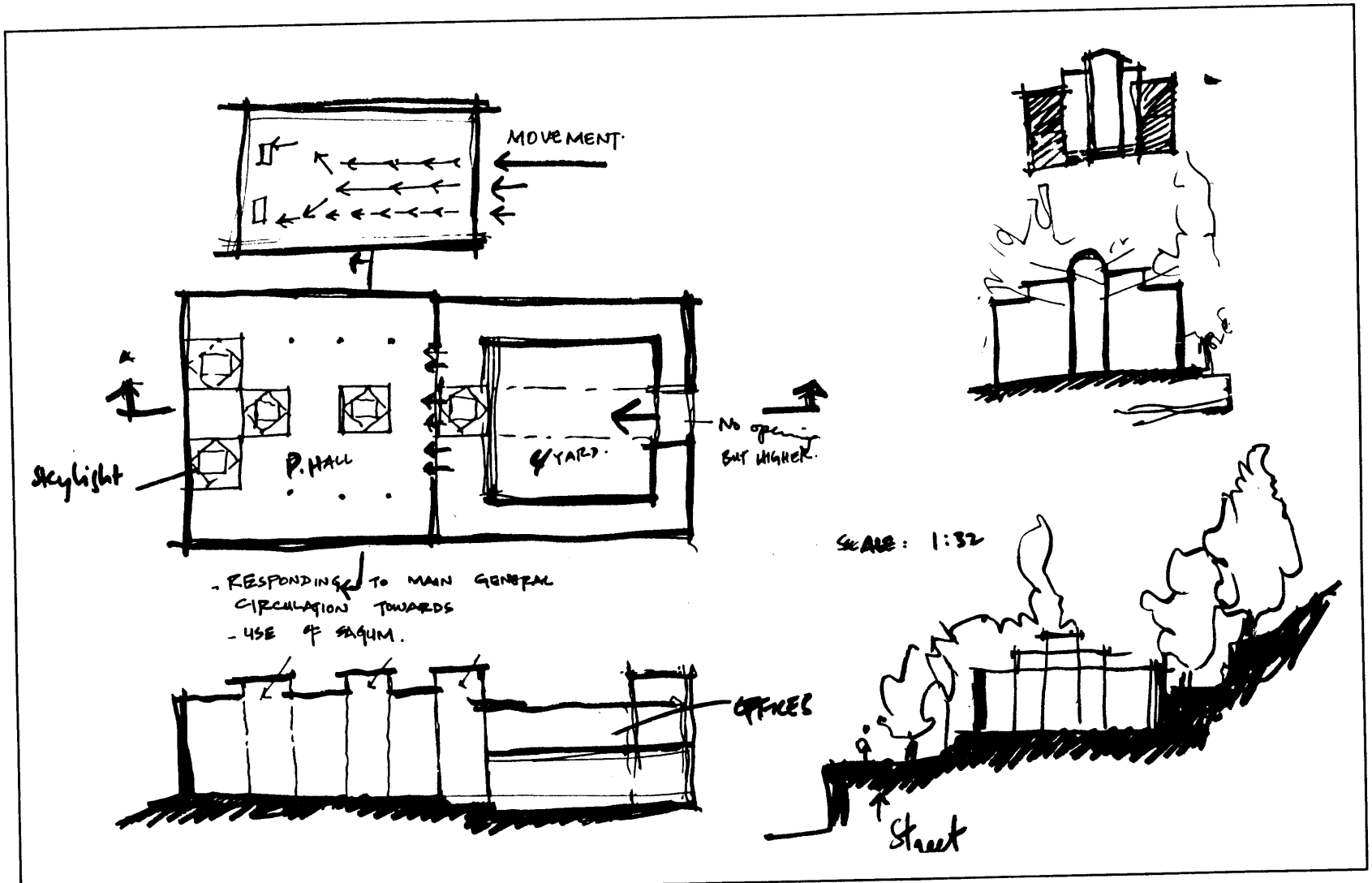

Fig. 5.10 Sketches showing the prayer hall on the grond floor and offices forming a courtyard.

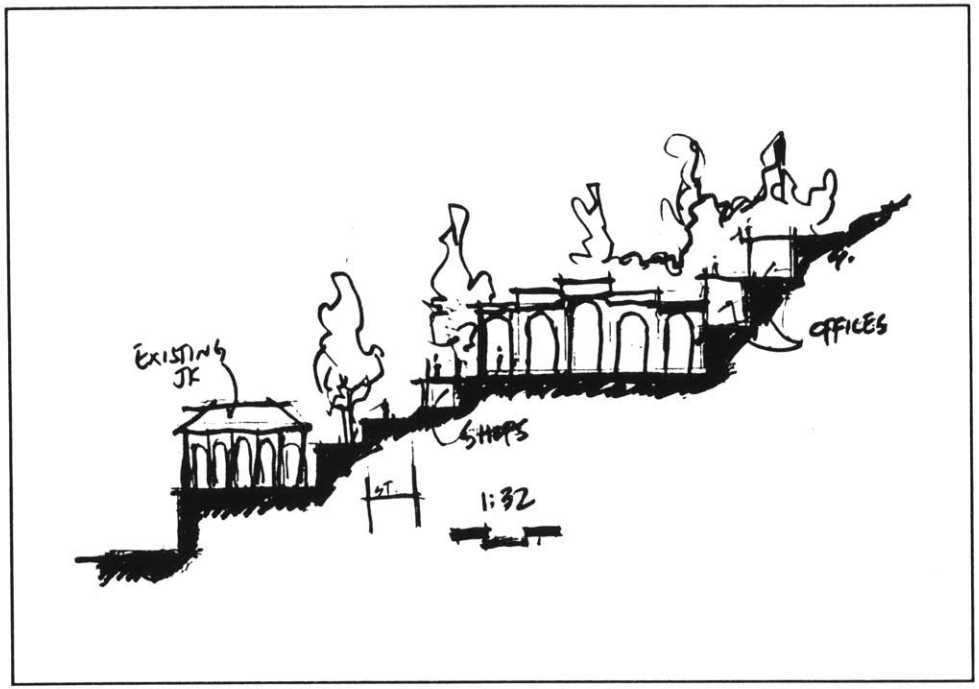

Fig. 5.11 Sketch showing the introduction of shops and placment of offices on the northern slope.

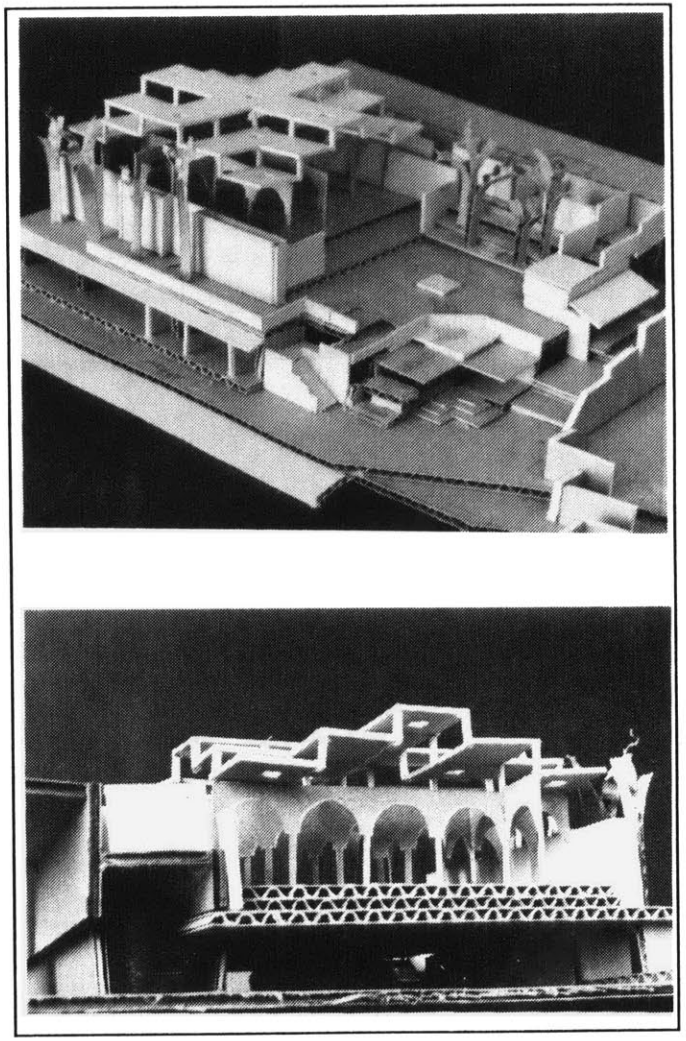

Fig. 5.12 Photos of study models of the third pass. The south-east corner fo the site cuts into the courtyard. Prayer hall had light timber roof with masonry bearing system.

Third pass, week five:

- The junction of the two paths was addressed by adding a gathering space which required cutting into the courtyard space. But in doing so the courtyard which should be attached to the prayer hall, has partially lost its symmetry and balance .
- All the offices from the courtyard were moved to the northern slope which, might however, be cramped if all the offices were there. The advantage of this arrangement is that it opens the courtyard allowing visual relationship with the village surroundings.
- Prayer hall roof-bearing system still of masonry arches with light timber roofing on top. Roof to be independent of the side walls of the prayer hall so that in case of wall failure the roof may remain unaffected.

Fourth pass, week seven:

- - Masonry bearing system for the prayer hall roof changed to timber columns for more seismic safety. Timber roof still to be independent of the masonry walls to allow the roof to be supported by elements that can sway in case of any shaking. Thus, the whole system may act like a concrete cup with a light roofing structure inside it.
- - An attempt to introduce a new roof system by using a large-scale, traditional *sagum* with diagonal square timber frames for the whole prayer hall. This was experimental to search for a roof using a traditional system.
- - Addition of an extra level between the previous two levels to house the offices and primarily to raise the jamat khana to let more light and air in from north. The conference room, which is actually the office for His Highness the Aga Khan during his visit, to remain on the north slope, as it may be inappropriate to move it to the second level or elsewhere.
- - The south edge of the complex becomes more responsive to the curve of the path by curving itself, and as a result creates a small-scale path above an existing one. The curved terraces create a small-scale version of the large curving fields used for agriculture in the valley.
- - Struggle with the southeast corner of the site continued. More work and simplification needed.

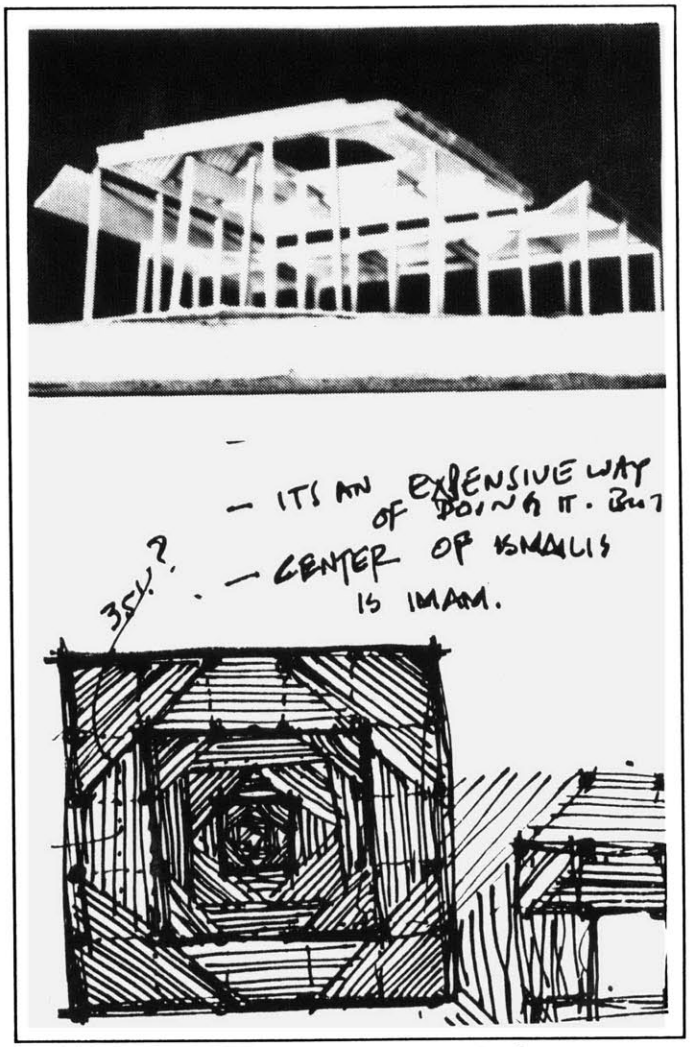

Fig 5.13 Study model and a sketch of the Sagum *roofing system for the prayer hall.*

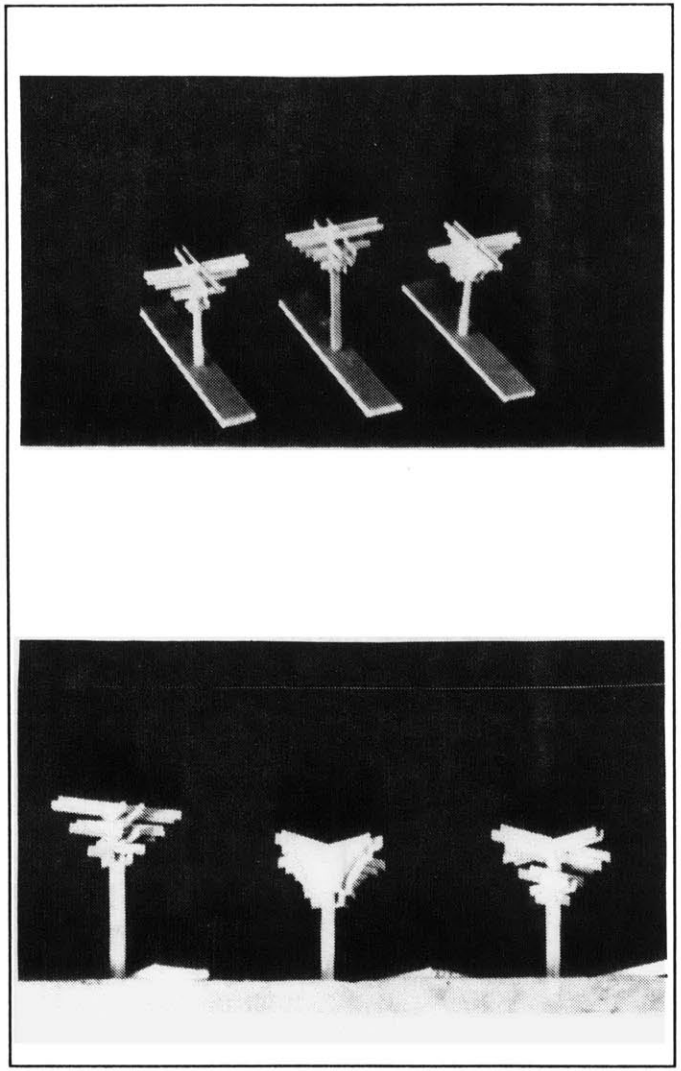

Fig. 5.14 Study models of diagonal bracing for the prayer hall.

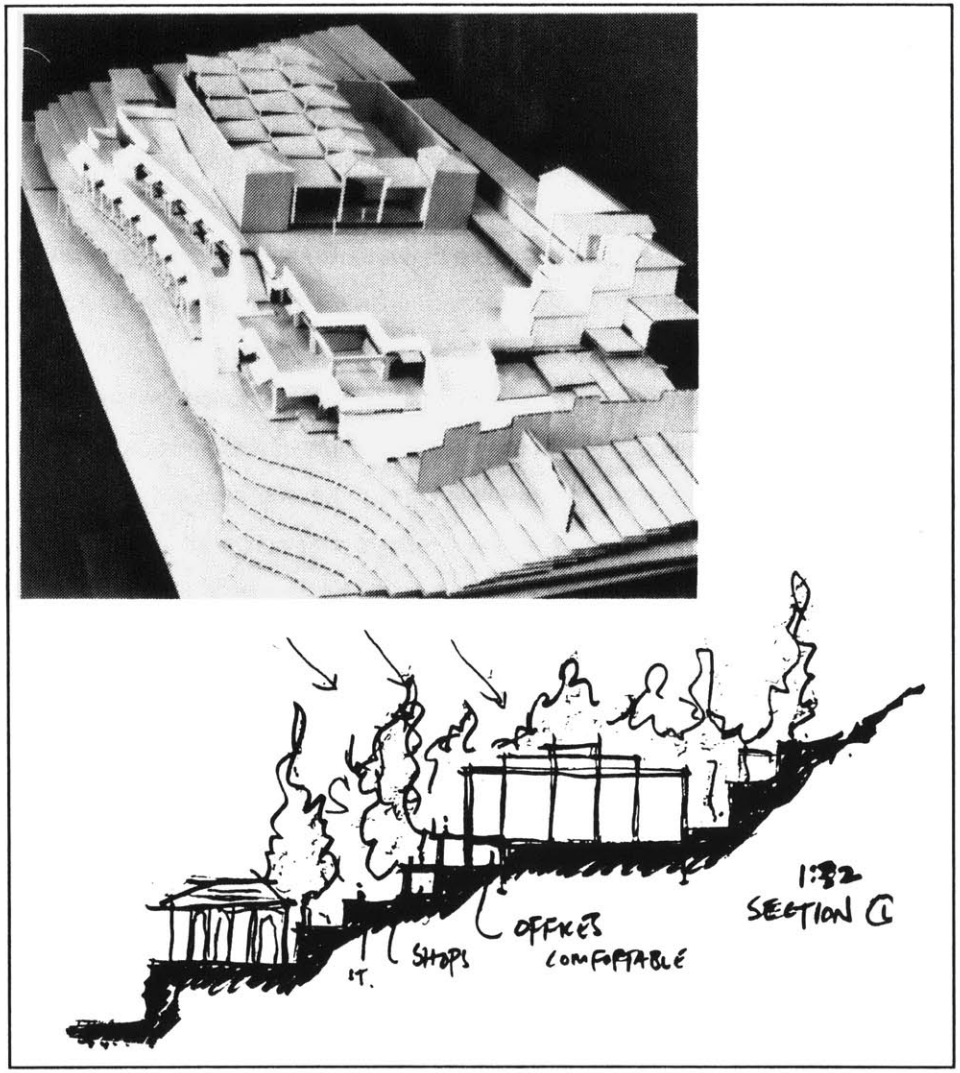

Fig. 5.15 Fourth pass -- addition of another level above the shops. The south edge of the building curves responding to the southern pathway.

