The Indigenous Architecture of the Northern Areas

Extracted from the report “An evaluation of the Self-help school building programme of the Aga Khan Foundation for the Northern Areas”
(September 1986)

By
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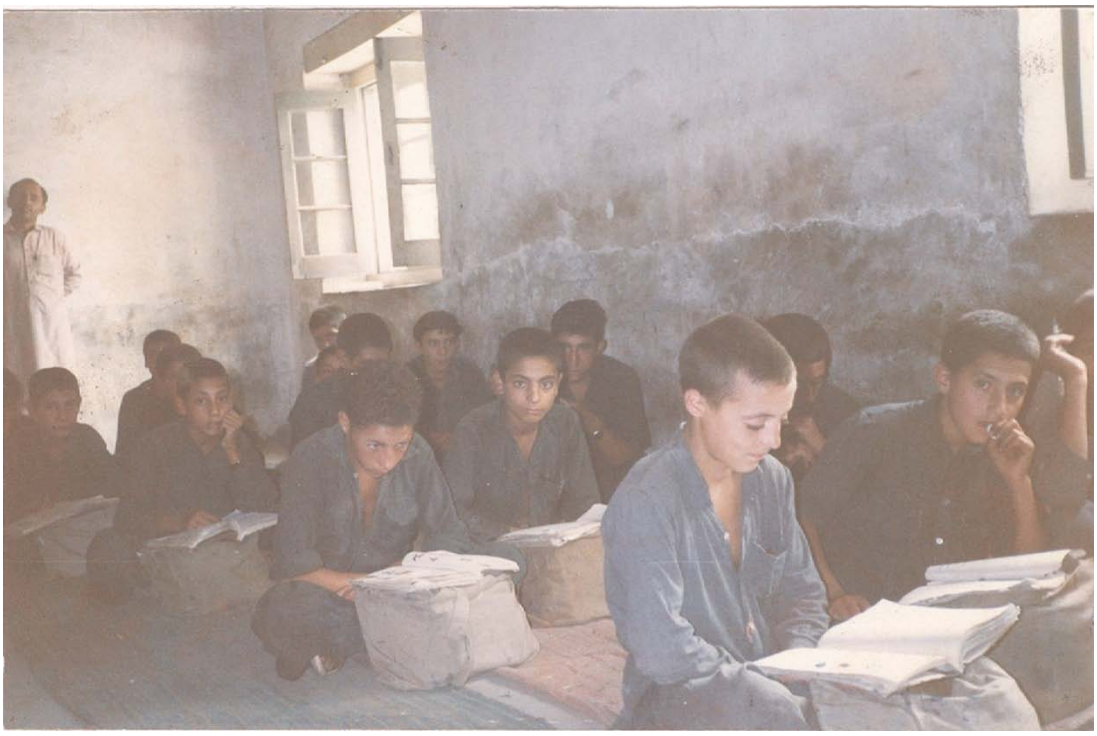

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GENERAL:

The people of the Northern Areas (NA) are, by and large, farmers. In almost all the areas visited there is no hereditary occupational structure in the villages, except for the Beyricho, who are singers and blacksmiths. These two professions being interlinked throughout the Subcontinent. As such, most families have some member or the other who manages to learn how to work stone or timber, or both, through necessity. It is these "artisans" who are responsible for putting up the vast majority of buildings in the rural parts of the NA.

Traditionally, the buildings put up by the rural population were their own houses, Langar Khanas, Pir Khanas and sometimes a small classroom. All these buildings have the same design. They are built around a central fire place and are almost square in dimension. There are no internal walls. The division of space is created by varying the floor levels. The external walls are of mud bonded stone rubble and windowless. The only opening is in the roof above the fire place. The roof itself is supported on four timber posts. These are sometimes linked at plinth level by timber members so as to resist earthquake forces. The floor is normally of compacted earth, and in the case of the more affluent, of timber boards. The roof consists of rough timber rafters covered with branches of trees. These in turn are covered with 'halli' the skin of the 'Tall' tree, for water-proofing, and finally with 'gara' (earth mixed with agricultural waste).

The construction of Jamaat Khana, government rest houses, offices, roads and bridges in the NA, and job opportunities in the developing townships of Gilgit, Skardu and Chilas, have trained a lot of masons and carpenters and created a new professional class of artisans. Those who have become slightly more affluent due to the recent changes which have taken place in the NA, employ these workmen for the construction of their houses, thus improving the quality of construction. The materials of construction, however, remain the same (stone, timber, mud) and the traditional house design still persists with minor variations, as it is suitable to an extreme winter climate.

MATERIALS OF CONSTRUCTION:

Stone:

Availability and Collection:

Stone is the natural building material for the NA. At all the villages visited by us it is available in boulder, rubble or slate form at not more than a kilometre distance. Originally, it was carried by the people on their backs to the site of construction. Now, however, it is more economical to hire a tractor than employ paid labour.

A tractor in one trip carries about 65 cubic feet of stone. In an eight hour period it can make about six trips if the source is at a distance of one kilometre and seven persons are employed in loading and unloading it. The cost of acquiring stone then works out to:

- Cost of hiring tractor (depending on the location in the NA) : Rs 200 - 250
- Cost of employing seven labourers for loading and unloading stone:

  7 x Rs 20 : Rs 140

  Average : Rs 365
- Quantity of stone acquired 65 x 6 : 400 cubic feet
- Cost of acquiring one cubic foot of stone : Rs 0.92

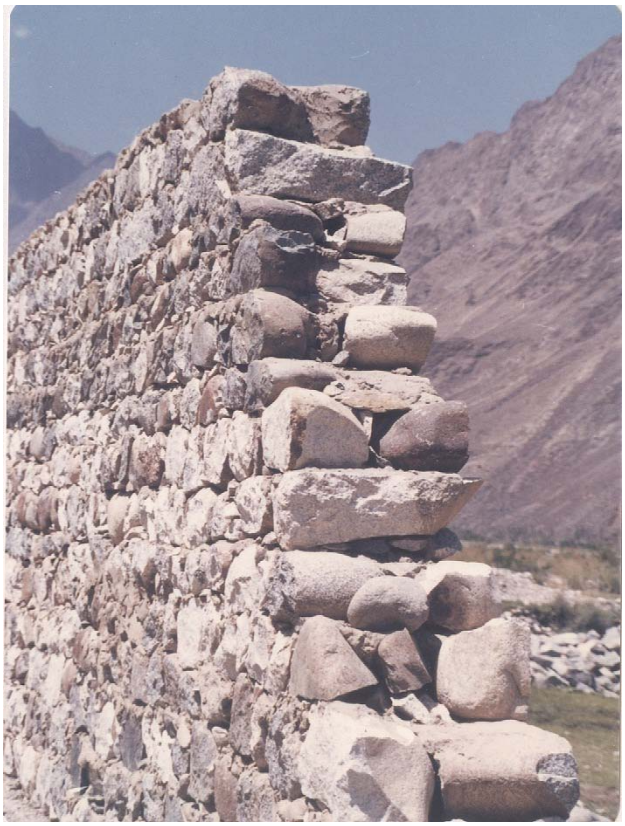
Working:

Stone is either broken at source or at the site into smaller manageable sizes. This breaking is done by a “mator” or hammer. The person who does it is known as a “matori”. He can break upto 120 cubic feet of stone per day. His wages vary from Rs 70 per day in Gilgit to about Rs 30 at Jandrote. In case of rural houses the people carry out this operation themselves.

The broken stone is then used as random or coarse rubble masonry. For better quality work it is hammer dressed to proper sizes and laid in regular courses. The figures given by masons for the amount of stone they can prepare and lay in a day vary considerably. However, figures given by Ustad Yakook Khan, the master mason of the Nazimabad School, and those given by Captain Sana Khan who has built a house in Gilgit, tally. According to them, two masons working together can put up about 100 square feet of rubble or dressed stone masonry in a day. The masonry thickness would be about 1’-6”. Sometimes 10” to 12” thick masonry is used, in which case a large square footage of wall can be erected in a day. In addition, one mason can prepare 30 to 40 pieces of hammer dressed stones of about 1’-6”x9”x6” in one day. The wages of a mason vary from Rs 70 to Rs 30 per day, depending on the quality of the mason and the location of the place where work is being carried out.

Skills for breaking, making and laying of stone are easily available in every settlement, where amateur masons may work for as little as Rs 20 per day. All masons interviewed said that they would prefer to work for considerably less wages in their own village rather than in Gilgit, Chilas or Skardu for a higher wage.

STONE MASONRY



Rubble masonry

Boulder : Mosque at Shakyot

STONE MASONRY

"Fundai" or hammer dressed : Passu School

"Sumbai" or chizeled : Medical Centre at Singul

ECONOMICS:

The cost of putting up one cubic foot of stone masonry is given below. This does not include unskilled labour required as helpers to the mason.

Sr. No.	Items	Cost with labour and material (in Rs)	Non-labour Cost (in Rs)	Labour (in Rs)
1.	Acquiring stone	0.92	0.56	0.36
2.	Breaking stone (1 matori at Rs 50 per day can break 120 cubic feet)	0.41	Ni.	0.41
3.	Hammer dressing (1 mason at Rs 50 per day can make about 22.5 cubic feet)	2.22	Nil	2.22
4.	Laying of stone (2 masons at Rs 50 each can lay about 100 cubic feet) inclusive of pointing in cement	1.00	Nil	1.00
5.	1 helper each for the masons at Rs 25 per day	0.50	Nil	0.50
	Total	**5.05**	**0.56**	**4.49**

This works out to Rs 5.05 per cubic foot or Rs 7.57 per square foot for a wall of 18" thickness.

Certain labour costs such as unskilled labour for helping mesons, breaking or loading stones, however, are not paid by house builders or for community use buildings. If these are deducted the cost per square foot of wall construction works out to Rs 4.63.