Fifth pass, week nine:

- The south-east corner of the complex transformed and simplified into a terracing structure without allowing the courtyard of the jamat khana to be sacrificed. This has been achieved by reducing the size of the courtyard by one bay.
- Jamat khana wall from inside more defined. Entry foyer enlarged with the addition of another bay unit to provide a better transitional space and to introduce a vestibule for energy conservation reasons.
- Shops to remain on the first level and the offices to remain on the second, whereas the conference room and two of the offices to be located on the northern slope. This way the privacy required for the offices and, especially for the prayer hall, can be achieved.
- Entry to the jamat khana to be from the two paths, with the one on the east being more directional and ceremonial, and forming the main axis. The transverse axis of the courtyard addresses the entry to the conference hall.

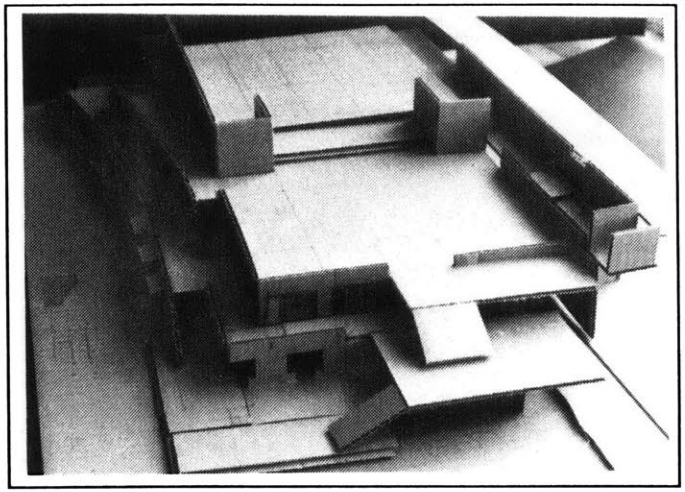

Fig. 5.16 Fifth pass. Southeast corner simplified.

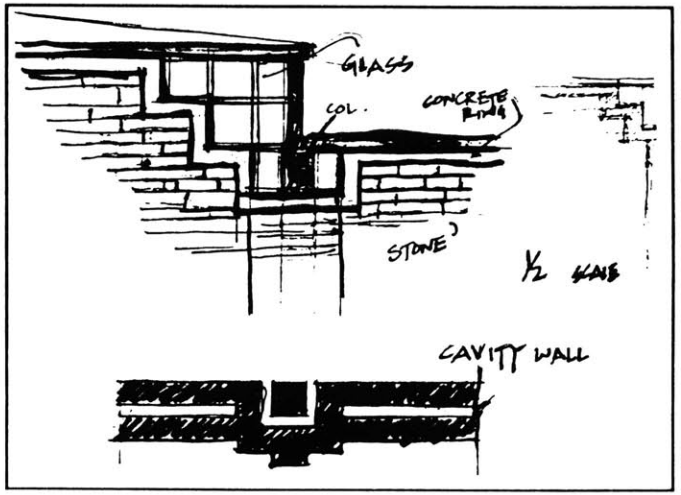

Fig. 5.17 Study of column and wall placing for the prayer hall.

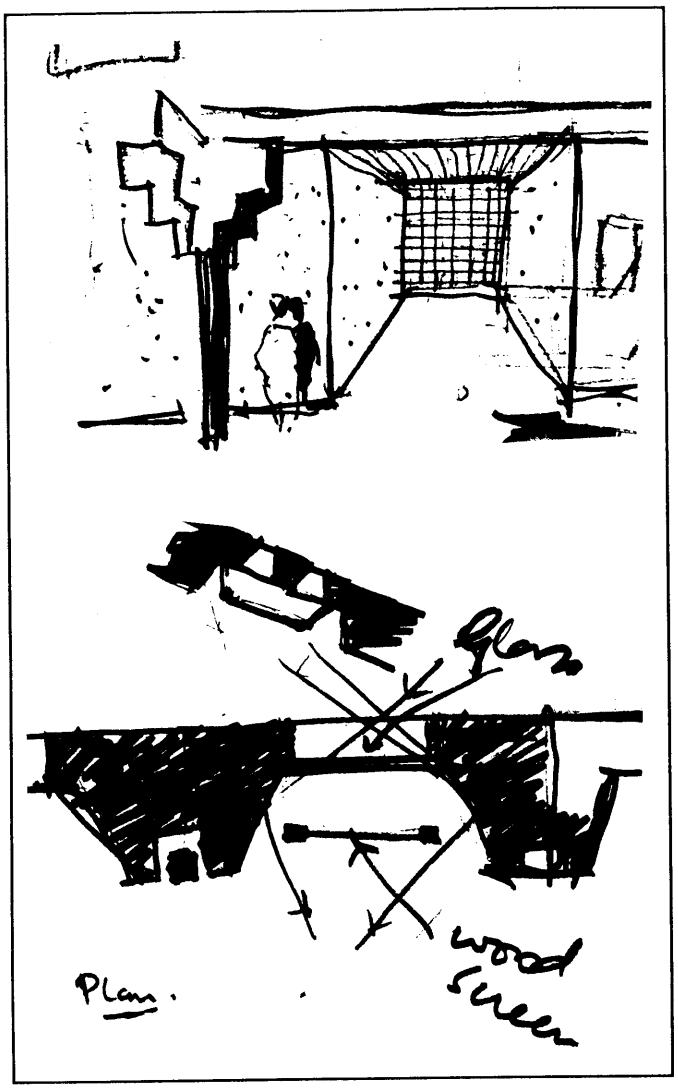

Fig. 5.18 Prayer hall wall from inside more defined. Integration of structure, light and decorative elements.

In summation it can be said that these stages in the search process have helped in simplifying and clarifying the design solution. They have also helped in establishing a hierarchy among the diverse functions and in addressing the issues relating to seismicity, building materials, use of traditional crafts versus new systems, and the relationship between the proposed building and existing low-key structures. The search process proved to be a learning experience in formulating ideas for an appropriate design solution that may relate to a particular time and place. The final design solution, which has been discussed in the next chapter, forms an architectural frame of reference that relates to the past, present the future of the Hunza region.

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1 Aga Khan Award for Architecture. *The Expanding Metropolis: Coping with the Urban Growth of Cairo.* Cairo: Concept Media, Pte. Ltd. November,1984.

2 Aga Khan Award for Architecture. *Towards an Architecture in teh Spirit of Islam.* Geneva: AKAA. April 1978.

3 Qibla wall is the wall of a mosque or a prayer hall oriented towards Mecca.

Chapter 6

The Design Searched

Appropriate design, as ultimately resolved, is intended not only to respond to the current needs of the village for a larger jamat khana but also establishes an architectural frame of reference which can possibly be utilized for other community buildings in the region. The design respects the site contours, establishes a hierarchy for three different functions by establishing three different levels; thus forming a terracing structure -- a major feature of Hunza architecture.

Project

The design scheme has been divided into four distinct parts.

First, the most significant section is the prayer hall. The space, in which this function is performed, occupies a major part of the site, and acts as a functional nucleus of the complex. All the other activities revolve around it. This prayer hall, even though for the use of any Ismaili Muslim, demands a certain privacy, and so has been located on the uppermost, i.e., the third level. This placement also helps in maintaining the sanctity of the building.

The second section of the complex is the reception building which contains a conference room and two offices for His Highness the Aga Khan during his visits to Hunza. This section can also be used by the administrative offices of Karimabad. Although, the placement of the reception building on the same level as the prayer hall relates the two buildings spatially by means of a ceremonial courtyard, the reception building nevertheless has a strong identity of its own.

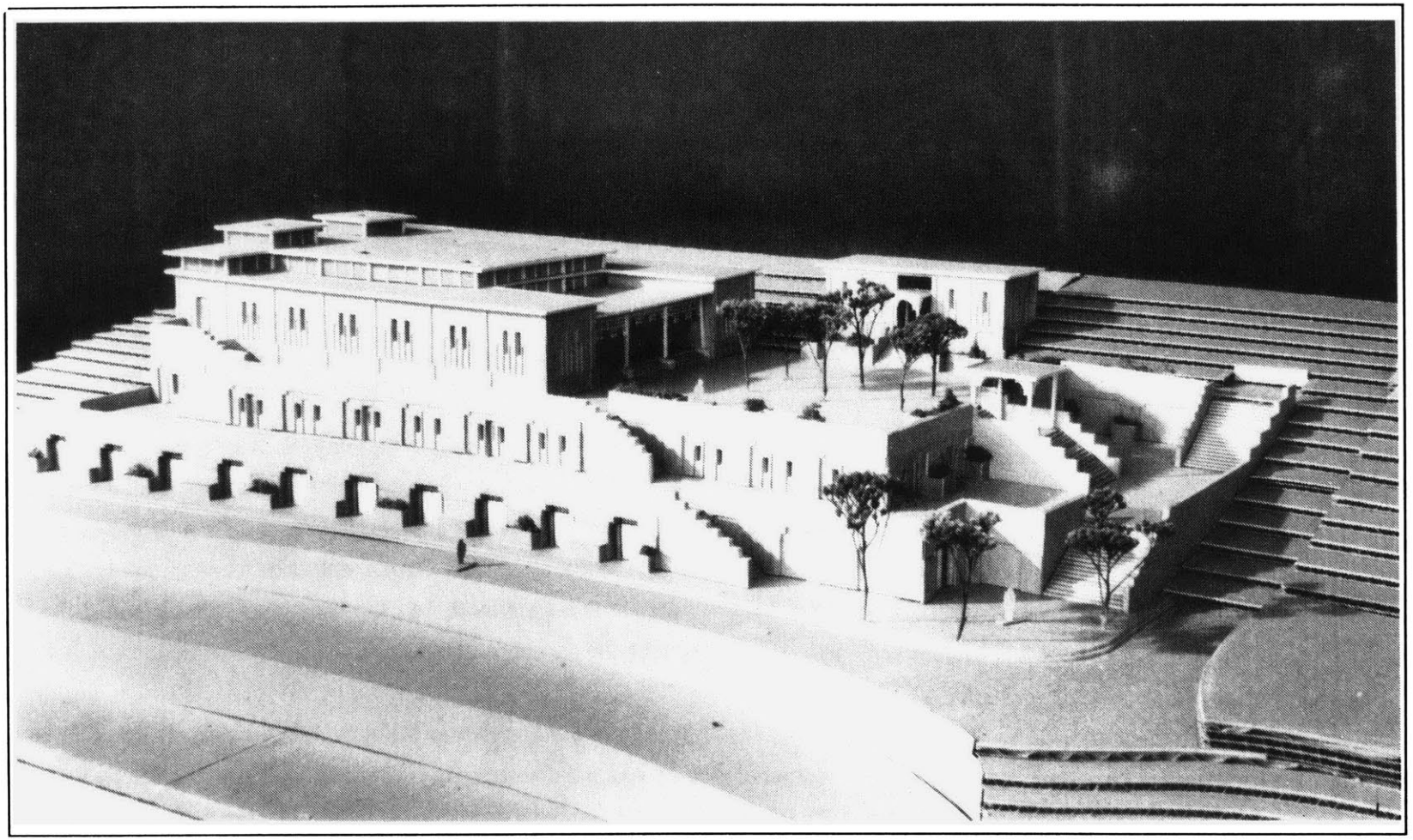

Fig. 6.1 View of the project from the south.

The third component of the community affiliated offices is located on the second level. This floor acts as a transition between the two levels, above and below. Access to these levels might later be controlled by locating doors at the stair entry points.

The fourth and the most public aspect of all the functions is the commercial part of the program. It addresses the street and helps maintain the pathway. As already mentioned, the introduction of a commercial aspect in the program is a rather new concept for the jamat khanas in Pakistan.

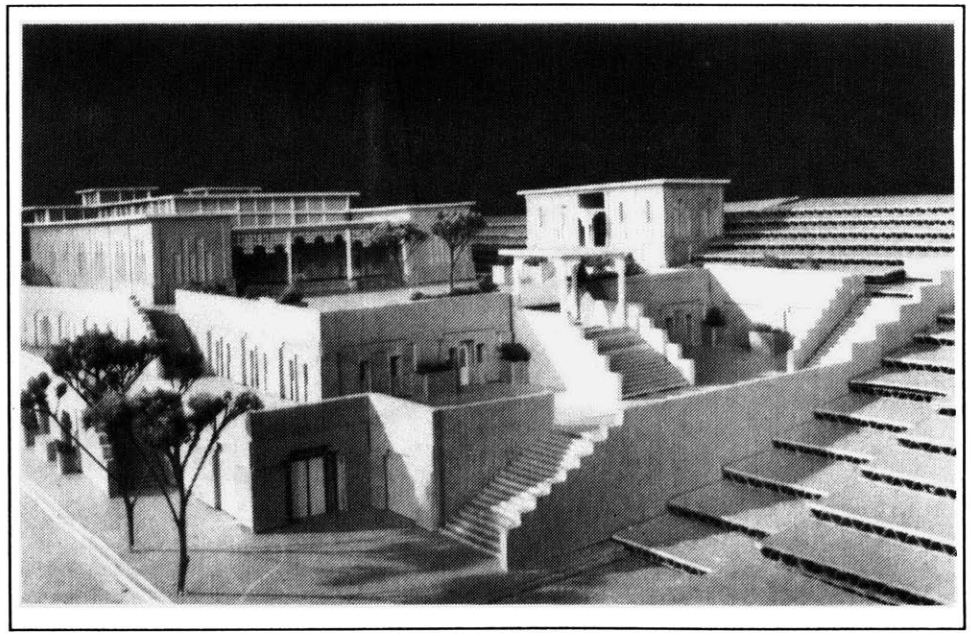

Fig. 6.2 The south-east corner.

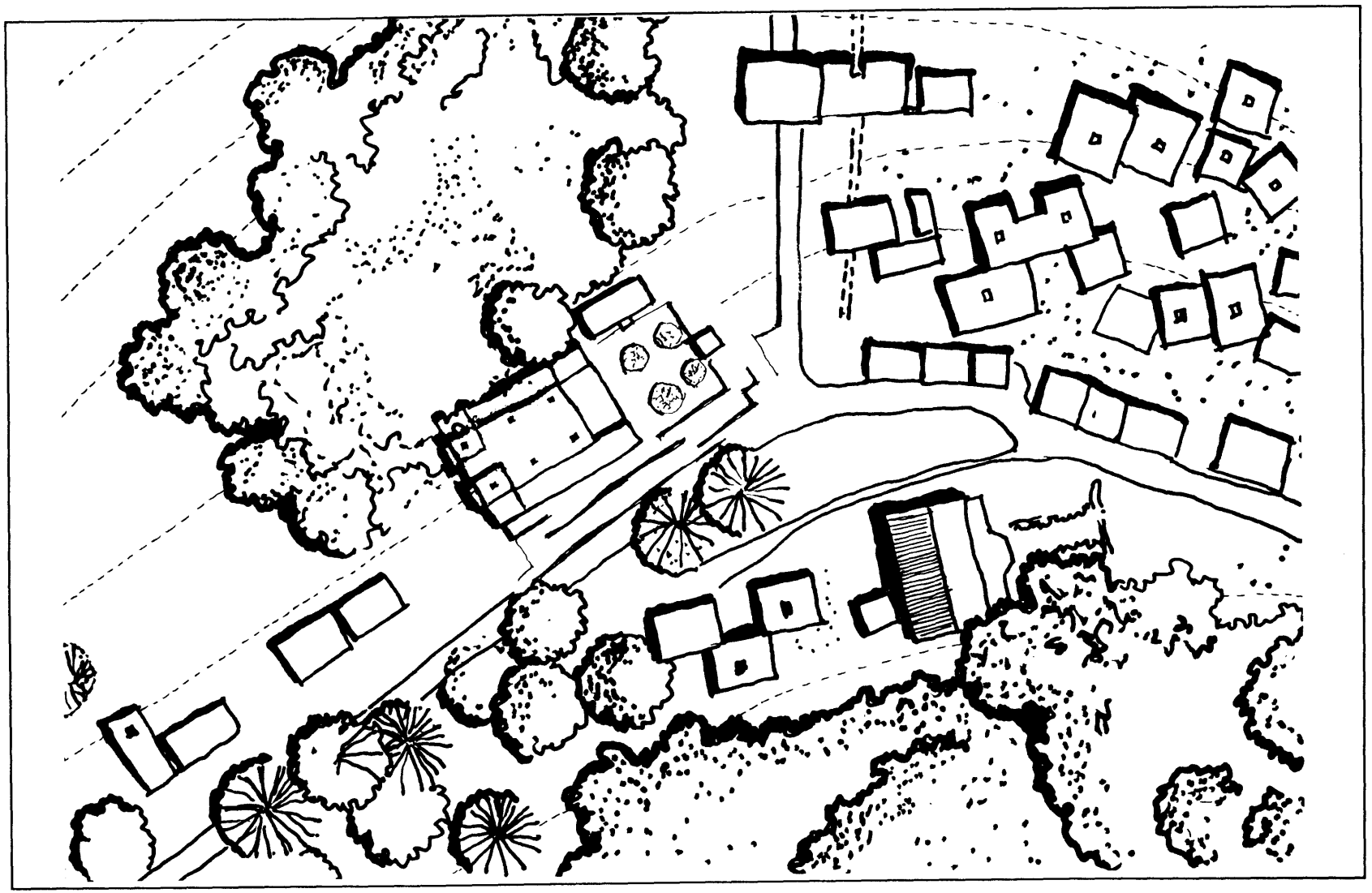

Fig. 6.3 Roof Plan of the project as it sits in the village.

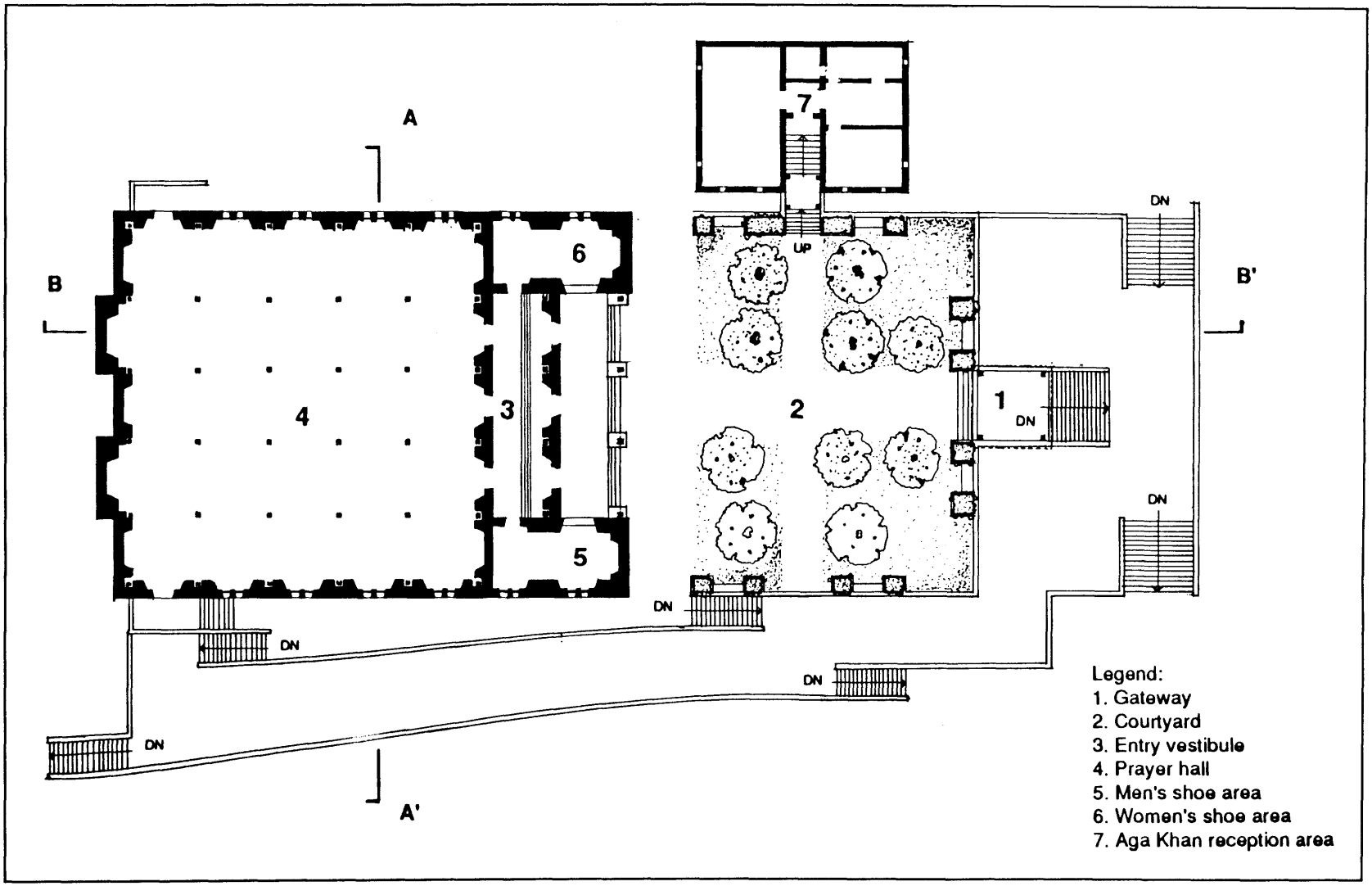

Fig. 6.4 Plan Level III

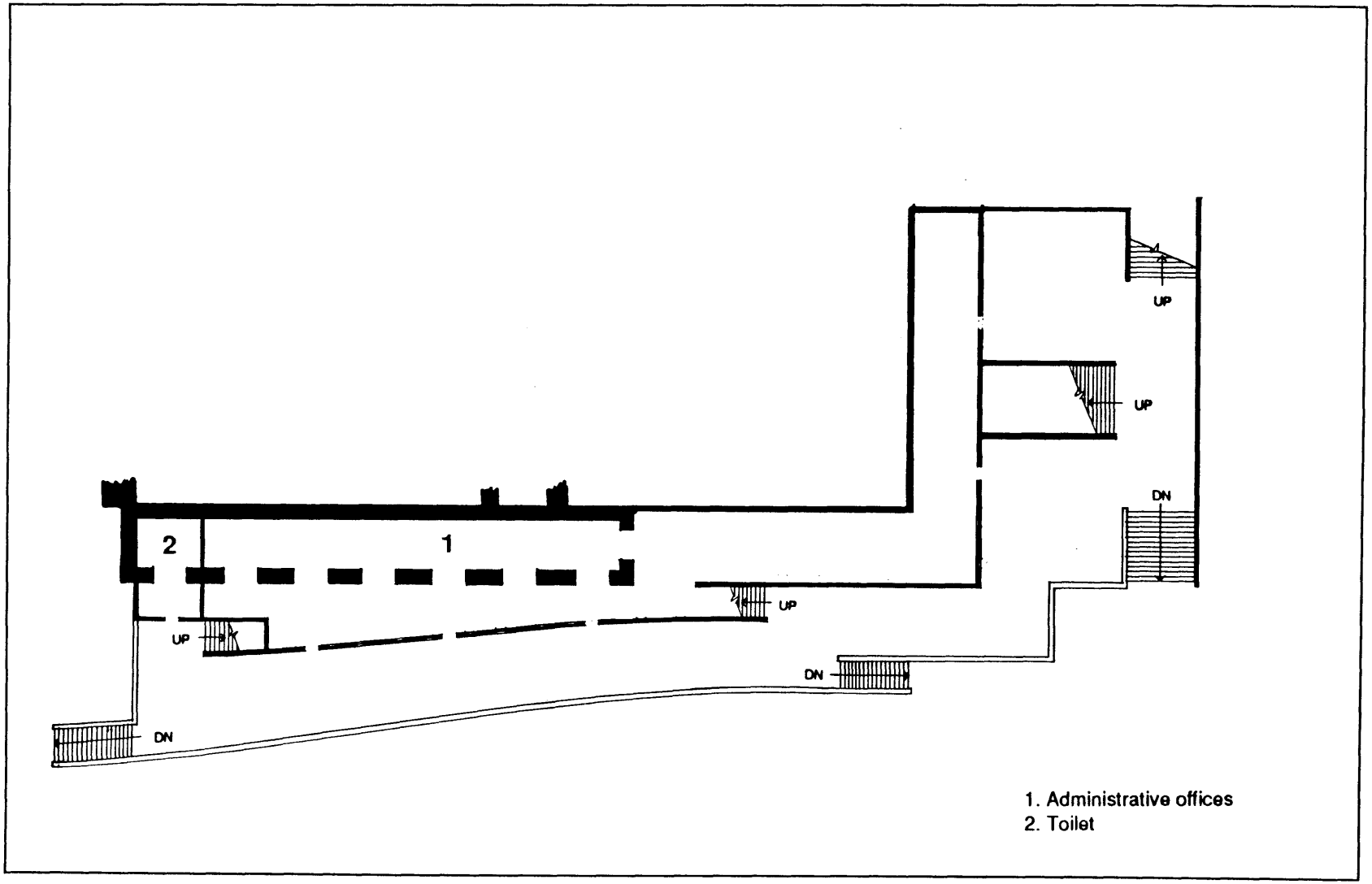

Fig. 6.5 Plan Level II

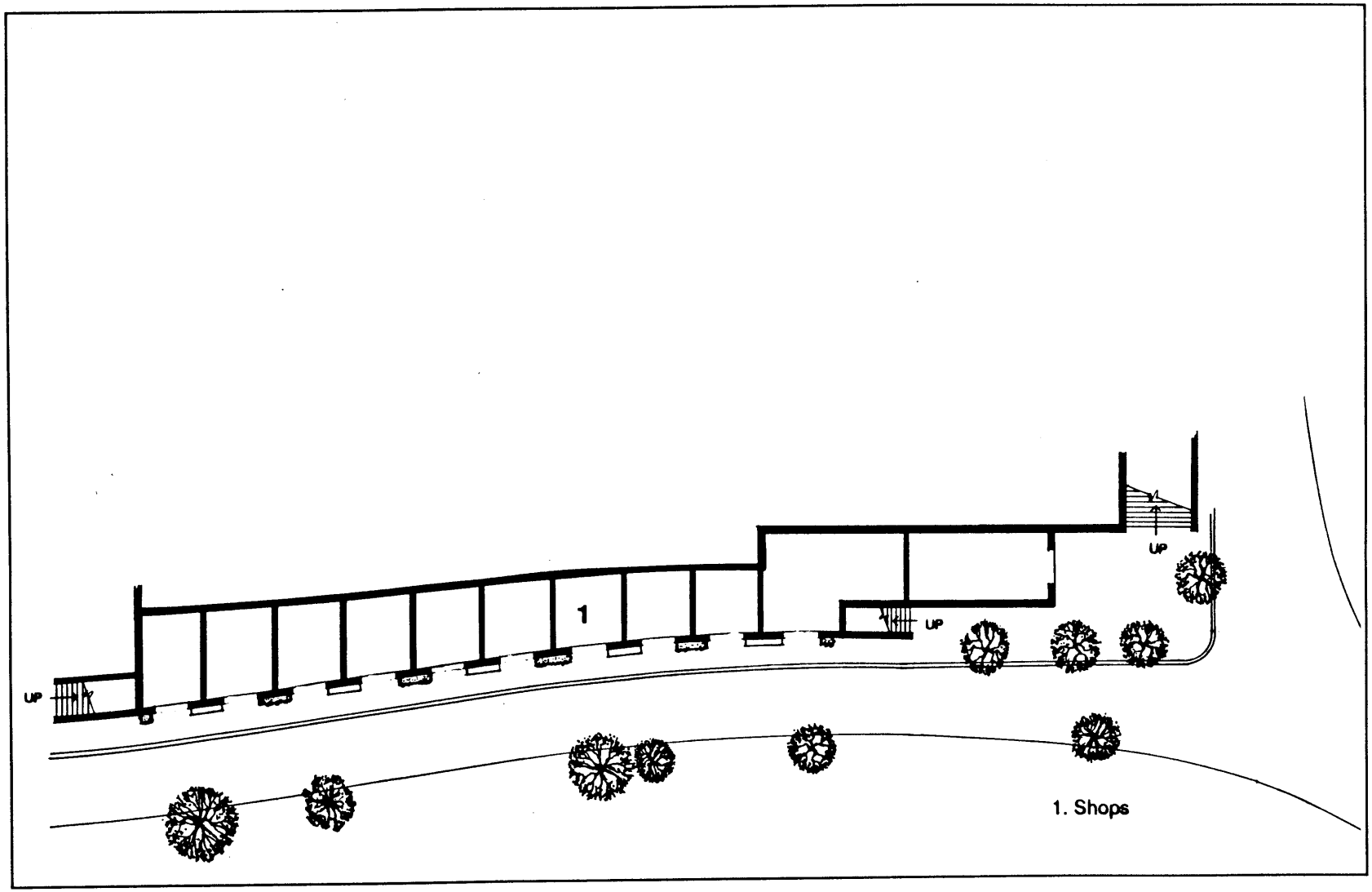

Fig. 6.6 Plan Level I

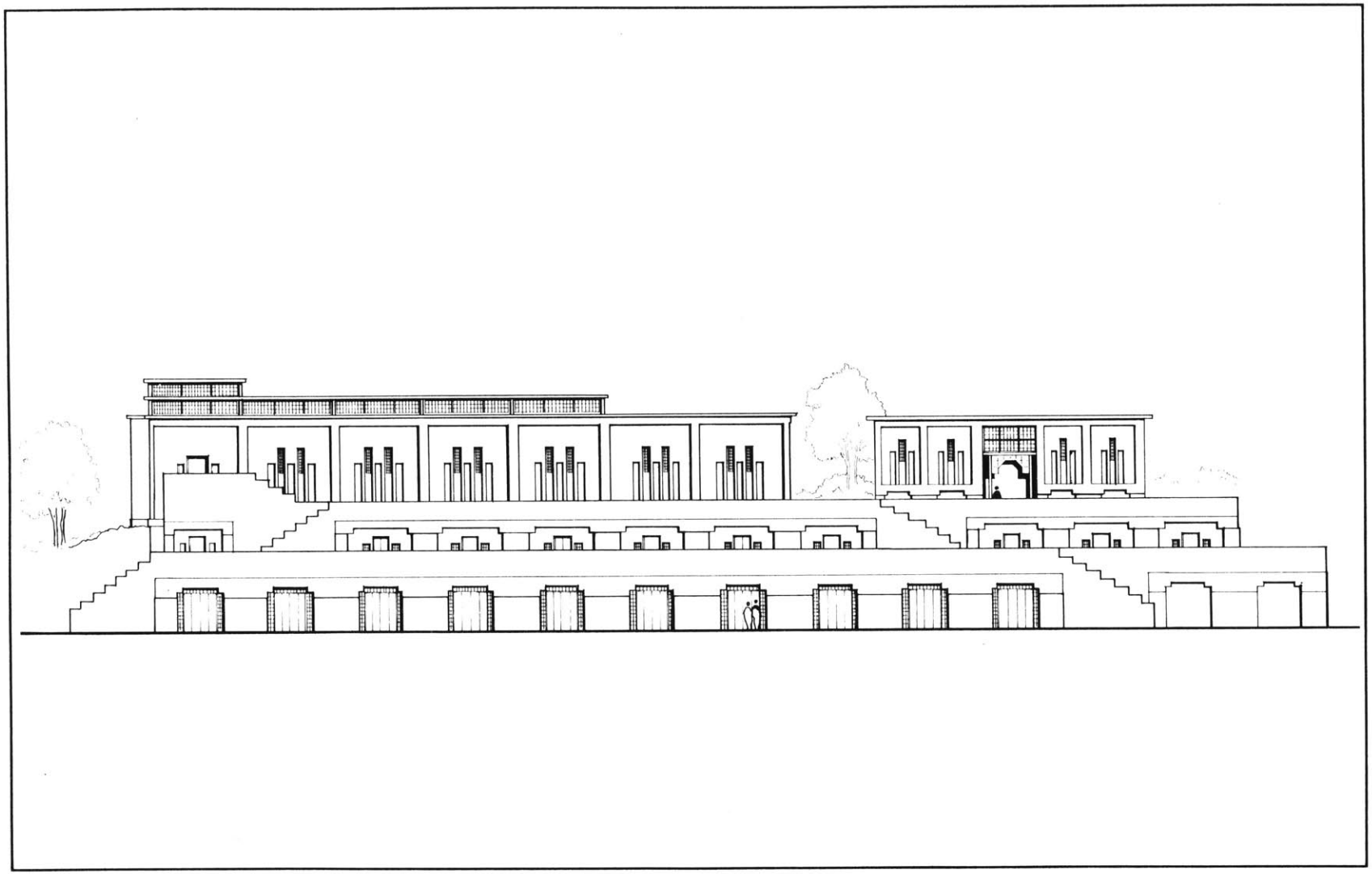

Fig. 6.7 South Elevation

0 16 32 48

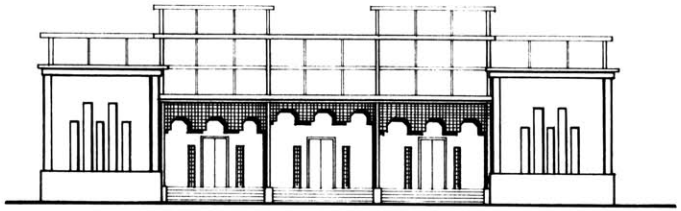

Fig. 6.8 East elevation of the prayer hall

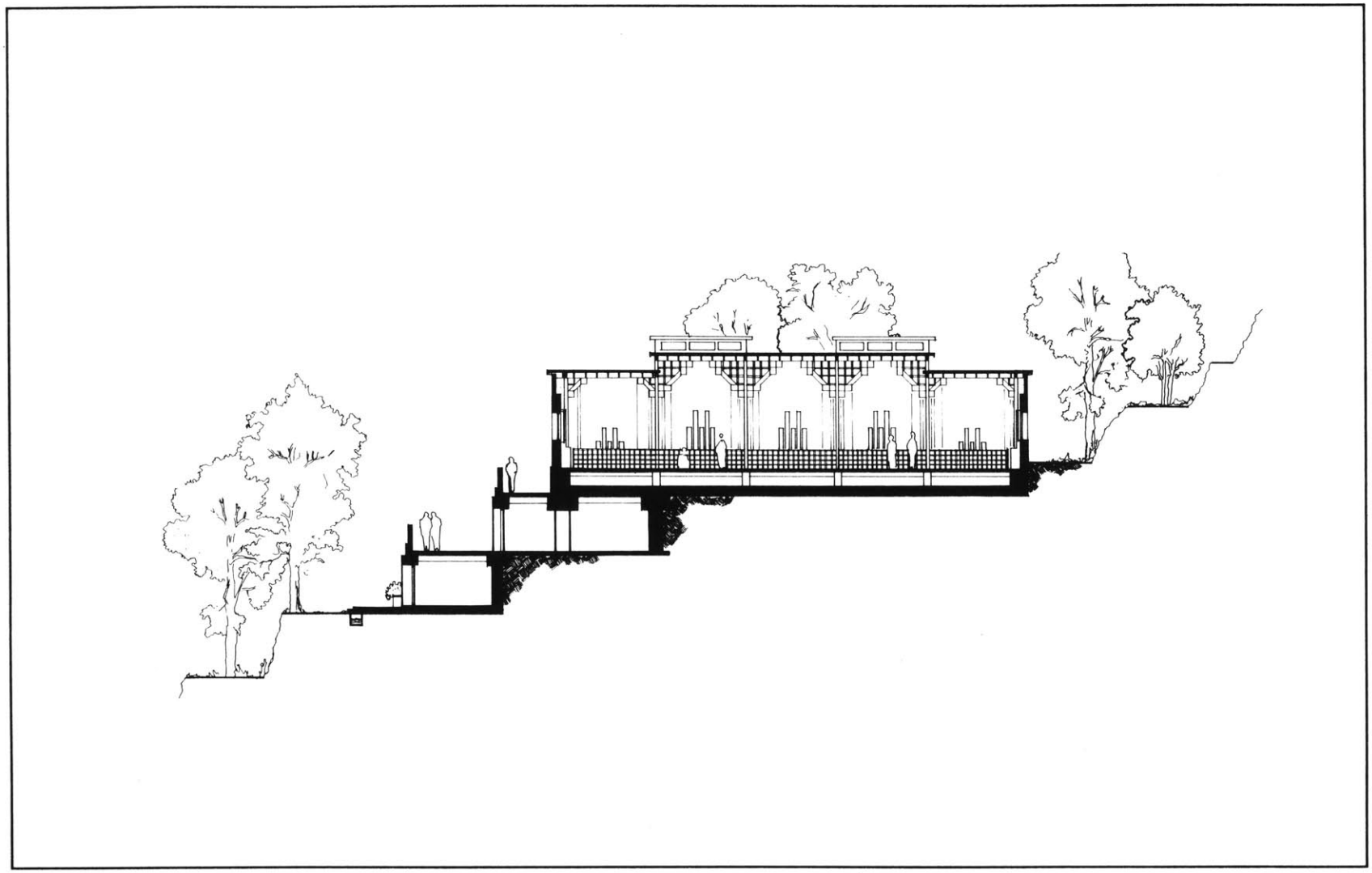

Fig. 6.9 Section AA'