The most important result that can be derived from the above table is that 89 % of the total cost involved in putting up a stone wall is related to labour. This money circulates within the community.

Problems and Properties:

The size of stone used by the masons normally makes its laying in the English bond difficult. The result is that laying is done in a manner nearer to the Flemish bond. This creates problems of staggering joints horizontally and vertically, and makes the walls less resistant to earthquake forces. This aspect is realised by the people and the masons. To overcome this, a large stone piece of wall thickness size is usually placed transversally in the wall bonding at short intervals. This, however, is not a very effective solution.

The other factor that causes problems in earthquakes is the bonding at the corners of the walls. The size and manner of the laying of stones does not create strong enough tie at the junctions, thus leading to serious vertical cracks at these points.

The bonding material for stone walls is invariably mud. Sometimes the masonry has an external pointing of lime or cement. Where walls are 18" thick and properly bonded stability can be achieved, but in the case of 10" – 12" walls problems have been known to arise in the Ghazar area, where a number of houses collapsed in an earthquake in July this year.

The 18" stone walls, with an internal coat of mud or lime plaster, have a much better insulation value than an 18" concrete block wall. The value of the former being 0.31 and of the latter 0.37. If the wall does not exceed a surface area of more than 200 square feet and is supported on top and at the sides effectively, its stability compares favourably with an 8" concrete block wall of the same dimension, laid in cement mortar.

TIMBER:

Availability and Collection:

Timber is acquired by the people either by cutting their own "Sufaida" or Poplar trees, or by purchasing it from the nearest available source, sometimes even in the form of trees from the Forest Department. In the former case, they normally do not plant new trees thus creating deforestation. In the latter case, problems of sawing, transportation from the forest to the road, and from the road to the site arise. The transportation and sawing costs end up by being almost 200 to 300 % higher than the actual cost of timber.

All people at the sites visited by us complained about deforestation, excessive transport costs of timber, and about its comparative non-availability. However, timber remains the most important building material in the NA. A more viable alternative for roofing has not yet been discovered.

Most people building their homes cannot afford Kael wood whose cost varies from Rs 40 to Rs 75 per cubic foot in sleeper form, depending on the location where purchase is made. A system of permits for acquiring timber, of misappropriating timber by striking deals with government officials, and of stealing it from forest reserves does exist, and is used. This reduces the timber cost to half of its market value.

"Sufaida" trees planted by the people in their farms are still the most common source of timber for domestic houses and for community made community use buildings. Unseasoned Sufaida is a supple timber and likely to bend in stress.

Working of Timber:

Amateur carpenters are present in all villages although many villages visited have Gilgit trained ones as well. These carpenters are capable of putting up fairly sophisticated purlin roofs with mild steel timber connectors. They have learnt these techniques from working on suspension bridges being put up by NAWO.

However, problems in timber use and construction exist and are listed below:

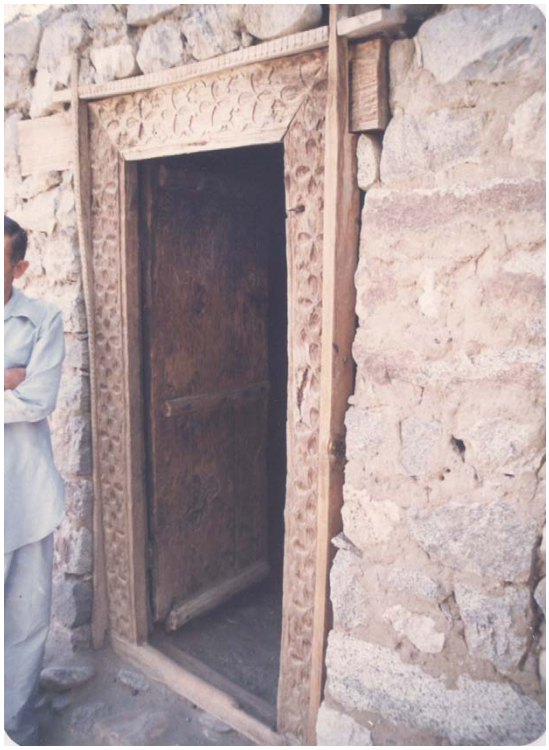
Seasoning: The people have a poor idea of the manner in which timber, especially Sufaida, is to be cut and stacked for seasoning. Just letting the log lie in the open for a month or so is not seasoning. Also, of the people interviewed who have cut down their Sufaida trees, almost none have planed new ones to replace the old.

Cutting and Sawing: The cutting and sawing process has three problems:

- The people do not properly understand the relationship of the grain direction to the functional use of the member being sawed. If this was understood smaller and stronger timber sections would be possible.

- The tools used by the people for sawing and cutting timber are archaic. More recent developments in tools, which minimise effort, have yet to be introduced. The saw operated by two persons, a simple hand-saw and an axe, all of substandard manufacture, are all that is available. The use of a planer, right angle and pencil line for marking out of sawing direction is rare.

Door of a house in Passu



Door of Pir Khana at Grunjar

Supports built into the walls : School at Grunjar

Lintols over doors and windows : Khyber school

Purlin roof: copies from Government Architecture: The school at Passu

Oversized timber cross beam : The School at Khyber

- Power is not available, making initial sawing labour intensive and expensive. Manual sawing also results in uneven thicknesses, necessitating thicker sections. This is especially true of timber boards spanning roof joists. These are normally 1" thick when a thickness of ½" would suffice if timber is properly seasoned and cut.

Timber Sizing: No scientific rule of thumb for timber sizing relating it to span and/or area of roof supported, is used by the carpenters, not even by the ones trained in Gilgit. The result is excessively large timber sections.

Joinery: The only joinery detail, apart from nailing, which is used in the NA, is a crude variety of the dove-tail joint. There are n tuck and tennon, tongue and groove, combed or dowelled joinery details. Nailing is an extremely poor substitute for proper joinery in a roof structure, especially in an earthquake effected area. Again correct joinery at relevant places and introduction of struts can reduce timber sizing.

Structural Use of Timber:

In traditional architecture timber was not only used in the roof structure. It was also used as structural columns to carry the roof. In some cases these columns have also been placed along the inside of the stone walls so that the walls are really nothing more that curtain walls. In most old buildings the timber vertical members have been connected at plinth level with other horizontal timber members. This structural use of timber makes the construction resistant to earthquake forces.

In the new domestic, community use and school architecture, both government and indigenous, this structural use of timber, apart from the roof, has been discontinued. Details, however, need to be worked out to make the new buildings further resistant to earthquakes.

A major structural problem that occurs in indigenous buildings is in the use of timber lintels over door and window openings. They tend to weaken the cohesiveness of the structure and make it susceptible to earthquake damage.

Water-proofing and Insulation:

Water Water-proofing techniques and the use of mud as an insulator are explained in paragraph above of this chapter. However, an optimum slope for the roof has to be worked out so as to ensure that the earth, either does not get washed away during the rains due to excessive slope, or fails to give proper protection from seepage, if the slope is too shallow. Both these two problems exist at the Passu school, and in most domestic houses which were visited. Eaves are also non-existent. This makes drainage of the roof problematic. It also creates problems for the wall as rainwater flows over them.

Economics:

Because of the easy availability of Sufaida trees, timber roofing is by far the most inexpensive option available. Even timber is imported, and given the problems of logistics and working, it compares favourably with concrete roofing. If proper seasoning, tools, sizing and details are introduced, the quantity of timber required for the roof structure could be reduced by over 30 %[1]. In addition, the use of an

[1]. Arif Hsan; Possible R&D Projects for the Northern Areas; Report prepared for the Aga Khan Rural Support Programme, July 1983

alternative for timber boards, such as slate or straw board, could reduce the consumption of timber by 65 %[2]. These reductions would make the timber roof by far the cheapest option.

No correct figures for timber working area available with the people in the NA, but the table given below gives some indication of the costs involved for the buildings listed. These figures have been given by members of the Construction Committees or artisans who have worked on the school buildings.

The chart shows that about 34.78% of the cost of timber in the case of the Khyber School was in transportation and initial sizing; 26.58% in labour, and only 38.64% is the actual cost of the material. If timber can be made available locally, which means transport cost will be saved, and timber sizes can be reduced by 20%, which is possible, the cost of the roof can be reduced to about Rs 18 to R 20 per square foot.