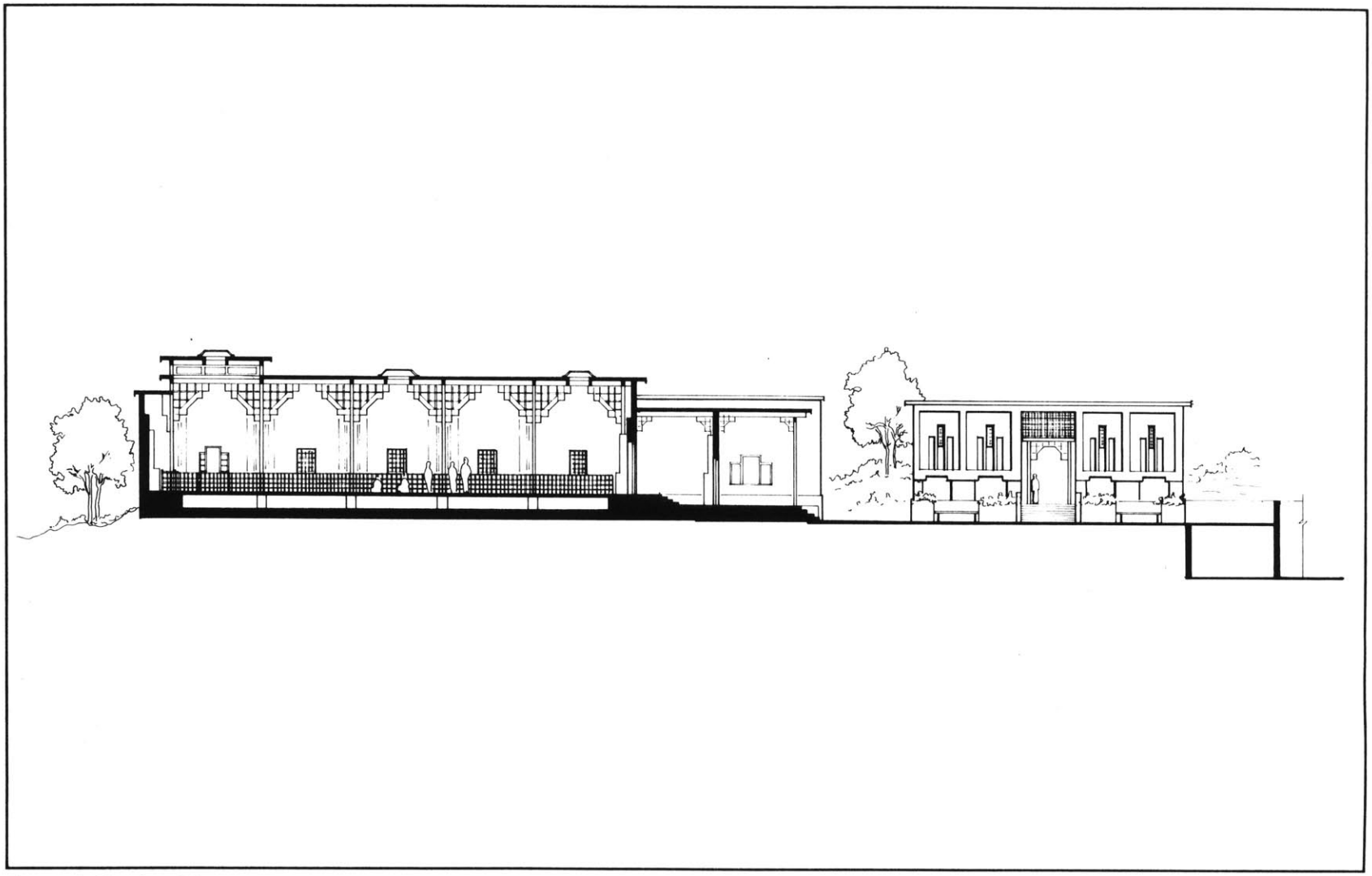

Fig. 6.10 Section BB'

0 16 32 48

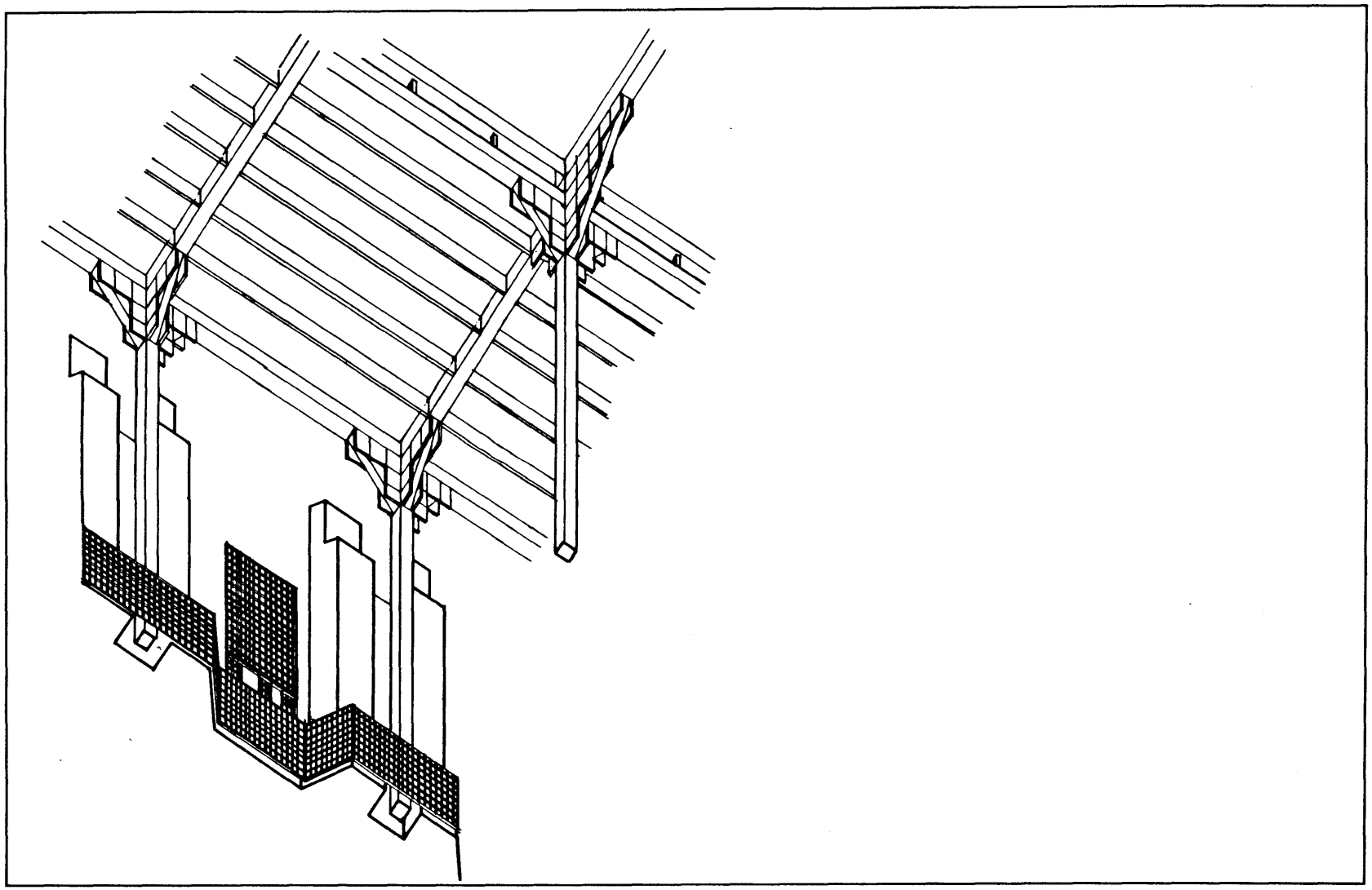

Fig. 6.11 A worm's eye view of the prayer hall interior.

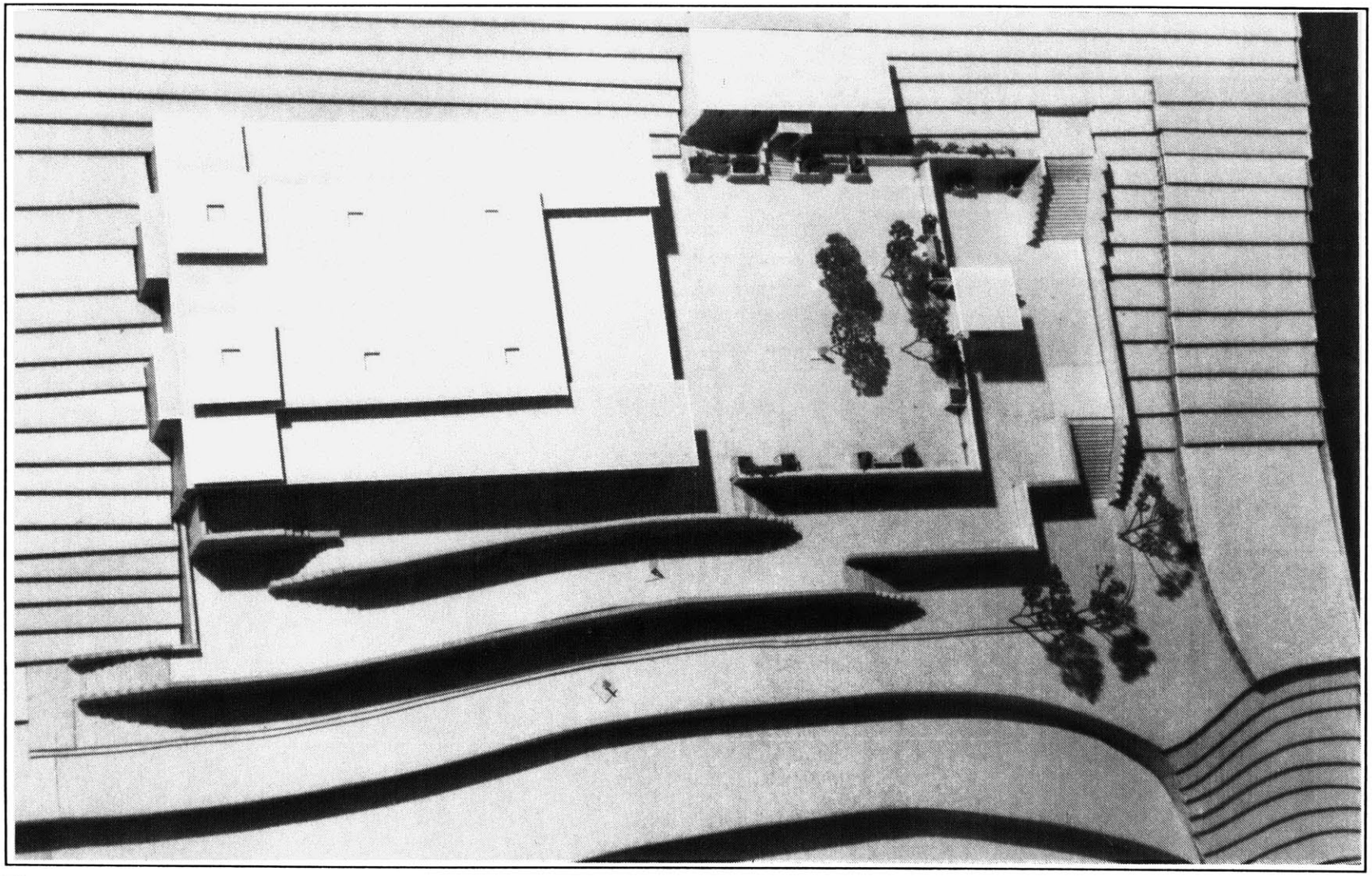

Fig. 6.12 Roof plan of the project.

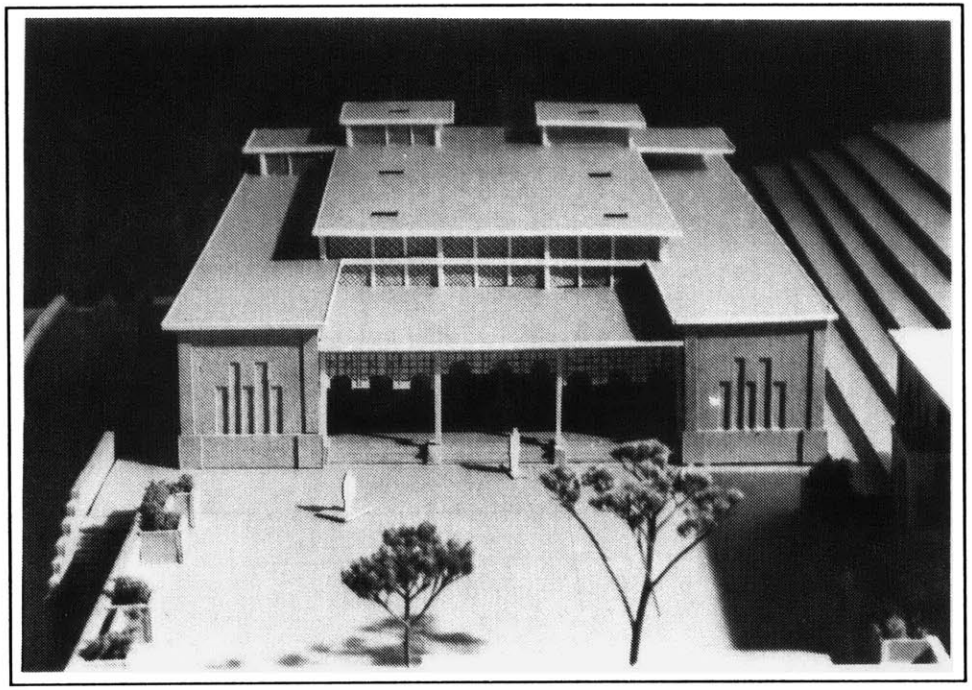

Fig. 6.13 View of the prayer hall from the east.

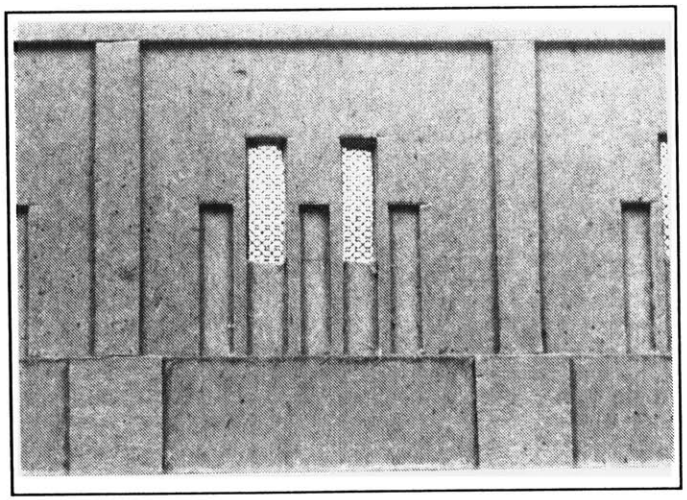

Fig. 6.14 Facade detail of the prayer hall.

Following is a detailed description of the various sections of the complex:

(1) Site:

An existing characteristic of the site is that it is located at the junction of three paths. which acts as a gathering place. This characteristic of the site has been maintained in the design while at the same time creating a hierarchy of spaces, especially for the jamat khana. From the junction of the two pathways, the search was also for a visual connection to the third level where the prayer hall is located. This has been achieved by relieving the courtyard of offices and placing of an entry canopy above the central stairs. This canopy also helps in announcing the presence of an important building on the third level. The entry into the courtyard and the prayer hall is allowed only to Ismailis. The required privacy is established by placing the prayer hall on the third level.

(2) Prayer hall:

A 16-foot square structural grid has been used which is derived, as an average spanning dimension, from the housing units and from the Baltit Fort. This grid allows the flexibility of extending the jamat khana in either direction for future expansion. The choice of the sixteen-foot dimension also keeps the spans short so that they are less difficult for the builders to work with. Moreover, a roof change in that dimension responds appropriately to the surrounding built form.