Chart: Cost of Timber Roofs

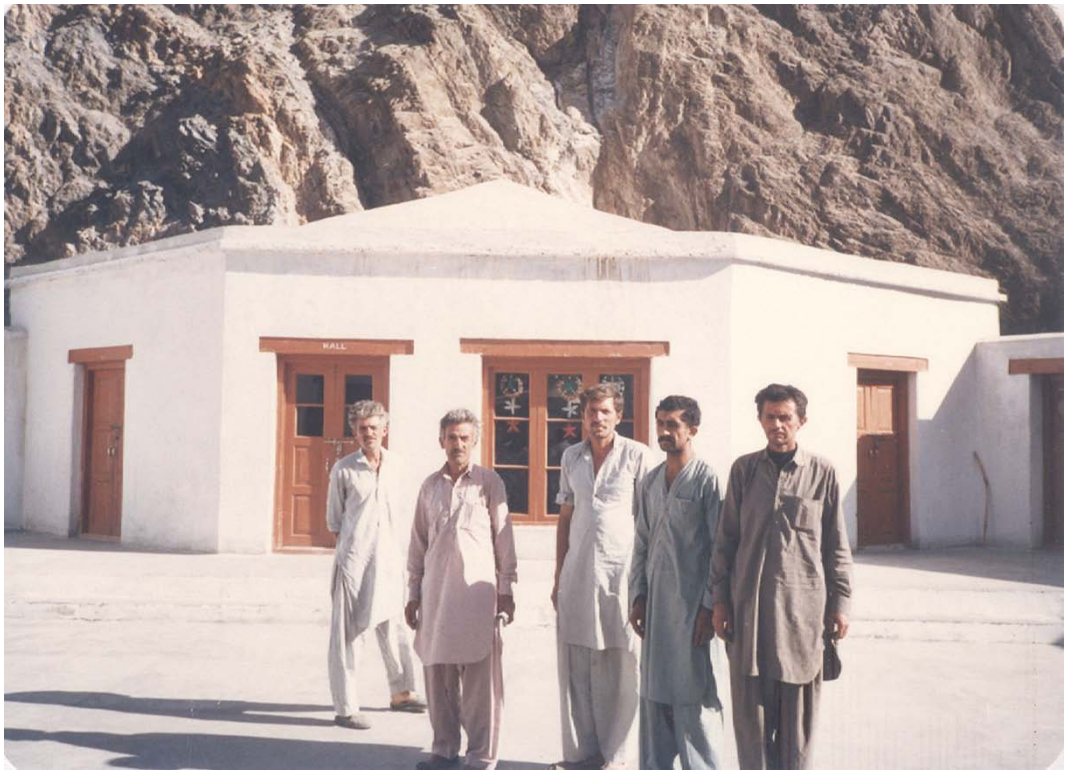
Building	Timber Used	Roof Area in Sft.	Total Cost in Rs.	Material Cost in Rs.	Transport Initial Cutting in Rs.	Labour Cost in Rs.	Per Sft. Cost in Rs.
Subedar Irbat Shah house, Hussainabad	"Sufaida" supplied by contractor	About 1,800 SF	30,000	-	-	-	16.66
Khyber School: Timber purchase, transport and initial sawing for 4 classrooms; roof and windows	Kael from	About 1,550 SF	-	16,000	11,000	14,400 (4 carpenters for 3 months at sar Rs 40 average)	26.70
Sumal: 10' x 12' room	"Sufaida" supplied by contractor	About 145 SF	1,200	-	-	-	8.27
Grunjar School: New classroom with roof doors and windows	"Sufaida" supplied by contractor	382 SF	6,000	-	-	-	15.7
Bubar School: Roofs, doors and windows	"Sufaida" supplied by contractor	1,200 SF	12,000	-	-	-	10.0

LIME:

Availability:

At all the sites visited by us, except Sumal, the people informed us that lime stone was available nearby and had been used for making lime in the last decade or so. In Sumal we were informed that it used to come from Sherqila. Even if purchased from Gilgit its cost is half the cost of cement. It has been used for

[2]. Ibid



External lime plaster : the school at Khyber

Stone in lime mortar : Gupis Rest House

the older Jamaat Khana buildings, bridges, homes of the Rajas of Gupis and older government buildings. In Nazimabad, the people toyed with the idea of using it for their school building but decided upon cement as the extraction of lime is a complex process.

The villagers at Khyber have extracted their own lime and used it for plastering their school. According to them, about 15 men worked for 30 days to excavate, fire and extract the lime. In addition, 200 maunds of timber were used for firing the kiln. The total lime used in the school works out roughly to 225 maunds. Although the acquiring of lime did not cost the people anything but labour, timber being free, an approximate cost is worked out:

• 12 men at Rs 15 per day for 30 days	:	Rs	5,400
• 200 maunds of timber at Rs 30 per maund	:	Rs	6,000

		Rs	11,400
		or	Rs 30 per maund

Reasons for Non-use of Lime:

Lime is now seldom used in the architecture of the NA. At all the sites visited by us its only recent use was noticed at the Bubar and Khyber School buildings. One of the reasons for this is that with the establishment of the new communication network, cement is readily available though twice the price of lime.

However, the real reason is that the extraction of lime is a complex affair. The manner in which it is done at present is labour intensive and consumes too large a quantity of fuel for the amount that is extracted. The kiln used is archaic and inefficient, and people cannot properly identify better quality lime stone.

If a more scientific and easy to construct kiln could be designed, maximising the use of heat generated, then people would adopt it in a big way. If it could be powered by solar energy, firing costs could be reduced to nil.

Economics:

Lime at Rs 55 per maund (scientifically done this gives a good profit margin as well), if easily available, is far more attractive to the people than cement at Rs 105 to Rs 130 per bag. If it had been used instead of cement at the Passu and Nazimabad schools, there would have been a saving of about RS 30,000 and Rs 40,000 respectively.

MUD:

Quality:

The quality of mud in the NA varies considerably from place to place. In most cases, it has a fairly large silica content, making it unsuitable as a building material.

Manner of Use:

Mud is used as a bonding material for stone walls, for internal and sometimes, where quality is good, for external plastering as well. As a plastering material it is mixed with straw to a ratio of 1 straw and 3 mud to form "gara". External plaster requires yearly maintenance.

"Gara" is also used as a covering to timber roofs. For this purpose a 4"-10" layer of "gara" is spread out on the roof boards after they have been covered with the skin on the "Tall" tree, known as "halli". Halli, if properly laid, with correct overlapping, acts as a water-proof membrane. At a under-construction house in Hussainabad we witnessed the installation of halli and noticed that its overlapping was haphazard and not in a uniform direction. The "gara" on the roof over the "halli" acts as insulation but needs yearly or bi-yearly maintenance, as rainwater erodes it.

Captain Sana Khan, who built his house in Gilgit in 1980-81, did not use "halli" as a water-proof.[3] Instead he placed "suroot" or reed on the timber roof boards, covered it with 4" of "gara", and then with a layer of 1-1/2" of earth mixed with apricot juice instead of water. For an area of about 1,000 square feet, three maunds of apricots were used. This 1-1/2" of earth with apricot juice is impervious to water and has needed no maintenance. Sana Khan says that in his childhood this was a common way of water-proofing "gara".

The price of "halli" at Gilgit, according to Sana Khan, is Rs 12 per seer. One seer of "halli" can cover over 40 square feet of area.

Water-proofing of Mud:

Chemical compounds can be used to make mud water-proof and maintenance free. Their economics and their manner of purchase and introduction into the construction technology of the NA need to be studied. The apricot juice formula also needs to be investigated and its effectiveness and costs established.

EXTENSION OF INDIGENOUS BUILDING TECHNOLOGY:

Government buildings, Jamaat Khanas and the rest houses in the settlements of the NA are being built since long before independence. These buildings have until recently, utilised locally available building materials and existing artisanal skills to new architectural designs. By and large, the only improvement in construction has been in the quality of stone work, and that too not in all cases. Though it has become more regular, it is still hammer dressed. Its regularity becomes more pronounced due to cement or lime pointing. Shortcomings and problems in indigenous construction, identified in the preceding section, persist in these officially planned and executed buildings.

Timber in this official architecture is used only in the roofs and joinery. Vertical timber members are used only as columns in verandahs and not as structural members built into the walls. Nor are they used as ties at plinth level. The horizontal roof joists and beams rest directly on load bearing stone walls and are not tied to one another except by the roof boards. In this way official architecture differs from the indigenous.

The Jamaat Khanas at Hussinabad and Passu, the rest houses at Gupis and Singul, and the Government High School at Bubar are examples of this architecture which were visited and examined by us.

[3]. See section 3 , Sana Khan's House, Gilgit

THE USE OF MUD

Mud walls at Geech

Gara finish to Gupi's Rest House

Government school building at Bubar

Jamat Khana at Passu

AN EVALUATION OF THE INDIGENOUS ARCHITECTURE OF THE NA:

DESIGN:

The traditional design for houses and other community use buildings is appropriate to the extreme winter of the NA. The solid windowless walls keep the cold out in winter and make maximum use of the fireplace by building the home around it. The lack of any physical divisions, except by varying the floor levels, makes it possible to heat the whole house with one fireplace and to use the same fireplace for cooking as well, thus conserving fuel. An internal layer of mud plaster and mud flooring adds to the insulation against cold and heat losses through stone.

However, this architecture has many draw backs. Eight to ten persons living in one 300 square feet room is unhygienic. The opening over the fireplace is inappropriate as most of the heat escape through it. The windowless walls prevent sunlight from coming into the house.

People have realised these shortcomings. In many of the new houses there are windows. The openings over the fireplaces have been converted into skylights; open fireplaces have been replaced by bukharis; verandahs and rooms for use is summer are now often provided around the traditional house. The old house design has adapted itself to the present times and survived.

CONSTRUCTION TECHNOLOGY:

In the last decade major changes have taken place in the NA. The building of the KKH has linked the area up with the industrial areas of Pakistan. Aggressive salesmen from the plains, with assistance from the more enterprising northerners, have established markets. The production of local goods, like “pattu” have declined as it cannot compete with industrially produced cloth for a variety of reasons related to its archaic manner of manufacturer and marketing. The production of wool has fallen, an animal grazing is disappearing. The children who were responsible for this work now go to school and cannot spend weeks on and in the pastures away from home. The NA now have three districts, a Northern Areas Works Organisation (NAWO), the PTDC and related government institutions. These have provided a large number of jobs to the rural population. The opening up of these areas has also considerably increased the number of persons in the armed forces of Pakistan. More and more young men go to Karachi to be educated.

These changes have taken place in other parts of Pakistan as well, and have led to radical changes in the use of building materials and construction technologies. The changes in all cases have led to the creation of an expensive and uncomfortable architecture. Uncomfortable in the widest sense of the world. Invariably this architecture and its technology has been introduced through official buildings. Its vernacular use has been substandard and squalid, as the users cut corners to reduce costs and the artisans have no tradition to turn to and apply. The architecture of the poor, however, has continued in the old materials and designs, becoming progressively poor in quality, as skilled artisans only work with new materials. It is due to these reasons that traditional buildings technologies are making a big come back in the mandi towns of the Punjab.

The same misuse of new technology is taking place in the NA. The use of concrete walls in Gilgit shops, Gulmit hotels and the new government school concrete roofs are all substandard and structurally and architecturally badly detailed. They are much less likely to withstand earthquake forces, temperature variations and provide far less insulation than the traditional building technology of the NA. Concrete

MISUSE OF TECHNOLOGY

Gilgit Shops

Government School near Geech

technology also means large investments in cement and steel. This diverts money away from the local economy.

In this context, it is therefore essential to evaluate indigenous technology in relation to costs, skills, insulation and seismic considerations. Conclusions reached as a result of information collected and analysed in the proceeding chapters are given below.

Costs:

Costs are definitely lower than that of standard concrete technology. The fact that the local population can participate in a big way as volunteers or semi-volunteers in this technology can further reduce costs.

Skills:

The introduction of new tools, research into materials and structures, extension work to make the results of research available, and further training of artisans, can reduce costs considerably and simplify the building process.

Insulation:

The insulation factor of a 18" stone wall with internal lime plaster is about 25 percent superior to an 8" concrete block wall. Similarly if earth covering over the roof can be increased to 8", it will compare favourably with a standard concrete slab with a 2" layer of screed.

Earthquake Considerations:

The NA are subject to earthquakes to a scale of 5 – 7. In the Hunza Nagar are all the gatherings interviewed did not know of a single building which had fallen or had been seriously damaged during an earthquake. In the Ghazar area, however, at all the sites people knew of buildings which had been damaged or had collapsed.

On investigation it was discovered that buildings which had collapsed or had been seriously damaged had one or more of the following characteristics in common:

- The load bearing walls had a vertical clay filling between 2 stone skins. This is known as a "dhori diwar" in the NA.
- The rubble did not have transversal stones of wall thickness at regular intervals.
- The roof joists were not interconnected by timber members.
- The walls gave way at the junctions.
- The wall thickness was of less than 10".

It is important to note that none of the official buildings built in traditional technology have fallen or been seriously damaged. Cracks have been noticed at the Bubar School and the Gupis Rest House. These cracks have appeared in both cases at the junction of walls. In the case of Gupis Rest House, according

to the Chowkidar, the cracks appeared after the 26 July earthquake this year. The earthquake was to the scale of 6.5. Apart from the cracks at the junctions, two vertical cracks have also appeared in the walls. These cracks have also appeared in the walls. These cracks are along the bonding of stone work where almost no staggering exists in stone laying.

In spite of the fact that the two buildings mentioned above have large spans, are deficient in proper stone overlapping and laying have weak junction links and their roof joists are not interconnected, they have not failed structurally in an earthquake of high intensity. The means that if proper foundations, stable bonding, junction ties and interconnected joists can be introduced along with the possibility of vertical timber members (if structurally necessary), then an earthquake-proof building in indigenous materials is possible.

2.THE DIAMOND JUBILEE SCHOOLS

SCHOOL VISITED: TWO CATEGORIES

CATEGORY – 1:

The schools own nothing to external inputs in any form. They are entirely the product of local planning, both physical and organisational, and have made use of materials available in the vicinity. Schools of this category were visited by us at Garlath, Bubar, Grunjar and the old school at Hussainabad.

CATEGORY – 2:

The layout plan of these schools was prepared by an architect and was followed by the villagers. In addition, the villagers were influenced by the school building at Sherqila. In all other ways this was also a completely indigenous effort with no external inputs. The schools of Category – 2, visited by us, were at Nazimabad, Passu and Khyber.

COMMON FEATURES OF THE TWO CATEGORIES:

REASONS FOR BUILDING SCHOOL:

In all cases the people undertook to construct the school because of the inadequacy of previous D.J. School accommodation. This previous accommodation was either in the verandahs of Jamaat Khanas or in Langar Khanas, and in one case in a private house. The other reason given was the rapid increase in the number of school going children.

MOTIVATION / ORGANISATION:

In all cases, except one, the whole village held a meeting to nominate a “tamiri” or construction committee. Office bearers generally consisted of President (Sadar), Vice President (Naib Sadar), Secretary and Treasurer. In addition, there were committee members. The size of the committee in all cases but one was 12 persons. The most vocal members of the community seem to be the ex-army havaldars and subedars. From conversations at the different sites, it is obvious that they are also the real activists behind this school building programme. The village Nambardar has also been actively involved but by the pressure put on him by the people. Both the retired army men and the nambardar are important as they can approach government and other agencies for permits for timber, diesel for tractors, cheaper etc. This in two cases helped to bring down costs considerably. At all the sites except one, the villagers mentioned that the chairman of the Regional Education Board was the person who motivated them to construct the school and then encouraged them during construction.

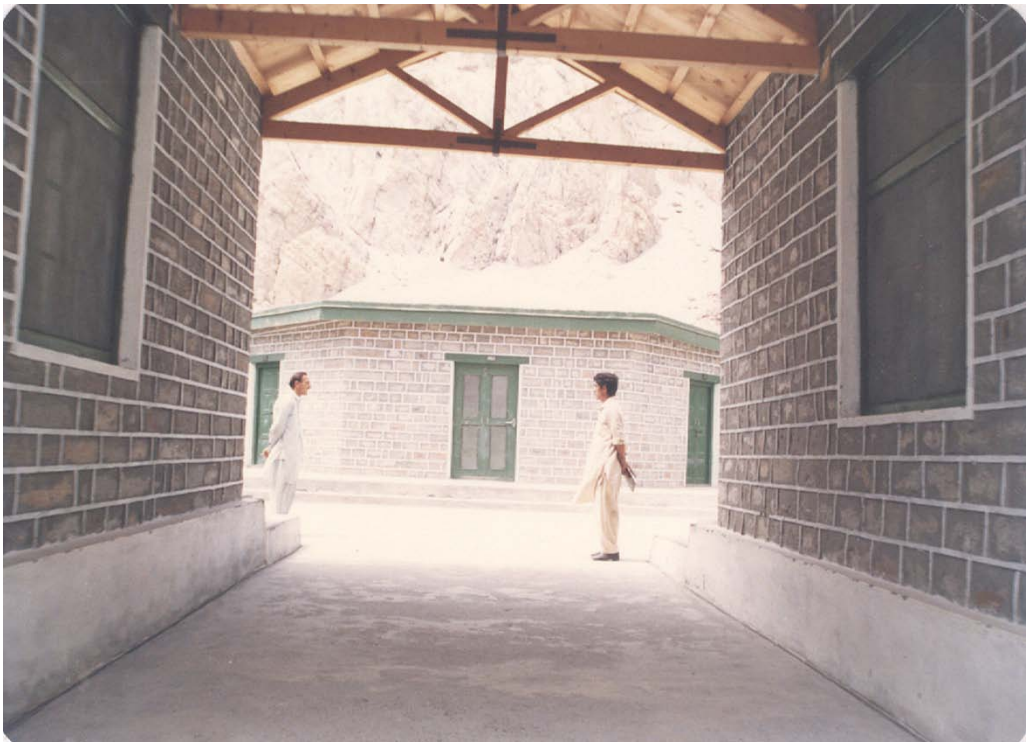
CATEGORY 1 SCHOOLS

Classroom at the D.J School at Bubar

The D.j School at Grunjar

CATEGORY 2 SCHOOLS

School at Nazimabad



School at Passu

LAND:

Land for school construction has either been donated by an individual or sold for less than market value to the School Committee. Households have either contributed equally for this purpose or as per the "haisiat" or economic standing of each family. In some cases, "Khalsa" land has also been used for school building purposes.

LABOUR:

In all cases except one, an enormous amount of volunteer labour was utilised, both skilled and unskilled. During certain operations such as stone loading and unloading, chopping timber in the hills, acquiring halli, or making lime, the community was able to organise food at the site for these volunteers at community expense. In certain other cases, the community gave "atia", or a token payment of appreciation, to the skilled artisans who worked on the project.

MATERIALS AND TECHNOLOGY OF CONSTRUCTION:

In all cases the materials and technology of construction are the same. Stone walls in rubble or "fundai" (hammer dressed) have been used. The roofs are of timber and internal plaster of mud, lime or cement has been used.

EARTHQUAKE FACTOR:

Both categories of buildings have problems related to earthquake resistance. This is because of poor structural detailing related to foundations, filling plinth with stones, location of doors and windows and their relationship to the roof structure.

DISSIMILARITIES BETWEEN THE TWO CATEGORIES:

In spite of the similarities, there are major differences between the two categories of schools. These differences are given below:

DESIGN:

The Category – 1 Schools are nothing more than an extension of indigenous architecture, with the incorporation of some features of official buildings. The result is that the classrooms are small, in some cases 9-1/2' x 20'[4]; lighting is poor as window openings are small and in some cases non-existent[5]; flooring in two cases is of earth[6]. The community members interviewed said that spans larger than 12' were far too uneconomical. Those who had visited Category – 2 Schools said that it had not occurred to them to use big spans and then break them by cross-beams as has been done in those schools. The old D.J. School at Hussainabad has a pitched purlin, "kanchi", roof over it, which creates a span of about 18'. Other villages have not used this form because of a fear that it might fail, although they know of its advantages. In Grunjar the classrooms have timber posts right in the middle of them, to support the roof, thus creating obstacles.

4. The School at Bubar
5. The School at Garlath
6. Garlath and Grunjar

The Category – 2 Schools on the other hand are well-designed. They are undoubtably schools, with a standard classroom size of 14' x 22'. The windows are large. The roofs in some classrooms have sky lights and the floors are of cement. The entrances are impressive, and the hall (except at Nazimabad) of 26' x 14', has a purlin roof which is fairly complex in its detailing, complete with cast iron connectors.

MATERIALS: ACQUISITION

In both cases stone has been acquired in the same manner. All the timber in Category – 1 and 30 percent of timber in Category – 2 has been locally procured. However, in the case of category – 2, people have had permits sanctioned from the government for cutting Keal wood, as at Nazimabad; purchased timber from as far off as Chilas and arranged for its transportation, and used cement in a "big way". This has not happened in the case of category – 1.