The design of the prayer hall is derived from the number five. This number represents the five close family members of the Prophet Mohammad, and holds

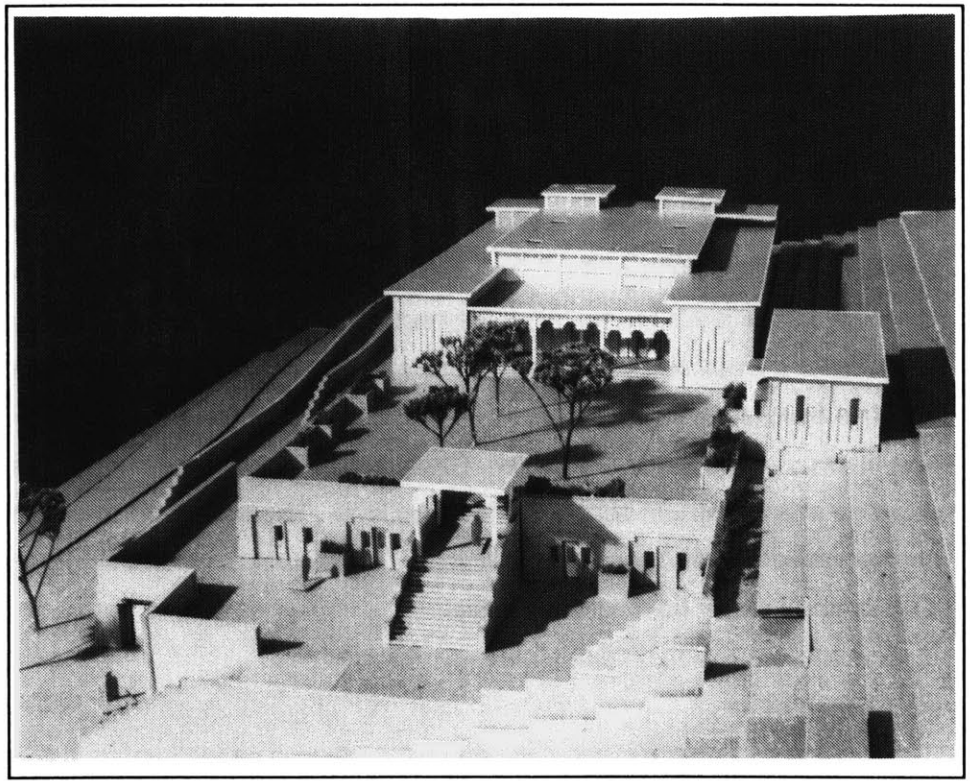

Fig. 6.15 View of the project from the east.

significance for the Shi'ia Imami Ismaili sect. Thus five bays have been used in both directions in the prayer hall and also in the courtyard. The front corner bastions also exhibit five blind niches to signify the same concept. On the south and north elevation, the two windows in each bay are accompanied with three rectangular blind niches to create a similar composition of five.

The establishment of the five bays is functionally helpful as it facilitates circulation of people inside the prayer hall. Two bays, each, are for men and women. The central bay, though used partially by both, acts as a dividing aisle and creates a spatial balance inside the hall. The aisles on either side of the central aisle, act as the main entry aisle for men and for women, and these entries lead in the direction of persons managing the services. The entry aisles form four feet deep bays in the *qibla* wall thus, signifying the importance of the *mukhi* and *kamadia* (and their counterparts in women) in the prayer hall.

Patterns, based on square and octagonal geometry have been used in the prayer hall. The reason for this is that Hunza region uses square forms quite frequently; i.e., the use of diagonal square timber frames in the vernacular system, the square openings in the roofs and walls, and the square and octagonal patterns on the timber work in forts and mosques. Thus, the prayer hall is a square, made up of square grid, and has square skylights in the roof. These openings occur in the circulation aisles in alternate bays. The timber screen, used for windows and along the wall on the floor, contain square and octagonal patterns. This is also true of the diagonal timber braces in the prayer hall and the facia board on the roof

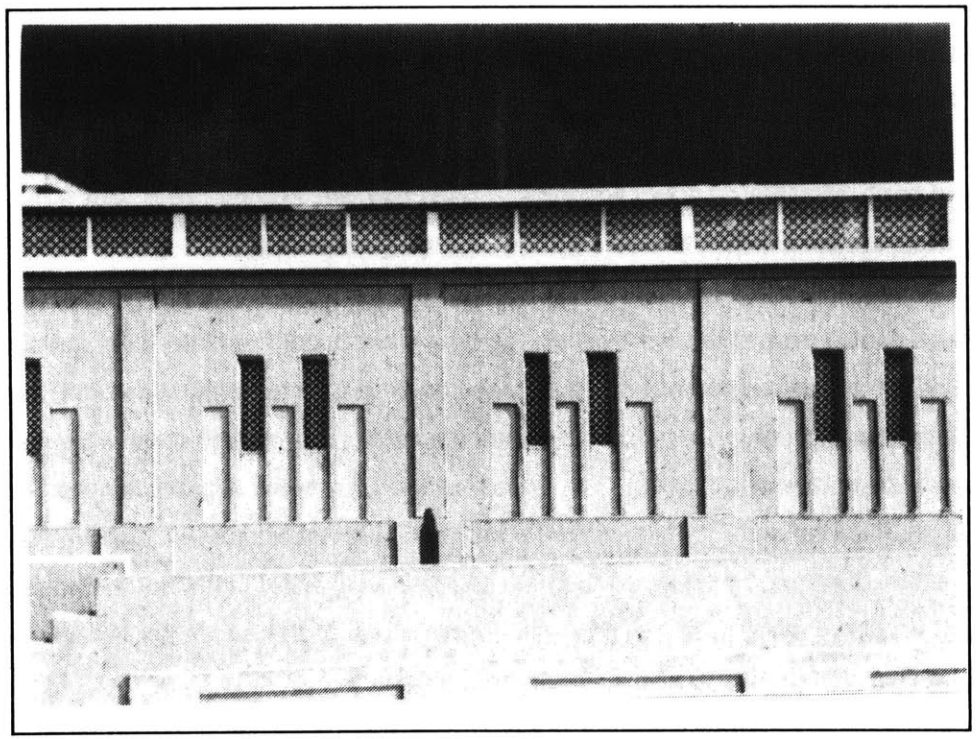

Fig. 6.16 South facade of the prayer hall.

For energy conservation in winter, two inch rigid insulation in the roof and insulated glass for the windows has been used. For the same reason, a crawl space below the prayer hall has been incorporated in the design.

The roof design of the prayer hall reflects the functions below it. This also aids in an endeavor to break up the roof form to reduce the scale and to respond to the surrounding structures. This roof form is not only seen from inside of the prayer hall but also from the hills on the higher altitudes in the village by which the complex is surrounded. The roof above the three central bays is raised to represent the primary circulation in the prayer hall. This also helps in establishing a direction inside the hall. The increase in the roof height has also been done at the front row (the *qibla* aisle) of the hall. A further increase in height of the two individual bays, next to the *qibla* wall, speak for the seating area of the persons managing the services. Square skylights, of 4'x 4' dimension, above the main circulation area allow natural light to come in, increasing the significance of the aisle. This concept is further supported by horizontal slit openings in between the changing roof levels. These narrow openings will work best at sunrise and sunset.

The concept of using different roof levels has been taken from the Fatimid mosque of al-Hakim where the changing roof heights, probably, signifies certain activity underneath.

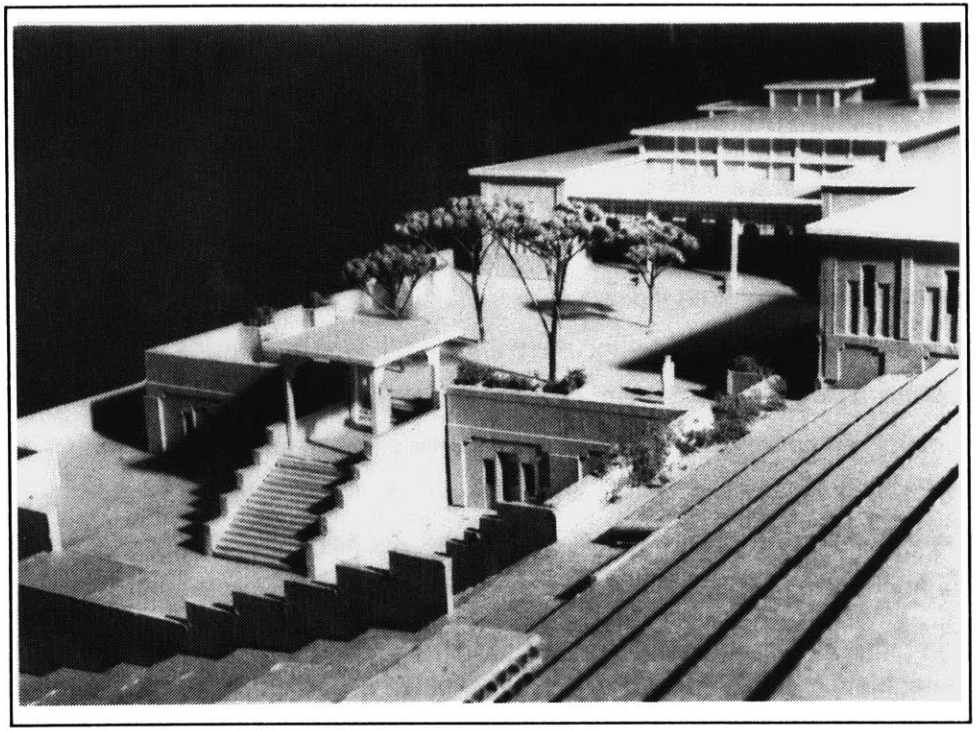

Fig. 6.17 The main entry gateway to the courtyard as viewed from the north-east.

The exterior of the prayer hall has been kept as simple as possible. The front facade contains two corner bastions -- an idea that alludes to the al-Mahdiyah mosque in North Africa and also to the al-Hakim mosque in Cairo. Timber screen used in the entry foyer helps in establishing a transition space by filtering the light through. Windows allow light to enter indirectly from outside and help visibility inside, without being noticed from outside. Thus, the windows establish privacy from outside -- a concept common in jamat khanas elsewhere.

(3) Courtyard:

The concept of the number five has been applied to the courtyard also by keeping its size equal to five bays of 16' square each. The central aisle of the square court, leads the main gateway stairs to the entrance of the prayer hall. This gateway is signified by the use of a canopy based on the roofing system used in the prayer hall. The transverse axis of the courtyard is less wide and faces the reception building.

The use of plants and trees in the courtyard helps in integrating better the newly built form into the surroundings, and make distinct the atmosphere of the courtyard from the lower two levels. Furniture elements, like benches and lamp posts, have also been added to allow the courtyard to be used before and after the prayer hours.

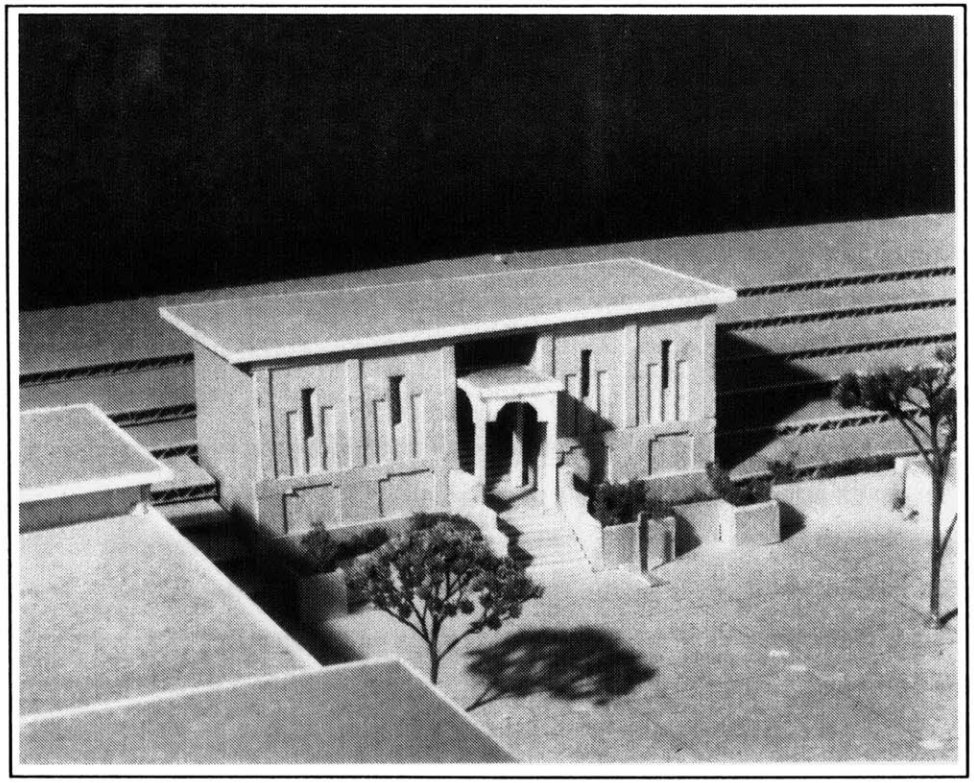

Fig. 6.18 View of the reception building for His Highness the Aga Khan.

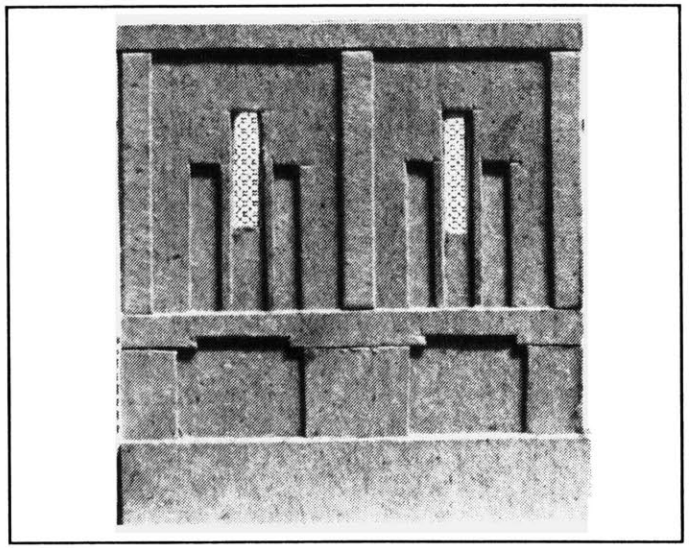

Fig. 6.19 Facade detail of the reception building.

(4) The Aga Khan Reception Building:

Composed of five squares of 16' x 16' each, this building sits on the higher slope, north of the courtyard. Its primary function is to serve as an office for His Highness the Aga Khan, during his visit, and also as a conference room, otherwise. It contains, along with the conference room, two accessory offices for the *mukhi* and the *kamadia*, a small kitchenette, and a bathroom. The windows of the building are designed with a similar concept as the prayer hall to retain the required privacy inside.

The north facade has been divided by an entry foyer, which is square in plan, with a square canopy covering it. This bulding of complex reads as a small nest in the trees standing on the slope.

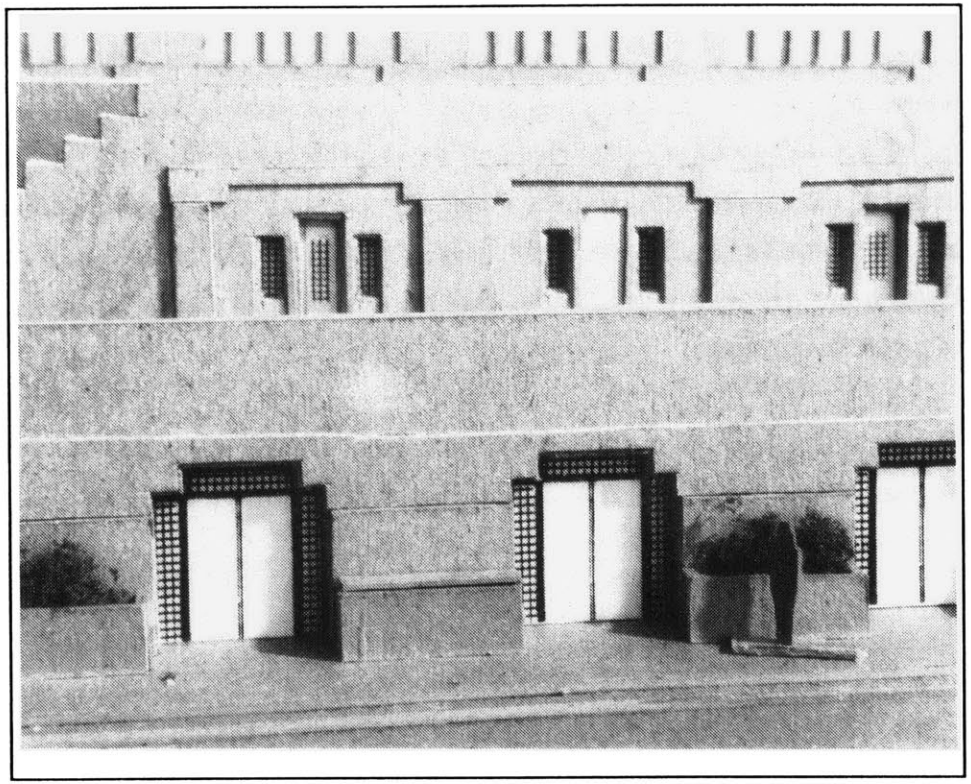

Fig. 6.20 The shops with seating area along the sidewalk.

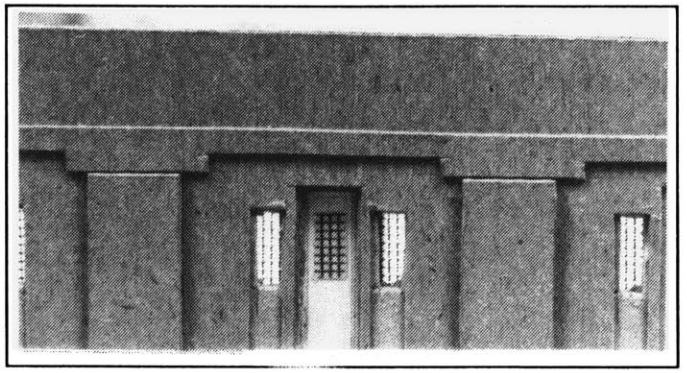

Fig. 6.21 Facade detail of the administrative offices on the second level.

(5) Second level:

Housed on the second level, the offices act as a transition zone between the public pathways and the sacred function above it.