QUALITY OF WORK:

In Category – 1, quality of work is generally poor. The walls are of undressed rubble and except for the Bubar School, are plastered internally with mud. The staggering of joints is poor and the walls are neither in plumb nor in level. The mud bonding is minimal and there is no cement or lime pointing. The only reason why the schools have survived earthquakes is the small span of the rooms and the small size of window and door openings. Timber work is in unseasoned Sufaida and the joists are of unequal and excessive thickness. Yet they have sagged due to the immaturity of the timber used.

In Category – 2, the quality of stone work is good. Properly hammer dressed stone has been laid in regular courses at Nazimabad and Passu. In Khyber it is of poorer quality. Corners have been comparatively well made and pointing is in cement. In Khyber, where there is no pointing, the people have plastered most of the walls with lime plaster and intend to plaster the rest. The walls are in plumb and the courses, wall endings and junctions in level and at tight angles. Timber details and quality of work are superior to Category – 1. Although the timber quality of Sufaida is poor, the Keal is of good quality and evenly cut. However, in Category – 2, there are major shortcomings related to structural stability in earthquakes, especially at Nazimabad, which need to be taken care of. These shortcomings are related to bad masonry details at the corners and intersections; lack of a tie between the roof and the walls; and more serious, insufficient support to the cross beams where window openings occur, the critical point being the jamb of the openings. Similar problem, though less serious, also exist at Passu and Khyber.

MANNER OF ORGANISING WORK:

In the case of Category – 1, in two cases out of three, work was let out on contract with materials, to a local person who hired labour and artisans for doing it. In Category – 2, in all three cases, work was done collectively and village artisans working in Gilgit and Skardu were asked to come back and participate in the effort. In Category – 2, a large amount of volunteer work was carried out by the community.

REASONS FOR DIFFERENCES BETWEEN THE TWO CATEGORIES:

The reasons for the differences between the two categories are not related to the comparative affluence of the villages or even to their size. Bubar with 243 households participating produced a school of Category – 1, while Khyber with only 52 households produced a Category – 2 School.

SOURCE OF INSPIRATION : THE SCHOOL OF SHERGILLA

Entrance of the school

Classroom

The reasons for the differences, as perceived by me, are given below:

SCHOOL DESIGN PREPARATION:

The layout plan for the schools of Category – 2 was prepared by an Architect.

THE SHERQILA SCHOOL EXAMPLE:

The Sherqila School has served as an example and a source of inspiration to the villagers. The School plan prepared by Amin Ali Moulji for Category – 2 Schools was carried through because of this example and inspiration.

ARTISANS EMPLOYED:

The artisans who worked as master masons and master carpenters on the category – 2 Schools have all been trained at government or related agencies projects at Skardu, Chilas and Gilgit. These artisans have a long experience in working stone and timber under the supervision of engineers. At their school sites they claim to have trained a sizeable number of people.

For the Category – 1 Schools local village masons and carpenters were used. These had no experience of working on official projects or with contractors. They were not professionals, except for the carpenter who laid the roof of the Bubar School.

USE OF TOOLS:

The artisans who built the Category – 2 Schools have used, in addition to a trowel and hammer, a water "dabba" level for establishing horizontal levels; a plumb line for establishing vertical levels; Pythogarus's theorem for establishing the right angle and layout of the building, and a string for layout of the horizontal stone courses. The artisans of Category – 1 Schools used none of these instruments.

Similarly for timber work, the artisans of the Category – 2 Schools claim to have used a "gunia" or a steel right angle, a pencil for making of sawing lines on sleepers or other timber members, and a planer for joist finishing. In the case of Category – 1, this work was done by "andaza" or intuition.

ECONOMICS:

Approximate costs of the D.J. School buildings, as given by the people are reproduced below. I have added the cost of skilled labour (the people say that it was voluntary), at lower than market rates, as all the artisans interviewed said that they would rather work in their village at half wages than at Gilgit at a standard wage.

GARLATH:

- School built in 1981 – 1984
- Cost of tractor Rs 24,000 for acquiring stone and sand

- Cost of timber Rs 30,000
- Masons Rs 36,000 for 2 masons for 12 months at Rs 50 per day. Villagers claim that this was voluntary work.
- Carpenters Rs 18,000 2 carpenters for 6 months at Rs 50 per day
- 200 cement bags at Rs 85 per bag Rs 17,000

  Total Rs 125,000 for about 2,500 SFT

  Or Rs 50 per square foot of construction
- Add unskilled and "shagrid" labour, halli and hardware.

NAZIMABAD:

- School built in 1978 – 1984
- Cost of tractor hire Rs 60,000 for acquiring stone and sand
- Cost of timber Rs 50,000 cutting and buying
- Masons and Carpenters Rs 236,000 12 persons for 18 months at Rs 40 per day. Villagers claim that this work was 70% voluntary.
- 1000 cement bags at Rs 85 per bag Rs 110,000 at Rs 110 per bag.

  Total Rs 480,000 for about 4,000 SFT

  Or Rs 120 per square foot
- Add unskilled and "shagrid" labour, halli and hardware.
- Number of households: 130
- Contribution per household in cash in 5 years: Rs 3,200

PASSU:

- School built during 1980 – 1982
- Cost of tractor hire Rs 50,000
- Cost of timber Rs 50,000 Sufaida also contributed by villagers
- Masons and Carpenters Rs 175,000 8 persons for 18 months at Rs 40 per day. Villagers claim that this work was voluntary and only "atia" was paid
- 1000 cement bags at Rs 85 per bag Rs 85,000 at Rs 85 per bag.

  Total Rs 360,000 for about 4,000 SFT

  Or Rs 90 per square foot of construction
- Add unskilled and "shagrid" labour, halli and hardware.
- Number of households : 62
- Contribution per household in cash over 3 years : Rs 5,800

KHYBER:

- School built during 1978 – 1983

- Cost of tractor hire Rs 60,000
- Cost of timber Rs 27,000 with transport "Sufaida timber also contributed by villagers free
- Masons and Carpenters Rs 175,000 as for Passu
- 200 cement bags at Rs 85 per bag Rs 20,000 at Rs 100 per bag.

  Total Rs 282,000 for about 4,000 SFT

  Or Rs 70.5 per square foot of construction
- Add as for Passu
- Number of households : 52
- Contribution per household in cash in 5 years : Rs 5,500

BUBAR:

- Contract let out to 2 contractors with all materials for : Rs 24,000
- Covered area : 1,200 sq.ft.
- Cost per sq.ft. of construction : Rs 20
- Number of households : 243
- Contribution per household : Rs 98

GRUNJAR:

No figures available.

CONCLUSION:

The conclusions which can be drawn from the information in this section (2) are given below.

MOTIVATION AND ORGANISATION:

The D.J. School Building Programme shows that a tremendous urge exists in the people for education and that they are quite capable of mobilising and organising their meagre resources. The form of organisation and its manner of operation is not suited to managing large and complex building projects without some assistance. The spirit of the people, the sacrifices made by the artisans, and the cash contribution made by the villagers are, I feel, without parallel. If correct costing of the projects, with details of when what was required had been made available to the people, the school building period would have been reduced, quality improved and financial difficulties overcome.

INPUTS AND THEIR IMPACT:

From the Grunjar, Bubar and Garlath schools to the Nazimabad, Passu and Khyber schools is a quantum jump. This has taken place only because of an architect's plan and an example of a new school building at Sherqila.

If similar directions in technology had been given, the school buildings could have been earthquake resistant without any extra cost. If correct siting had been chosen the cost of plinth construction could

have been substantially reduced. Better tools, thumb rules for sizing, easy availability of cheap lime and innovations in the use of timber as a structural material, could have made this self help effort appropriate sociologically, technically and economically.