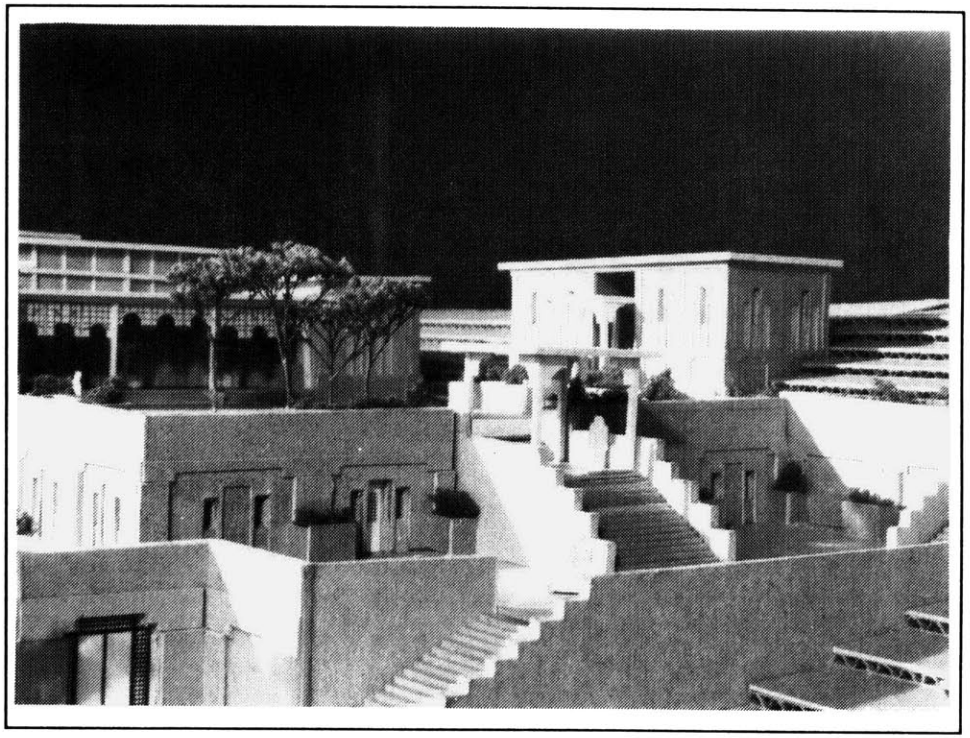

Fig. 6.22 The main entry gateway.

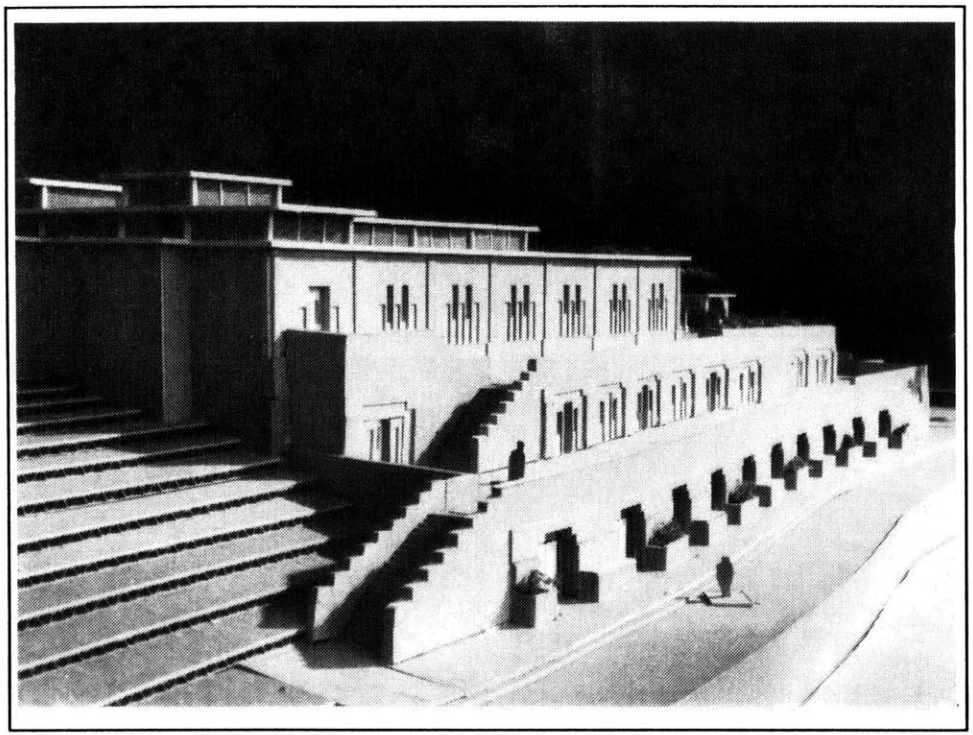

Fig. 6.23 View of the project fron the south-west.

(6) First level:

Along with the prayer hall, the first level is also the most important part of the project as it helps in establishing a frame of reference for the surrounding part of the village. It creates a dialogue between itself and the person using the facility and is closer to the majority of the villagers than to any part of the project.

The shops are 16' wide and about equally deep. At the junction of the two pathways, a gathering place has been established by creating a recess in the corner of the buiding. Along the sidewalk, i.e., outside the shops, seating areas have been provided. This is in continuation with the existing characteristic of the site, and is also a common feature of a typical small town bazaar in Pakistan.

Hence, the project not only fulfills the current need of the villagers for a new jamat khana, but provides much more by establishing an order and a system in the village surrounding, especially through the design features of the first level. The project not only responds to the demands of the site and respects them, but also meets the aspirations of the people of Karimabad, in particular, and of the region, in general.

Structural System

As mentioned in Chapter 1, the Hunza valley is in a seismic zone of 7.0 on the Richter scale[1]. It is, therefore, essential that the structure of the jamat khana complex be strong and stable to be able to respond to movement of that

strength. Technically, it is impossible to design buildings which are strong enough to resist the largest possible earthquake shaking without any damage. Therefore, a modest criteria has been adopted in this design problem to resist earthquake forces.

> In event of the probable maximum earthquake intensity, the building should not suffer total or partial collapse, or suffer irreparable damage which would require demolishing and rebuilding.
> --The International Association for Earthquake Engineering, 1980.[2]

The general characteristic of the built form is such that it is a stepped structure sitting on a slope. The walls and the columns of one level act as a foundation for the upper. And, hence, the sixteen-foot grid, which is common throughout the project, aids in the construction of such a structure.

Structurally, the jamat khana has been separated by two systems. One is of the prayer hall and the other is of the administrative offices and shops.

Prayer Hall Structure: Since the site is sloping, the southern bay of the prayer hall sits on a hollow concrete mass. This block is attached horizontally, to the ground and to the columns beneath the prayer hall, by means of tie rods. This way the concrete mass may act as an integral part of the earth, on which the rest of the four bays of the prayer hall sit, during an earthquake shaking.

The external walls of the prayer hall are of stone, 1'-6" thick, and self-bearing. Since, it has been observed that wall collapse has been very common and a significant cause of casualties during earthquake, the prayer hall walls have been buttressed from inside which not only makes the walls more stable to absorb horizontal forces, but also allows them to fall outward, in case of ground shaking. These buttresses taper as they move up along the height of the wall. The top section of the wall is capped by a concrete ring beam. Mortar, of sufficient strength, will be used to prevent displacement of individual stones if shaking may occur.

Within these four walls of the prayer hall rises a flat timber roof supported by timber columns. This roof is independent of the surrounding walls so that, in case of wall collapse, the roof may remain unaffected -- an idea taken from traditional construction system. The timber columns are connected to the concrete foundations pads by means of a pin joint to allow movement. Above, the columns are diagonally braced to the timber beams to provide the required stability but also allow the roof plane to move slightly to absorb vibration. These diagonal bracings, in four directions, provides enough in-plane stiffness to the different levels of the roof to act as one element. The roof and the walls have been connected by a slip joint which allows the two elements to detach on the application of small force.

Structure of Lower Levels:

The second structural system supports the lower two levels. The structure is formed by a reinforced concrete frame system with stone as wall-infill material.

Strong diagonal reinforced bracings have been used at the connection of beams and columns. The floors at these levels are of reinforced concrete slabs.

Building Materials

Three materials are primarily used in the construction of the complex: reinforced concrete, stone and timber.

To resist earthquake forces in the main structural frame of the project, of this magnitude, reinforced concrete was the most suitable material[3]. Stone has been used as self-bearing and infil material for the folowing reasons: better insulation and compressive strength than concrete blocks, ready availability, lower cost than concrete blocks and continuity with the traditional building system in the area. The Barbar water channel can be used to generate power, to operate stone cutting machine. This would lower the cost of cutting stone considerably. Timber, being lighter than reinforced concrete has been used to support and span the jamat khana roof. This provides a continuity with the local tradition and allows the local carpenters to improve their skills. Moreover, timber is easier to repair in case of any damage from an earthquake, whereas, reinforced concrete has to be rebuilt. Research on Chinese and Japanese timber joint systems have shown that it performs well in seismic structures, its careful use in this building may have more beneficial effects on building methods in the area than the use of reinforced concrete.

Unsolved Question

The hazards from the earthquake is as high as in many other places in the world, and its perception as a major hazard by the Hunza communities is one of far less importance than water shortage, electricity, land erosion, etc. Means of creating a greater awareness of the need to design buildings to resist earthquakes needs to be studied.

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1 For a more detailed information on the seismic activity in the region, please refer to Appendix 1.

2 Joaquin, Monge E. "Seismic Behaviour and Design of Small Buldings in Chile." *Fourth World Conference of Earthquake Engineering.* Santiago: 1969.

3 Though reinforced concrete is a new building material in the region, it facilitates in constructing a building of this magnitude with much ease and low cost. Its use has been limited to those portions of the project which act as foundations for the levels above them, and where a complete structural frame was required.

Part III

Reflections

Communication is said to have been the next revolution after industrialization, with effects on our lives more dramatic than that of the industrial revolution. In this age of rapid transfer of information, it is inevitable that prejudices and preferences for certain architecture will travel into different parts of the world. There is very little architects can do about the spread of information, but they can do much to influence new ideas that affect our society and the built environment. This revolution should not be regarded defensively as a threat to our architectural identity, but merely as one more reality of our time, one to be sensitively used in appropriate projects and places. If architects are conscious and willing to value the individuality of each project and its setting, the international component can never monopolize their designs, but will only enrich them with one more layer of meaning.

Besides the effects of the global or international style of architecture on many Third World countries, local or regional styles have also been highly influential in the contemporary built environments of these countries. In the last few decades, a varied spectrum of results has been observed, ranging from a thoughtful eclecticism to a worthless pastiche. Whatever the time and place may be, the true value of the architecture of a place can never be found in a superficial application of its vernacular images on the built forms, just as a shallow application of domes and arches on built forms cannot transform them into an appropriate architecture in the spirit of Islam. The authentic architecture of a place has to go beyond the facades to reach deep down into the tradition, culture and faith of the society; it must assimilate what the society has to offer and translate it into today's

vocabulary, using todays materials and responding to current aspirations of the people.

In the opinion of Christian Norberg-Schulz the purpose of architecture is to make people 'feel at home'. This, he says, will happen when a person can both orient himself to and identify himself with a place. Architecture should assist us in our home-coming and should make us feel at ease in a place. It can only do this by gathering and containing the elements of identity within itself.

The two components mentioned above: (1) the global or international movement, and (2) the local or regional or vernacular styles, form the basis of today's architecture, and need to be present in all the projects. We cannot avoid international influences, nor should an environment be devoid of its local characteristics. A balance of these two factors, along with people's culture and faith, should interact to produce an architecture in the spirit of the place. The percentage of the above-mentioned two components should and may vary from project to project depending on the location, the scale and the function.

Examples of Projects:

To clearly understand and help elaborate above concepts, let us take examples of two projects of different scales and functions. The reason for chosing these projects are: they are located in Pakistan, are recently built, and have been personally observed.

(i) The Aga Khan University and Hospital, located in Karachi, is a good example of the adoption and transformation of appropriate building principles according to the twentieth century need. The whole project clearly demonstrates a sensitive approach to the region, resulting in innovative design and architecture. The completion of this complex, which is spread over an area of 84 acres, has set unprecedented standards of construction and quality of finish, for the region. The strong exteriors of the structures blend in mass, color and texture with the desert surroundings of Karachi. One of the beliefs in the design of the project was that environment plays a part in aiding recovery and increases productivity. Not only the local principles, such as wind-catching, have been used throughout the project, but various local crafts have been revived with their application and use in a building of this magnitude.

(ii) The second project, different in scale and function is located in Faisalabad, Pakistan. The Serena Hotel embodies the local styles and traditions of the city and also fulfills today's need for a hotel of high standard in an industrial town. The building layout, use of materials and technology, and the architectural details, make direct references to the vernacular style of Faisalabad. The recessed doors and windows reduce the sun glare, the perforated brick walls allow the breeze to come through, and the use of local crafts, like, mosaic tile-work, brass lamps, and corbelling brick capitals, provide an exhilarating experience as one passes through. The hotel, with all these local experiences, provides modern facilities for this growing town, which is a major industrial center of Pakistan.

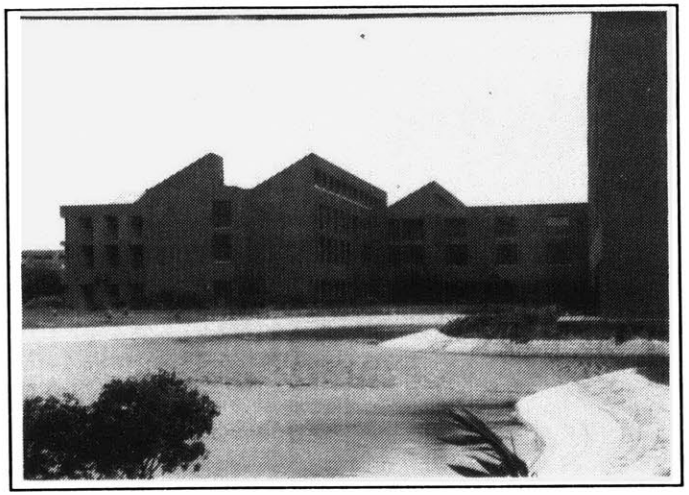

Fig. 7.1 The Aga Khan University and Hospital, Karachi, Pakistan.

Fig. 7.2 Use of traditional enamelled glazed tiles for calligraphical decoration in the dental clinic of the Aga Khan University and Hospital, Karachi.

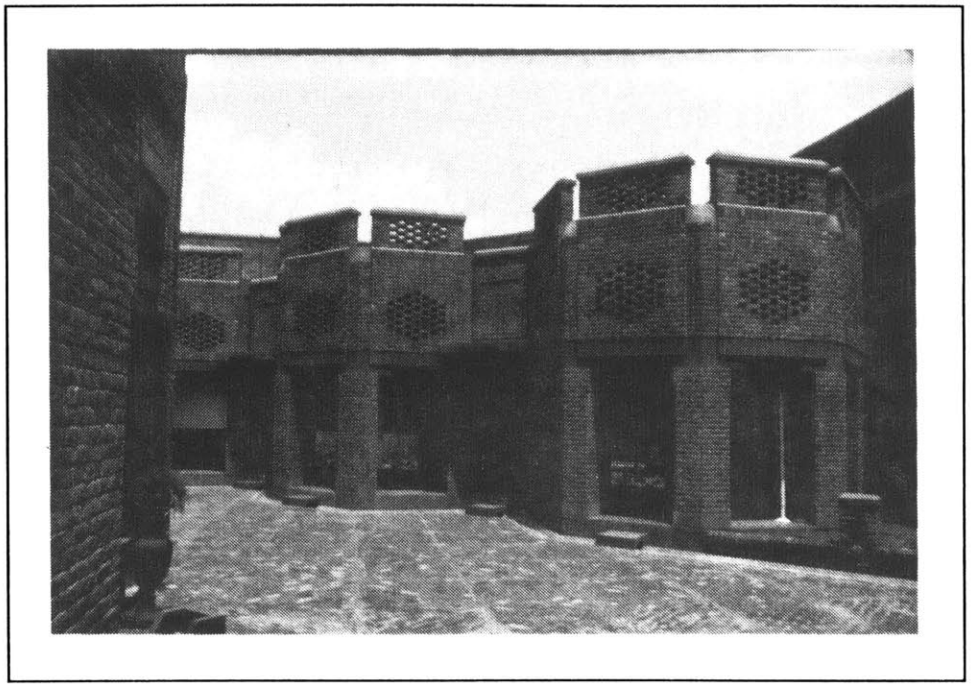

Fig. 7.3 View of one of the courtyards of the Serena Hotel in Faisalabad, Pakistan.

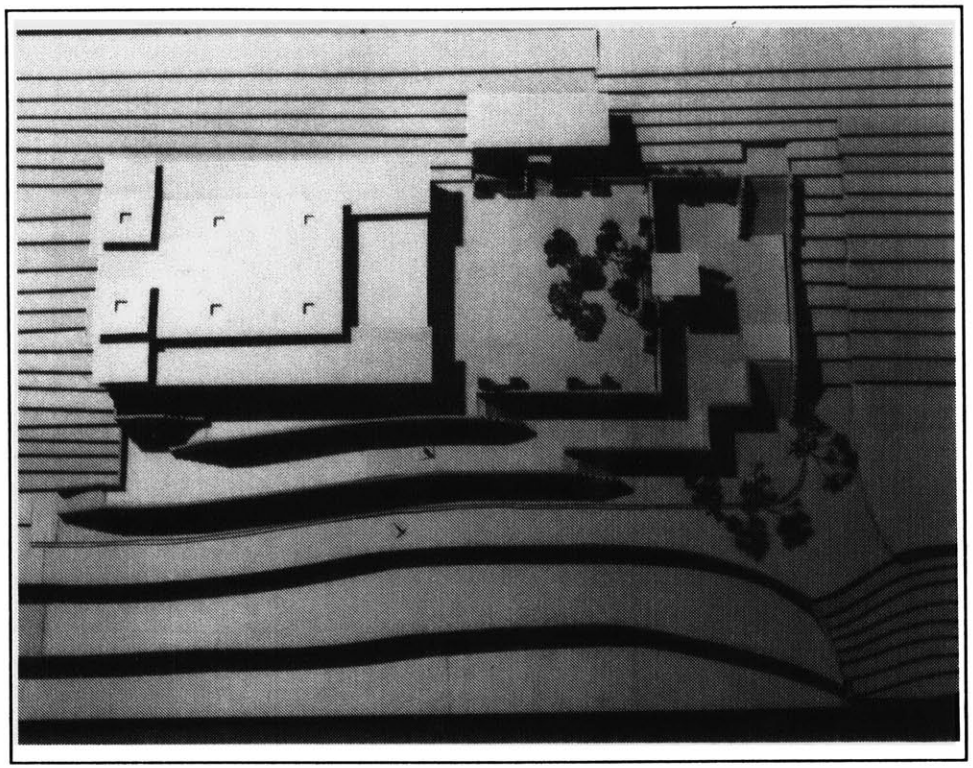

Fig. 7.4 Roof plan of the project.