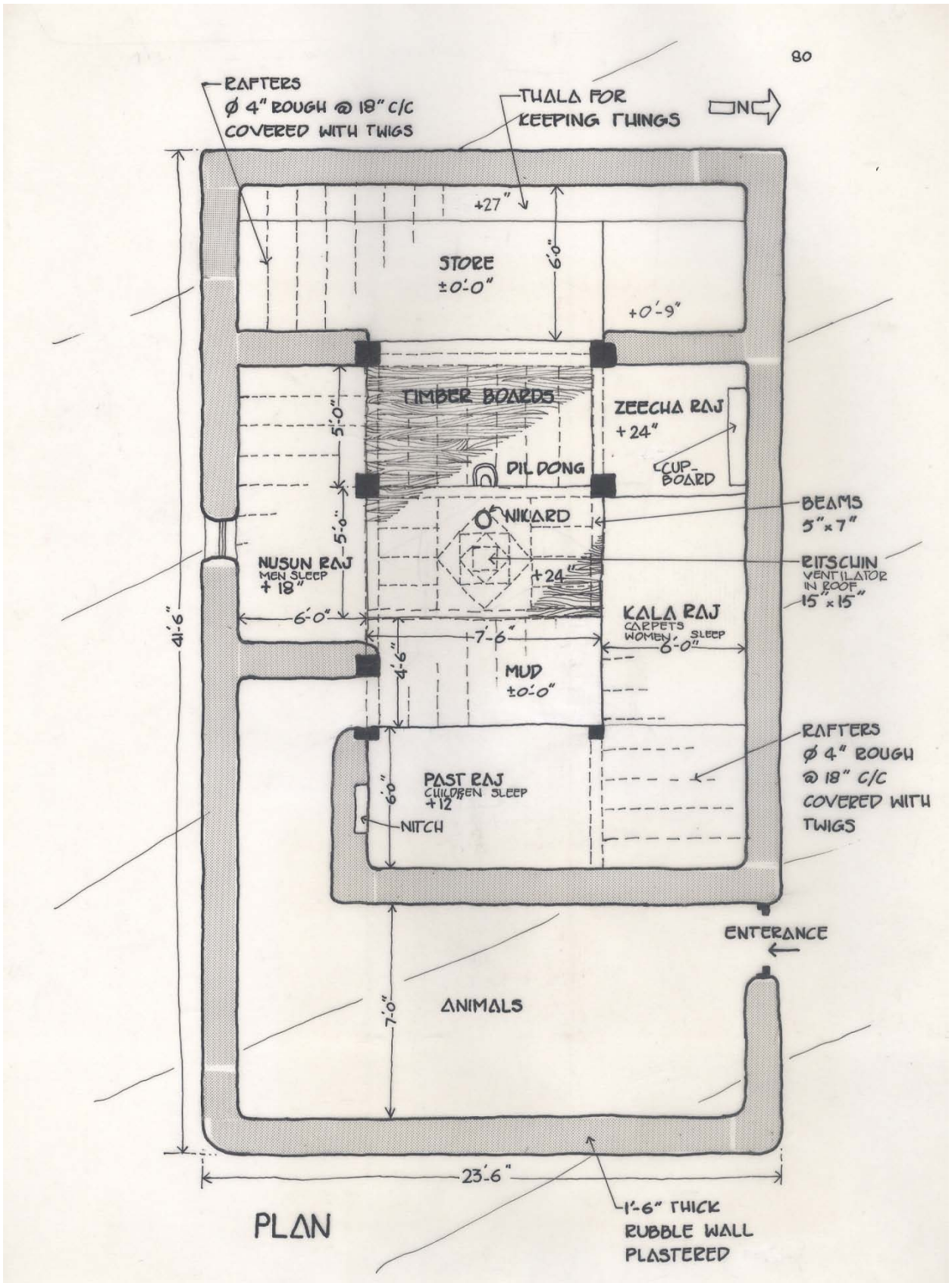
In conclusion one can say that the Category – 2 Schools are far superior as design and construction to the Government Primary School at Nazimabad and the Government High School at Bubar. Both these government buildings have withstood seven to eight earthquakes each year extremely well for the last seven years.

3.Documentation of Indigenous Architecture of the Northern Areas

IZZATULLAH'S HOUSE AT PASSU:

Outside

Inside


80
RAFTERS
ø 4" ROUGH @ 18" C/C
COVERED WITH TWIGS
THALA FOR
KEEPING THINGS
N
+27"
STORE
±0'-0"
6'-0"
+0'-9"
TIMBER BOARDS
5'-0"
ZEECHA RAJ
+24"
CUP-
BOARD
DIL DONG
NIKARD
BEAMS
5"x7"
5'-0"
NUSUN RAJ
MEN SLEEP
+18"
+24"
RITSCHIN
VENTILATOR
IN ROOF
15"x15"
6'-0"
KALA RAJ
CARPETS
WOMEN SLEEP
7'-6"
6'-0"
41'-6"
4'-6"
MUD
±0'-0"
RAFTERS
ø 4" ROUGH
@ 18" C/C
COVERED WITH
TWIGS
PAST RAJ
CHILDREN SLEEP
+12
6'-0"
NITCH
ENTERANCE
7'-0"
ANIMALS
23'-6"
1'-6" THICK
RUBBLE WALL
PLASTERED
PLAN

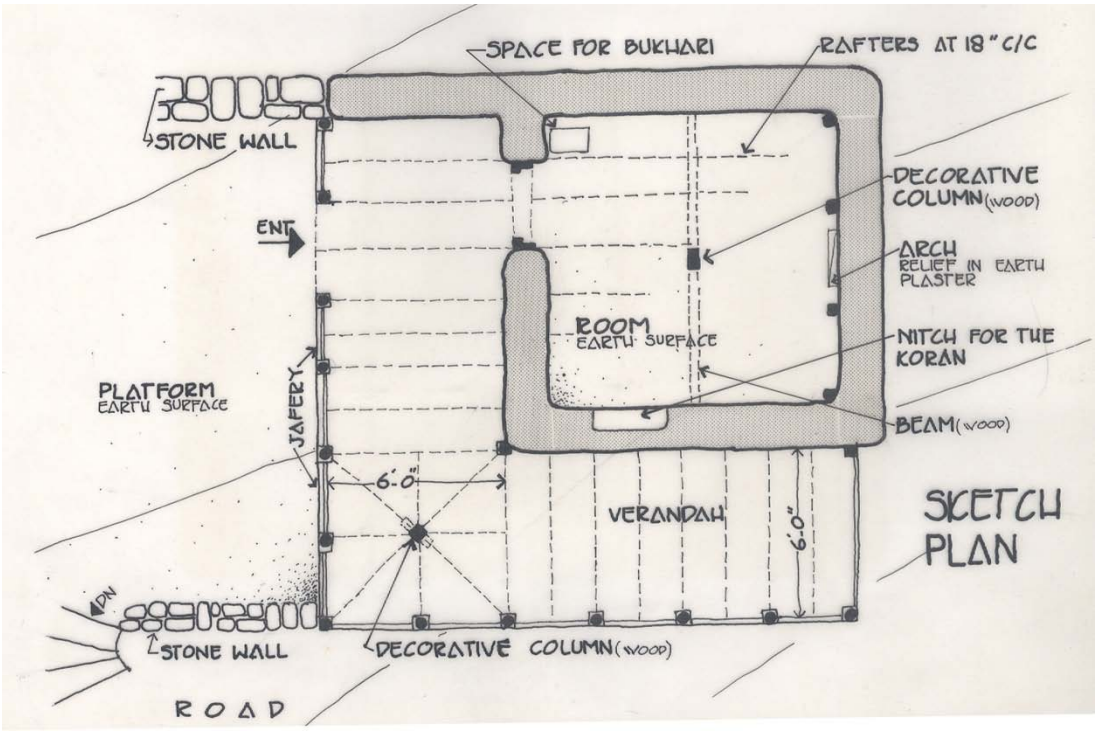
SHIA MOSQUE AT SHAKYOT:

According to the people the mosque was built about 120 years ago. The verandah floor is earth and has mats on it. The room has a hay covering, is pitch dark and is used in winter only. Although it is a small mosque it is sufficient for the needs of the seven Shia households in the village.

Verandah

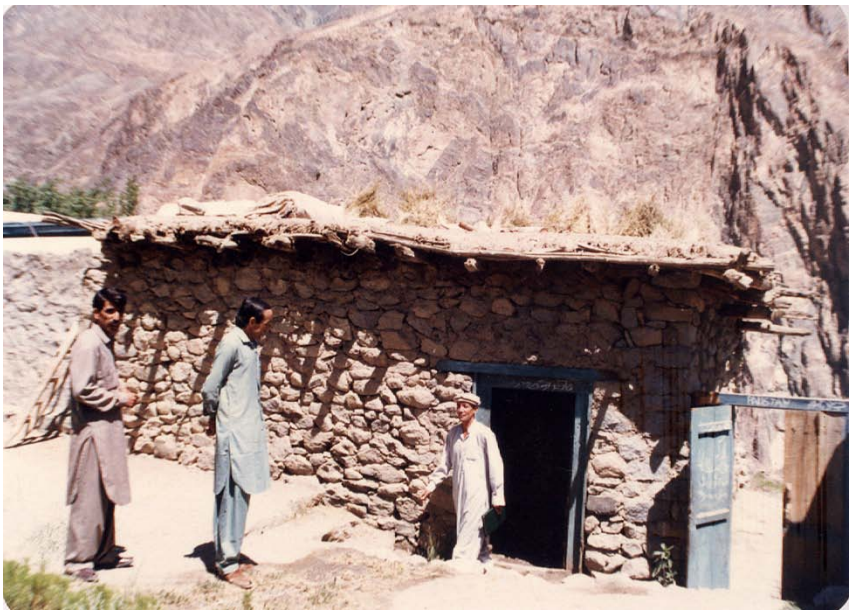
Timber Details

Door to Room

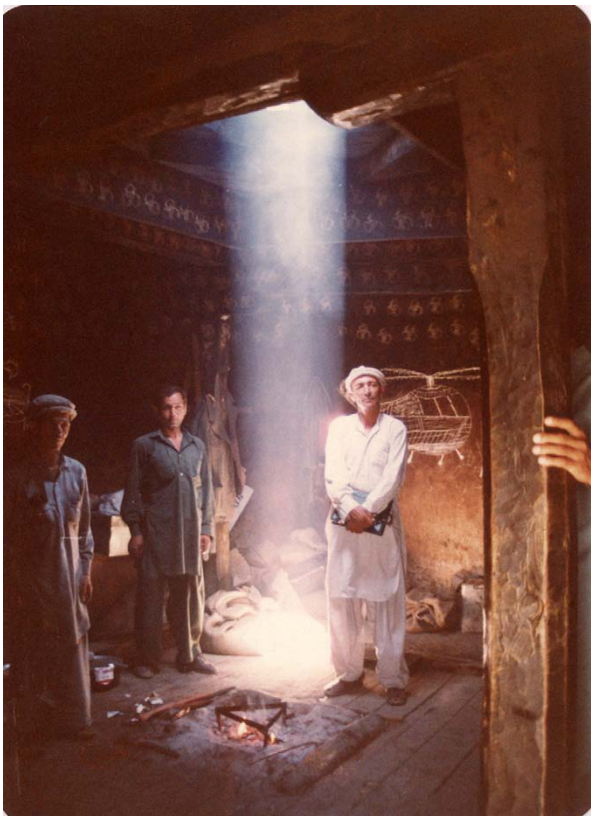

SPACE FOR BUKHARI
RAFTERS AT 18" C/C
STONE WALL
DECORATIVE COLUMN (WOOD)
ENT
ARCH RELIEF IN EARTH PLASTER
ROOM EARTH SURFACE
NITCH FOR THE KORAN
PLATFORM EARTH SURFACE
JAFERY
BEAM (WOOD)
6'-0"
VERANDAH
6'-0"
SKETCH PLAN
DN
STONE WALL
DECORATIVE COLUMN (WOOD)
ROAD