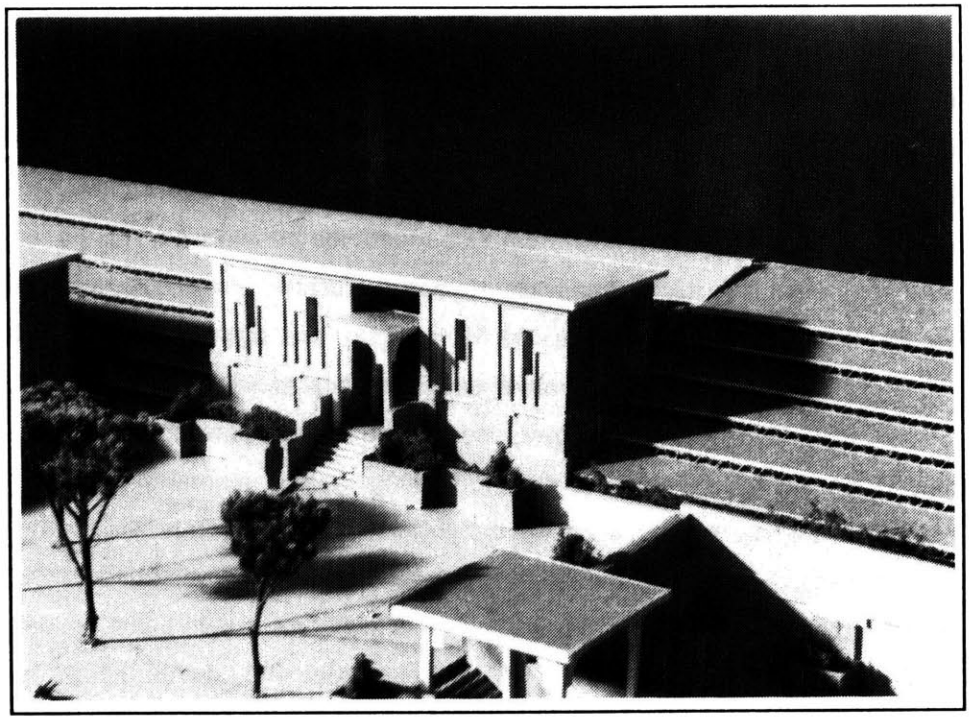

Fig. 7.5 The reception building for His Highness the Aga Khan.

The Thesis Project:

In this project, attempt has been made to achieve appropriate regional and the local character, while at the same time making an opinion about the future of Hunza architecture. The limited use of reinforced concrete satisfies not only the seismic need for a stable structure but also meets the people's aspirations for future progress . The thick stone walls, terracing structure, timber columns and screens, flat roofs with overhangs, the 16 foot grid, and square and diagonal geometrical patterns are all direct references to the local architectural style. The glass skylight, double glazed windows, use of crawl space below the prayer hall, diffused electric lighting and the electric heating system generated by water turbine, are all new phenomenon for the people of Hunza. Thus, the theme behind the search for an appropriate architectural design in the Karimabad village has been to allow evolution and progress towards the future, rather than to retreat into the past by imitating styles and traditional symbols. The design is utilizing new systems to meet new needs without losing the cultural heritage of the past. Thus, this building, a new presence in the area, is making a statement for the future of the region without losing sight of the past, because the past belongs to the present and the present to the future.

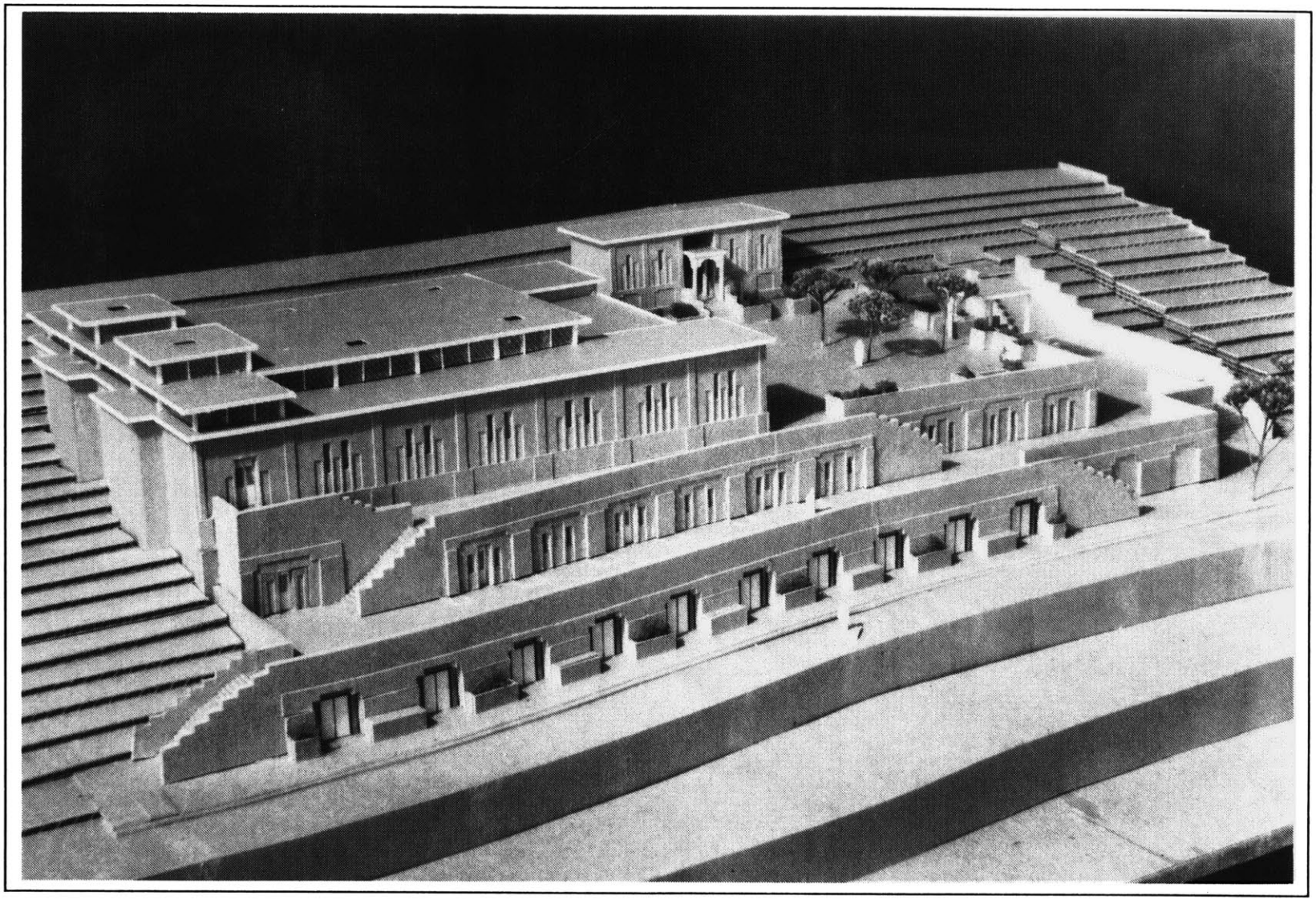

Fig. 7.6 Aerial view of the project as seen from the south-west.

Appendix 1

Seismicity in the Northern Areas of Pakistan

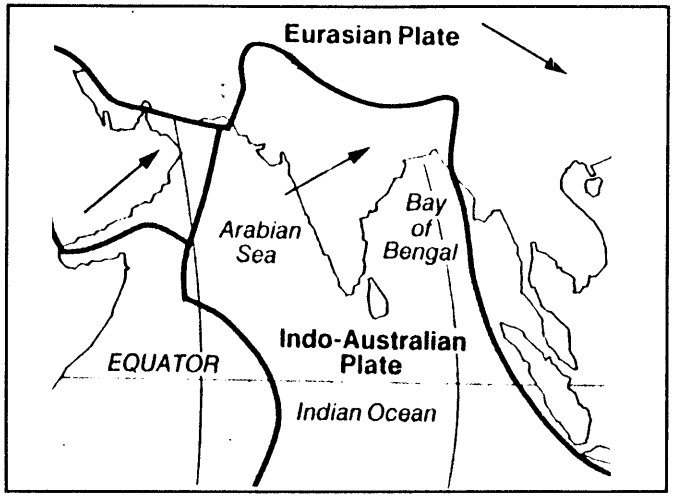

Fig. 8.1 The Himalayan region is a 'structural knot' of interactions of continental plates. The arrows indicate direction of plate movement.

The Himalayan region, in which the Hunza valley lies, is a "structural knot" of interactions of continental plates[1]. It all started millions of years ago when the Indio-Australian plate began converging towards Eurasian plate. The rate of convergence slowed down about forty million years ago (from 100 mm/year to 50 mm/year approximately) when the two masses came into direct contact with each other.[2] This joining of the two plates resulted in the formation of vertical thickening of the continental crust and hence the formation of huge mountains in that region, which are: the Himalaya, the Pamir and the Hindukush. It is believed that this convergence is still continuing today and resulting in a series of seismic networks in the region.

Based on the available historical data and geotectonic maps, a large part of the Northern Area, including the Hunza valley, falls into seismic zone of an intensity of 7.0 or higher on the Richter scale. According to one report, about 59, 738 people have died in Pakistan because of earthquakes from 1900 to 1977.[3] Figs. 8.2 and 8.3 and show maps of Pakistan which indicate that the Hunza and the surrounding region falls in a significantly seismic danger zone. Dr. Roger Bilham of the University of Colorado at Boulder is of the opinion that more deaths could be expected in future earthquakes, in the seismic zone from the Mediterranean to Central Asia, as third world populations grow and construction methods become poorer. He further says that its "buildings, not earthquakes", that kill people.[4]

Interviews with the villagers, of Karimabad during the August 1988 visit, has

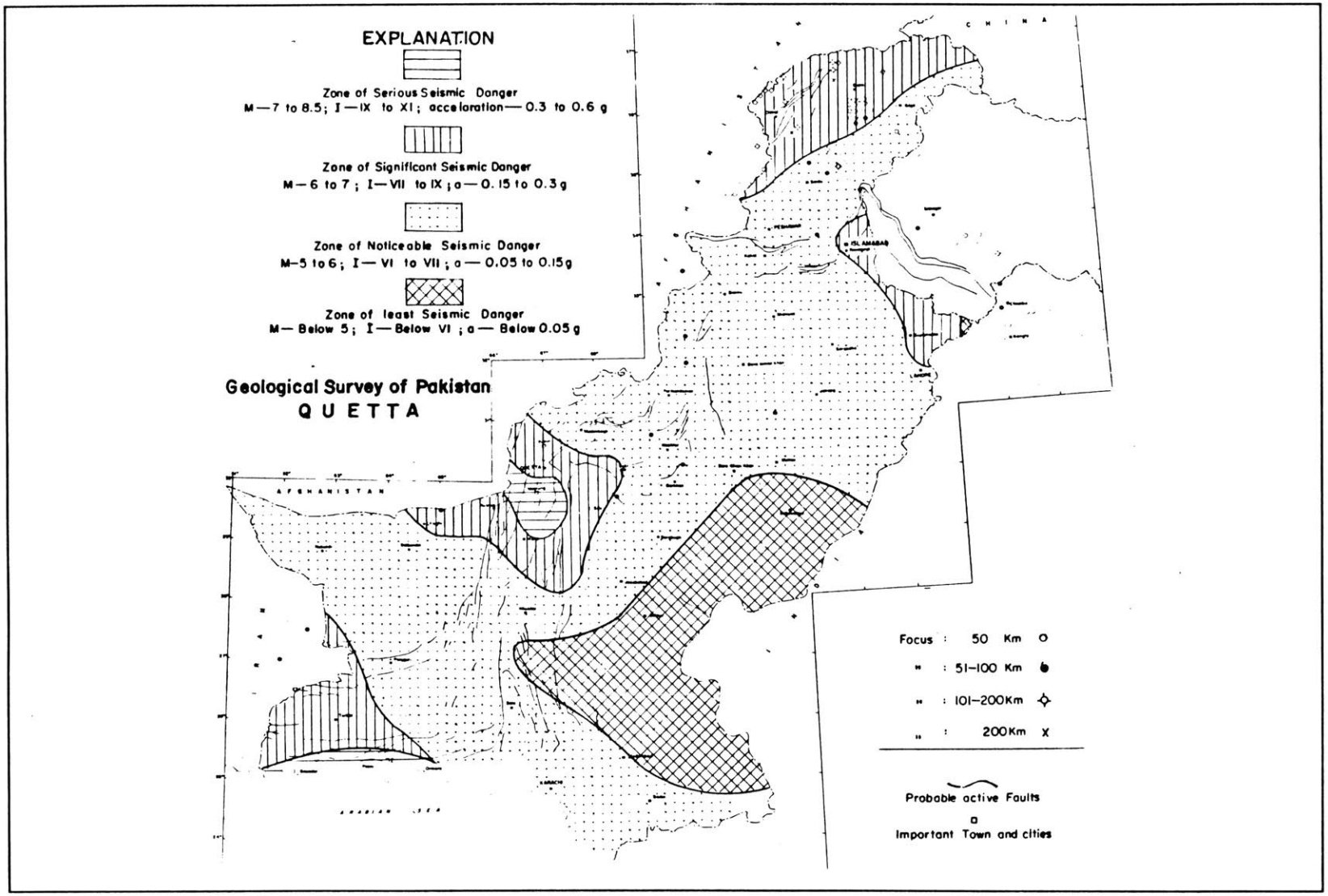

Fig. 8.2 Map showing seismic danger zones in Pakistan.

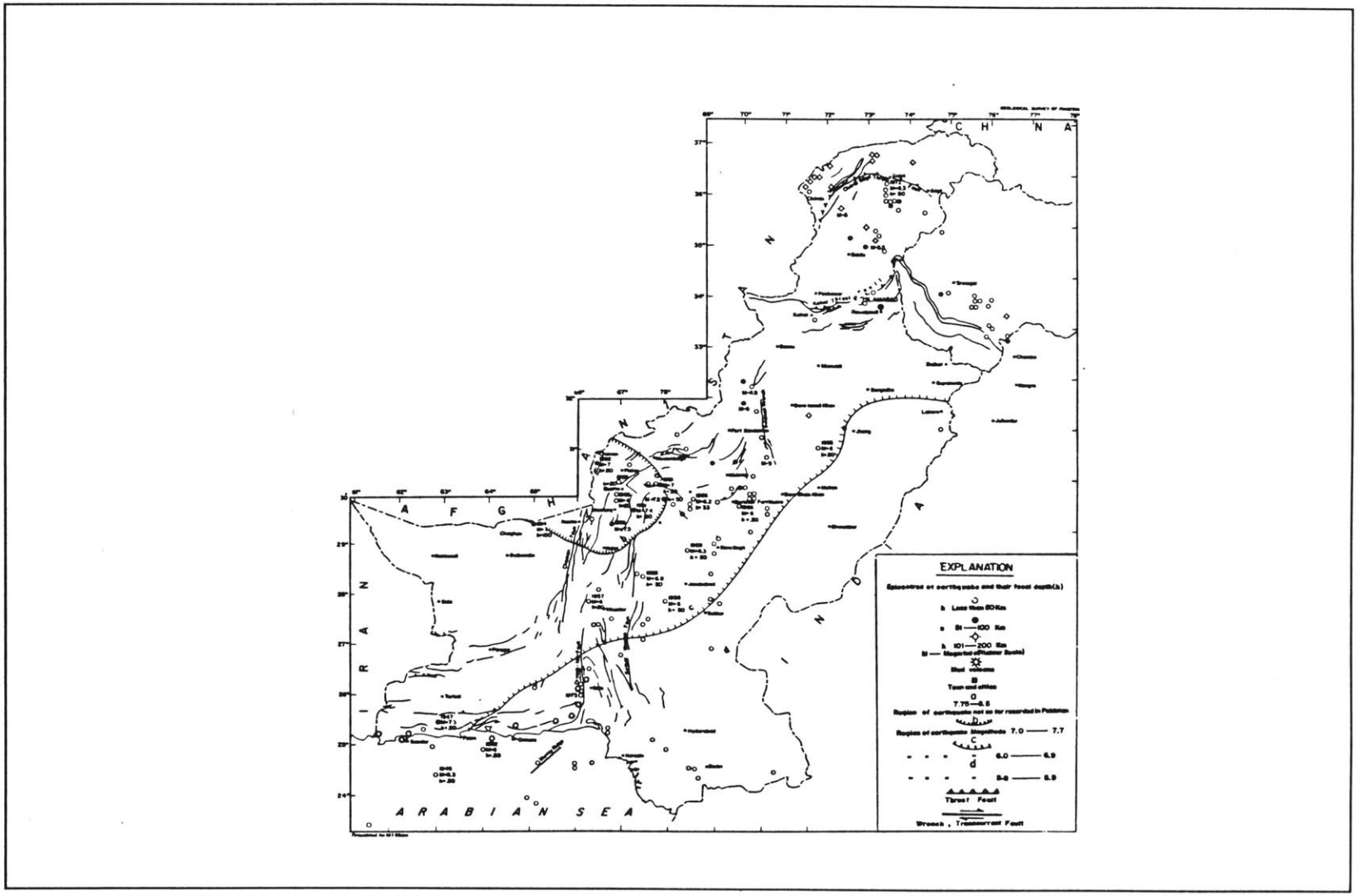

Fig. 8.3 Map showing probable active faults and epicenters of earthquake, 1905-1972.

revealed that earthquake tremors are quite common in the village. The most recent one had occurred in July, last year . Before this, tremors were felt a year ago. Unavailability of technical facilities, makes it difficult to record such tremors, but it is certain that the region is vulnerable to earthquakes.

The two, and the most recent earthquakes in the Northern Area, have been in Hamran (1972) and in Pattan (1974). On December 28, 1974, the Patan area was hit by an earthquake of the intensity close to about 6.0 on the Richter scale. According to a report prepared by UNESCO[5], this earthquake was a comparatively small event, as compared to other events that have occurred in the region, previously. The shock was felt over an area of about 300,000 square kilometers and caused damage to the precariously situated local population. About 5,000 people were estimated to have died and about 15,000 injured. It was also reported that 4,400 houses collapsed. The report continues that, tall *shingri* towers, usually a part of forts and palaces, (Figs. 8.4 and 8.5) and which are usually about high 45 feet, did not suffer any damage. These structures are built with thick (2'-0" to 3'-6") flat stone walls reinforced with horizontal timber beams or planks arranged in two dimensions at intervals of 1'-8" to 2'-0". About domestic architecture, the report says that dwellings of the bearing-type construction (in which the roof rests on the exterior stone wall) suffered severely due to the collapse of the walls. Other dwellings, with independent wooden columns, withstood the tremor much better. Rubble-fill walls, consisting of angular rocks, withstood the shaking better than those built of river-worn rounded or semi-rounded boulders.

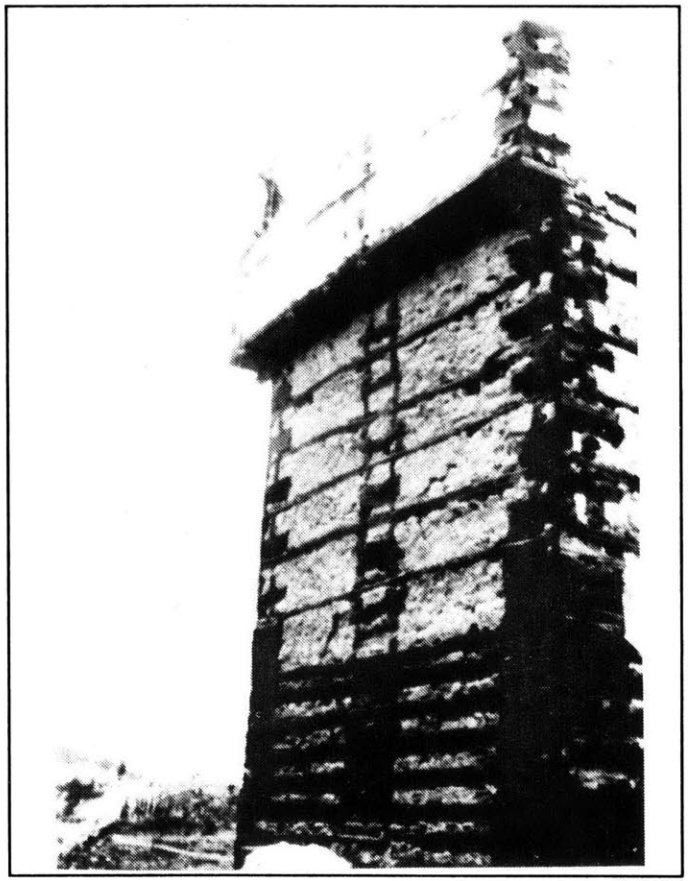

Fig. 8.4 and 8.5 Shingri *towers, approximately 40'high, still stand today -- probabaly because of their construction technique. Alternate courses of timber and stone are proven to be earthquake-resistant structures. (Above)* Shingri *tower of the Altit Fort in Hunza.*

Fig. 8.5 Shingri *tower of the fort in Sherqilla.*

Another study by Arif Hasan, a Pakistani architect, shows that very few structures have collapsed because of earthquake. He believes that buildings which do collapse have either of the following qualities:

(1) The load bearing wall has a clay filling in between the two stone walls. (Such a wall is locally called *dohri diwar*)

(2) There is no regular transversal stone connection in the wall thickness at regular intervals.

(3) The wall thickness is of less than 10".

(4) The wall junctions are not well connected.

Thus, if appropriate measures are taken, like strong foundations, stable bonding, and proper bracings of horizontal and vertical members, an earthquake proof building with local materials is possible. The local people need not hire trained expertise to solve their seismic construction. The solution exists in the region, but only needs to be respected and followed.

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1 "Pressing Rock Masses Mark Center of Quake". *New York Times.* December 9, 1988. p.A16.

2 "A Microearth Survey in the Karakoram" in the *International Karakoram Project.* Vol. 2. 1984. p.150

[3] Reza Rezani "Seismic Protection of Unreinforced Masonry and Adobe Low-cost Housing in less Developed Countries: Policy Issues and Design Criteria" in *International Conference on Disasters and Small Dwellings.* Oxford: Oxford Polytechnic, U.K. 1978.

[4] "Toll Put in Tens of Thousands from Quake in Soviet Armenia" *New York Times.* December 9, 1988. p. 1.

[5] Ambraseys, N., Lensen, G. and Moinfar, A. "The Pattan Earthquake of 28 December, 1974." UNESCO. Paris. 1975.

Appendix 2

Building Materials in Hunza and their Costs

Introduction

The information in this section is based on reports prepared by Mr. Arif Hasan -- a practicing architect in Pakistan, and the Aga Khan Housing Board of Pakistan. Information obtained, during the field visit to Hunza in August 1988, is also included. All prices are in Pakistani rupees and the current exchange rate of about eighteen rupees to a US dollar, has been used.

Stone

As mentioned in previous sections, stone is the natural building material for the Northern Area. It is available either in boulder, rubble or slate form and, usually, is easily available. Tractors are used to transport stone from its source to the site. In Karimabad, stone is obtained in two ways, depending on the size and type of construction. (1) From the site itself and is usually for residential construction. (2) For commercial or community construction stone is acquired from Husainabad about 6 miles away from Karimabad.

To transport stone, a tractor from Karimabad to Husainabad makes about two trips in a day and charges about Rs. 225 per day. It can acquire about 60 pieces of stone in one trip. Masons and contractors, interviewed in the village, mentioned that a lot of stone is available in Karimabad, but there is no access road to those site for the tractor. If some form of transport access is developed, the cost of stone acquisition will not only lower down, but about eight times more stone can be obtained per day. The basic labor and acquisition costs are as follows:

Fig. 9.1 **Acquiring stone** (all figures in Pakistani rupees)

Cost for hiring tractor (per day)	225	
Cost to employ labor to load and unload stone (4 labors @ 20 per day)	80	
Total cost of acquiring stone	305	
Quantity of stone acquired 60x2 (each piece gives a stone block of 6"x6"x12)	360	cu.ft.

Cost of acquiring 1 cu. ft. of stone in Karimabad from Husainabad: 1.18 rupee

Breaking stone

Stone is either broken at source or at the site into smaller manageable sizes. It is usually the site where cutting and dressing,is done. In one day about 90 to 110 cu. ft. of stone can be cut by one person, labor costs for this activity vary from Rs 100 to 120, per day, depending on the location of the site, the skills and the speed of the labor. Labor is relatively more expensive in more developed parts of the region, for example, in Gilgit. In case of small rural houses this operation is carried out by the owner himself, as he is the builder.

The broken stone is then either used as coarse rubble masonry or is used for better quality masonry wall with hammer dressed stones. Thus, the breaking cost also depends on the quality of the dressing. 1 cu. ft. of stone for a wall comes out to be Rs 0.91 This type of stone is acceptable for residential construction.

Stone dressing

The stone broken into smaller sizes needs to be further hammer dressed for a more regularized stone masonry. This is usually the case with communal or public architecture where better quality finish is required. Again, with the same labor cost of Rs. 120 per day, stone equivalent of 100 cu.ft. can be dressed by a mason in one day. The cost for this quality stone comes out to be Rs. 0.83 for 1 cu. ft.

Wall assembly

According to some estimates, two masons working together at the cost of about Rs. 120 and Rs. 90 per day can put up a wall of about 100 sq. ft. in one day. This gives a cost of about Rs. 2.1 to lay 1 cu. ft. of stones for a wall, including cement mortar.

Hence the cumulative cost to put 1 cu. ft. of a stone wall 18" thick comes out to be as follows:

Fig. 9.2: **Summary cost table for stone wall per cu. ft.**

Items	Material	Labor	Total
Cost of acquiring	0.96	0.22	1.18
Cost of breaking stone	–	0.91	0.91
Stone dressing	–	0.83	0.83
Stone laying (including cement mortar)	–	2.10	2.10
One helper for the masons in laying stones @ 35 per day	–	0.35	0.35
TOTAL	**0.96**	**7.56**	**8.52**

Hence the cost to construct 1 cu. ft. of a 18" thick wall comes out to be Rs. 8.52. Certain labor costs like unskilled labor for helping masons, breaking or loading stones, are usually not paid by the house builders. For community buildings like jamat khanas, voluntary workers can be and most probably will be involved, if these are deducted, the labor costs will lower.

An important result observed from the above analysis is that, more than 85% of the total cost involved in the process of the construction of stone wall is related to labor, and this money circulates within the region.[1] Usually, in stone acquisition, the builder does not has to pay for the material -- as is the case with cement.

Timber

For residential construction, timber is usually acquired, either by cutting one's own poplar trees, or by purchasing it from the nearest source, i.e., the forest department. In the former case, people do not plant trees after cutting and hence, create deforestation. In the latter, it is much more expensive to saw and transport timber from the buying place to the site. For community and public buildings, timber has to be acquired either from the forest department or from Chillas, Danyor or Janglot. Sometimes, transportation and sawing costs end up about 200% to 300% more than the actual cost of the timber. If the people desire to continue using timber, in their future architecture -- may it be domestic, institutional or communal -- they have to increase forestation.

A common complaint among home owners and builders has been regarding the rising costs of timber and its non-availability. According to Arif Hasan, timber is still the most important construction material when compared to concrete, especially for domestic roof construction.[2]

The cost of timber is directly related to the proper usage of timber. Observations have been made by local architects that people have a poor idea of how timber should be cut, stacked and seasoned. Wood logs are allowed to dry in open air for a year before they are used. Since there is no special way of seasoning, there is no difference in price between a seasoned and a non-seasoned timber.

Builders, in the region, need to understand the relationship of the grain direction to the functional use of the member. Usage of improper tools is also a factor in the increased cost of timber as it demands more labor. Unavailability of proper sawing system often results in more than required timber being used. The most commonly observed joinery is a crude version of dove-tail joint. Nails are quite often used where timber joints would prove to be more economical and strong. A correct understanding of all such minor details would result in economical use of timber in the region.

No exact figures or cost for the usage of timber in houses is available, but according to Arif Hasan's report, average cost for roof construction including transportation and labor vary from 30 rupees to 15 rupees per sq. ft. Transportation cost of timber is the most varying factor in roof construction depending on the distance between the source and site. The above-mentioned figures are based on an estimate of school construction in the region; in case of houses it may be lower because of smaller scale and less overhead expenses. For a community building, like a jamat khana, the cost may be lower because of voluntary manpower. Moreover, if timber can be made available locally and if proper seasoning, sizing and structural qualities are understood, the cost of roof construction are bound to decrease.[3]

The introduction of cement and steel in the village of Karimabad has not yet affected the local building technology to an extent where the roofing system of houses is affected. This may primarily be because of relatively higher cost of new

system, unavailability of cheap labor trained in concrete roofing, and unavailability of technical know-how to an ordinary house builder. The roofing system of a house constructed with cement-concrete-block wall is still of timber and mud.

Lime

Lime is locally available in abundance and is half the price of cement-- even when purchased from a far-off town. It has been used in community buildings, bridges, houses of Mirs and upper-class families, but to a very limited extent.

In Karimabad, It is not commonly used today, probably because of the difficulty in its extraction. Contractors and masons interviewed in Karimabad say that a lot of lime deposits are available, in and near, Karimabad, but it requires a lot of wood for fuel to extract it. If a facility for fueling is made available, it would be much cheaper and easily available. Approximate cost of lime with extraction would come to about Rs. 35 per *maund* (38 kilograms), i.e., about one-quarter of the cost of cement. Currently, lime is being imported from Punjab and it costs about Rs. 75 per *maund* . The local masons complain that the quality of imported lime is not good, compared to the one extracted locally.

Cement, relatively, is more commonly used because of its ready availability, even though the cost is twice to the cost of lime. According to Arif Hasan, the current procedure of lime extraction is a very complex and labor intensive. The kilns used for the purpose are archaic and inefficient, and people cannot identify better quality lime stone. If a more sophisticated and easy to construct kiln could be

designed, maximizing the use of heat generated, it would be adopted at a more wider scale. Moreover, the economic circulation stays within the region among the local people.

Mud

The quality of mud in Hunza varies from region to region. In many cases it contains fairly large silica content, making it unsuitable as a building material. People in the region have been using mud very widely, sometimes with wheat waste or sometimes with apricot juice (for better roofing). There is no cost involved in the acquisition of mud for domestic construction, except for transportation, where necessary.

According to Arif Hasan, if proper research is carried out, chemical compounds and apricot juice can be mixed with mud to make it waterproof and maintenance free. The economics of these chemicals, their purchase and their introduction into the area, needs to be studied.

Halli

Halli is a skin membrane of a tall tree, and is used for roof waterproofing. It is usually laid on the roof boards before applying the layer of mud on it. If properly overlapped, it acts as a good waterproofing membrane. The cost of *halli* to cover an area of about 40 sq. ft. is Rs. 12, and is usually imported into Karimabad from a nearby village, Nagar. This system of using *halli* is not so commonly used today, probably because of scarcity of trees and increasing cost of *halli* and easy

availability of alternate means to waterproof the roof. Polythene sheets are being more commonly used for roof water-proofing. A comparative cost analysis of the two systems needs to be done.

Cement-concrete Blocks

The intervention of the new cement-concrete block technology is currently limited only to constructing walls and flooring in the domestic architecture of Karimabad. Calculations, based on field survey and interviews with masons and builders, show that imported technology, is more expensive than locally available stone.

People interviewed in Karimabad knew or understood the weaknesses of cement-concrete blocks, and the advantages of having a stone wall. People with cement-concrete-block houses do not have stone at their site of construction and belong to a relatively high income group. Hence, instead of acquiring stone from another site they make cement-concrete blocks at the site; but in in doing so they import cement from Punjab. In majority of cases, its the owner's desire to use new materials for their houses. This, results in increased import of new technologies, which may be inappropriate for the region.

The cost of a cement bag imported from Punjab, a province of Pakistan, is about Rs. 128 to 134 and weighs one *maund*. Gravel used to make these blocks is also imported from elsewhere. From one bag of cement masons can produce 32 to 90 blocks depending on the quality of the block and the proportions of its

ingredients. The following chart will give a detailed information about the proportion of the ingredients, their costs and the number of blocks produced from one cement bag. The sizes of these blocks is 12"x6"x8", and the ingredients are cement , gravel and water, respectively.

Fig.9.3 **Cement-concrete block production table.**

Category	Proportion	No. of blocks produced	Cost per block
A	1:2:4	36	6.00
B	1:3:6	40	4.50
C	1:4:8	65	4.00
D	1:6:12	90	3.50

The above table shows that a variety of cement-concrete blocks can be produced from one bag of cement. It is, therefore, very easy for an ordinary consumer to fall in trap for buying the low quality blocks without realizing it. Interviews with local builders revealed that the last two categories, C and D, are usually produced for selling. While categories A and B, are usually produced by the owners for their own use.

Making cement-concrete blocks allows the local economy to flow externally, whereas, use of stone allows it to circulate within the region.

Conclusion

From the above data, it can be concluded that the costs of local technology are lower than those of imported concrete technology, especially keeping in mind the quality. Moreover, the fact that local population can participate substantially as volunteers or semi-volunteers, or as self-employed laborers, can further reduce the construction costs considerably, for the use of local technology.

Introduction of new tools, accompanied by research into materials and structures, and further training of artisans might also reduce costs also. For Karimabad, the water channel, Barbar, can generate power to operate stone cutting machines; this innovation, if applied, can reduce the cost of cutting stones considerably. According to the expert on appropriate local building, Arif Hasan, poor villagers are not enthusiastic about new technologies because of the exorbitant cost usually experienced in using them. On the other hand, their availability is creating a lot of disparity among the villagers. Moreover, the quality of local technology is beginning to suffer because of imported technologies, as more and more artisans and masons want to work with new materials only. It has been observed that currently about 5-10% of families in Karimabad have houses built with cement-concrete blocks. A question arises whether the use of new imported technology will continue to increase in the villages? This deserves further investigation. Careful decisions are required in selecting materials and technology for construction, especially for any public building. Decisions taken on such an important new building, as this, might have a substantial remedial affect on the situation.

[1] Two contradicting sources of information are available for evaluation of cost estimate of the two building systems. Architect, Arif Hasan is of the opinion that the indigenous technology is cheaper than the imported system of cement-concrete. Whereas, according to the Aga Khan Housing Board, Pakistan, who is responsible for the construction of Self-help schools in the region, imported technology is cheaper. Both the sources are correct, depending on the quality one buys. Moreover, the implications and repercussions of the use of these materials on the local built character, and the response of local population to it, should not be ignored. It must be borne in mind that, the region of Northern Area is very vast and accessibility, availability of materials, and transportation cost vary from village to village. Therefore, figures from one area may not apply to another, and each village may need a separate study and evaluation.

[2] Observation on the recent study was made that though the cost of timber has risen considerably, people of Hunza continue to using it, probably no alternative system is yet discovered for domestic roofing.

[3] It is quite possible that proper stacking, seasoning and sizing may raise cost of timber as it might entail more labor, more space, more tools, etc. Hence, this aspect needs to be studied for the Karimabad village.

Illustration Credits

All uncredited illustrations are done by the author.

1.2	Didier Lefort.
2.3	Architectural Record, August 1986
3.4	Mimar 20, 1984
3.5	Mimar 20, 1984
3.6	Mimar 20, 1984
3.7	Mimar 20, 1984
4.3	Mimar 3, 1982
5.1	Hoag, J.
5.2	Didier Lefort.
8.1	New York Times, December 9, 1988.
8.2 and 8.3	Cento Seminar on Recent Advances in Earthquake Hazard Minimization.

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