JANDROTE SCHOOL (LANGAR KHANA):

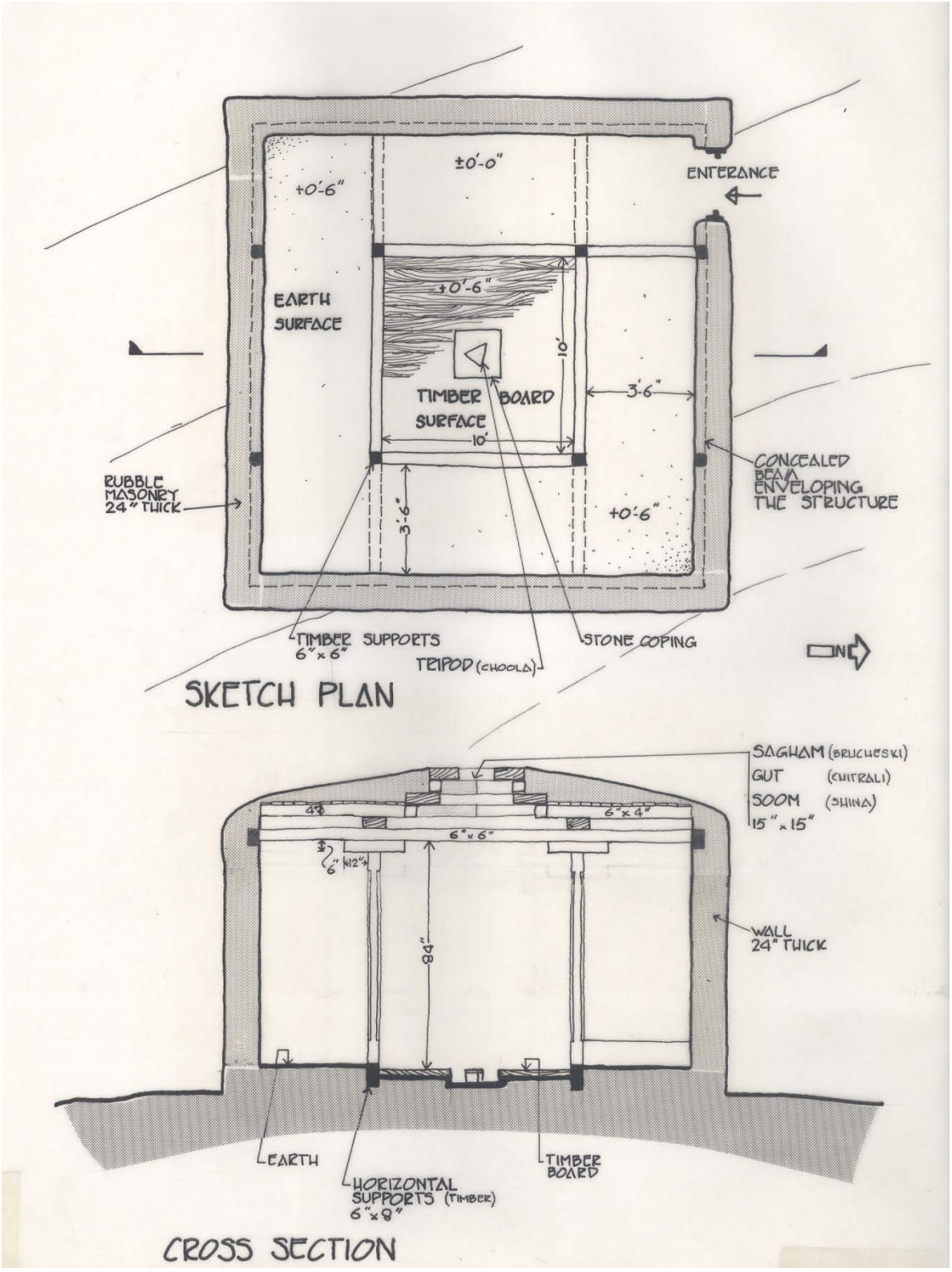
The School was built in 1937 by Syed Madoom Shah. He was a Maulim from Chitral. Sarfaraz Shah, the headmaster of the present school, studied here.



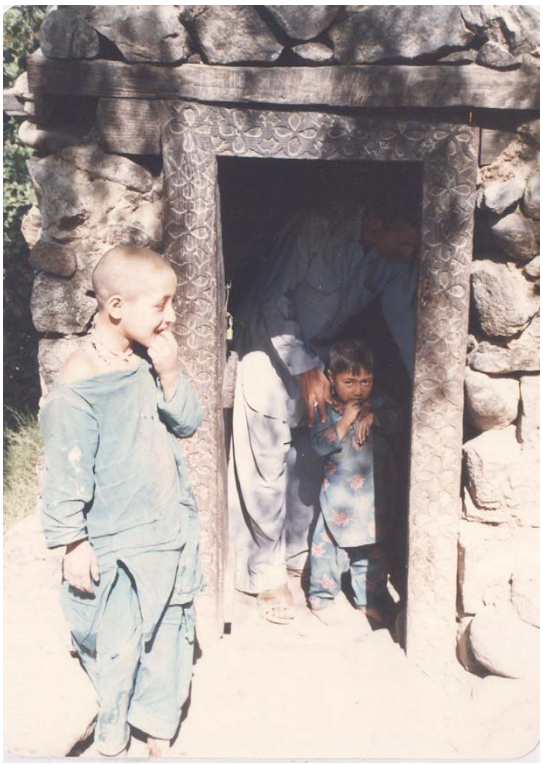
External View



Internal View


±0'-0"
ENTERANCE
+0'-6"
EARTH SURFACE
+0'-6"
10'
TIMBER BOARD SURFACE
10'
3'-6"
CONCEALED BEAM ENVELOPING THE STRUCTURE
RUBBLE MASONRY 24" THICK
3'-6"
+0'-6"
TIMBER SUPPORTS 6"x6"
TEIPOD (CHOOLA)
STONE COPING
N
SKETCH PLAN
SAGHAM (BRUCHESKI)
GUT (CHITRALI)
SOOM (SHINA)
15" x 15"
4"
6"x4"
6"x6"
6" 12"
84"
WALL 24" THICK
EARTH
HORIZONTAL SUPPORTS (TIMBER) 6"x8"
TIMBER BOARD
CROSS SECTION

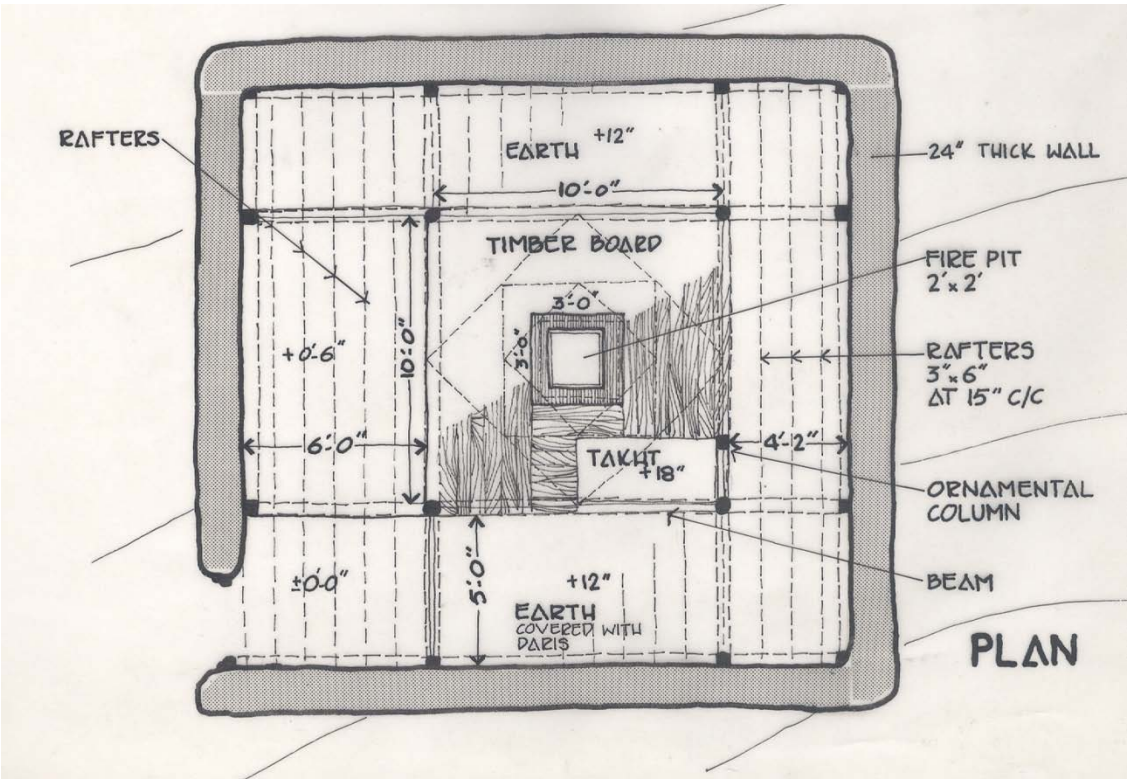
PIR KHAN, GRUNJAR:



Door way

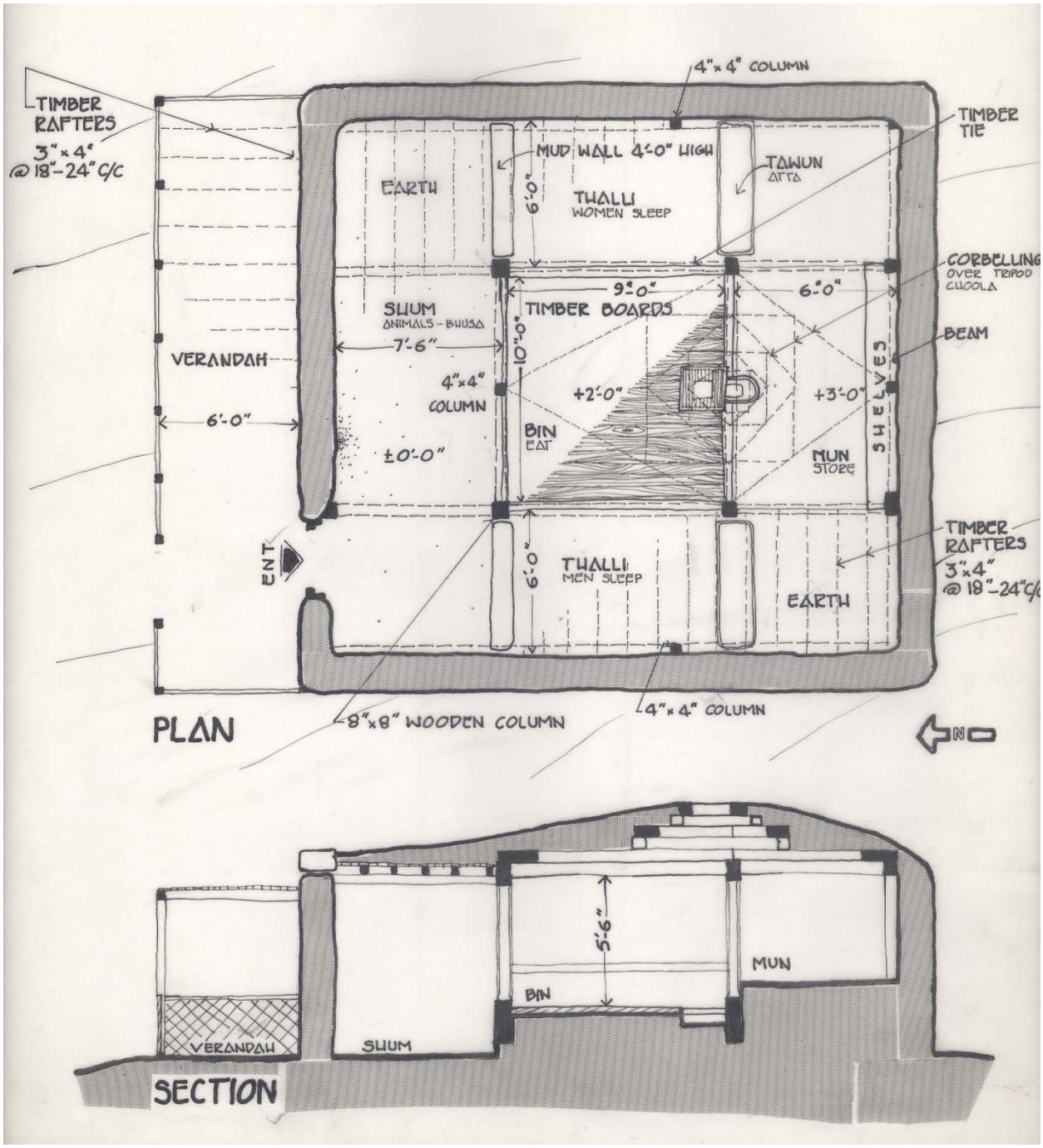
Interior

Carved columns



IBRAHIM MADHAT SHAH'S HOUSE AT SUMAL:

Ibrahim has a family of seven. Four boys, two girls and his wife. This house was constructed 25 years ago when he was 20 years old.

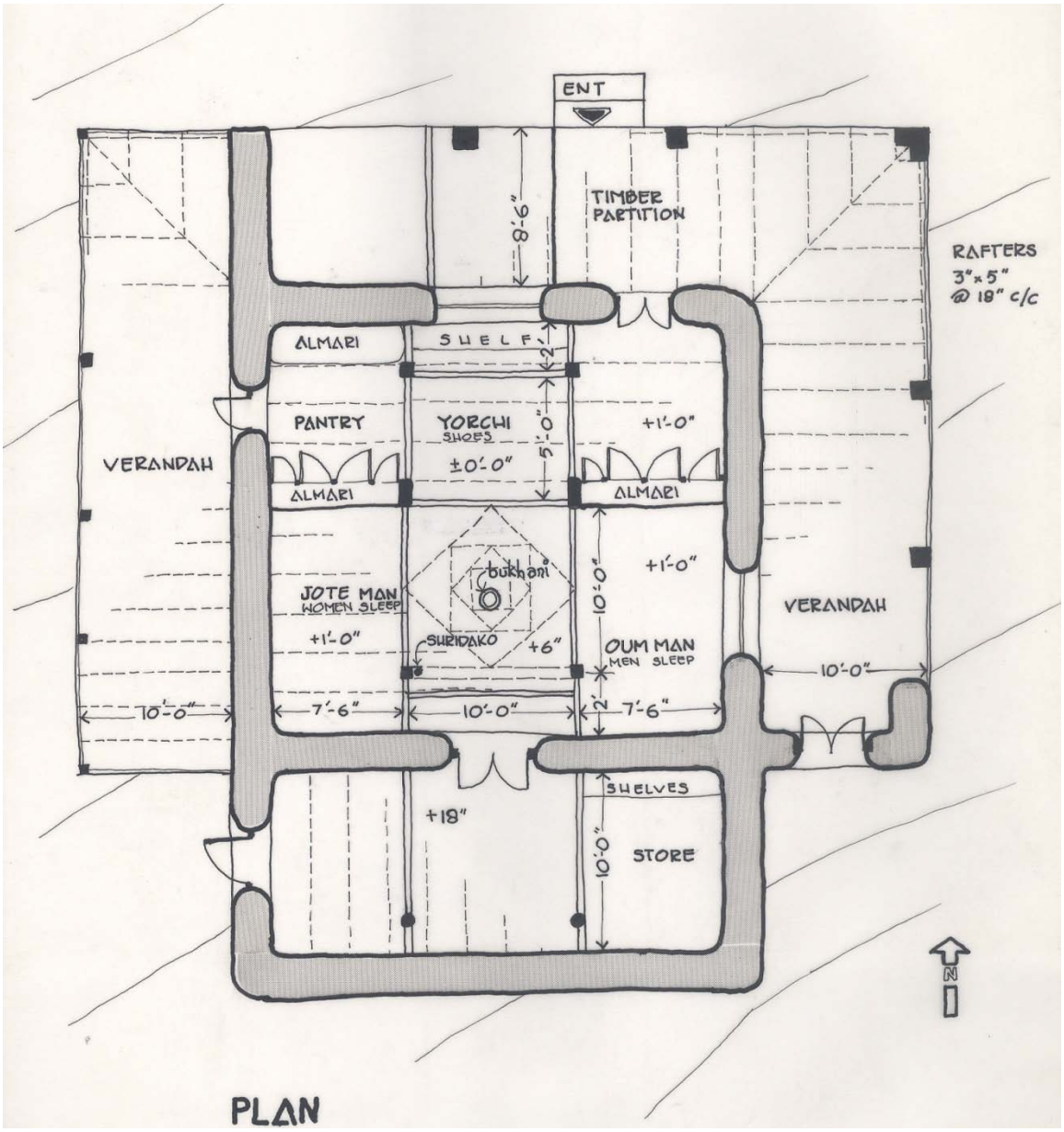


CAPTAIN SANA KHAN'S HOUSE, GILGIT:

Captain Sana Khan built his house in 1980. It was completed in a year. The core of the house is traditional and the family spends its winters there. The summer house is built around this core. The total cost of the house worked out to Rs 180,000. Stone was free and timber was purchased on permit from the jungle. This facility is often given to ex-servicemen.

The house is an example of an old house design adapting itself to the new world and its requirements. Sana Khan explained the old terminology which describes different parts of the house. His children, grown up in Gilgit, were unaware of its meaning and even the existence of some terms. This terminology is replaced below.

- Chiskish : Store
- Chintara : Timber skirting around room
- Yarchi : Shoes. On days of happiness one dances on this space so it is clad in timber
- Berochoman : Where the singers, the Berocho sit and play
- Shridako : This is the name of the column. Guest or honourable man sits facing west near this column
- Oum man : Man's sleeping area. It is larger by a "balish", about 10" than the "jote man", or women's sleeping area.
- Tokobal : "Bal" means wall and "took" to put. This used to be a hollow wall for storage where Sana Khan has put his cupboards
- Saghor : Same as "tokobal" but in the "jote man" area. It was a store for "ata or wheat
- Akhoto : The roof over the central part. As we move outwards the depth of core belling decreases from 5" to 4" to 3" to 2"
- Sagham : The hole in the roof for smoke exit. Sana Khan has installed a bukhari and covered the hole with a skylight
- Nikarth : Central eating place
- Khungigash : Entrance space. Water was kept here and supplied to the people
- Baldi : Verandah



Plan – Captain Sana Khan's House, Gilgit

4.Notes on Conversations with Village People, Artisans and Notables

AT THE SCHOOL SITES AT GARLATH, BUBAR AND GRUNJAR:

GARLATH:

At Garlath, at the meeting only two persons were present. One was Faqir Shah, a retired Subedar and a local member of the Educational Board. The other was Niat Shah, an ex-army Havaldar. Both were the activists behind the School Building Programme along with the village Nambardar.

The community decided to build the school as previously the children studied in the verandah of an old Jamaat Khana. This made separation into different groups impossible and created problems of communication. In winter, the school had to close down due to lack of space and heating problems.

The Shias refused to participate in the school building effort and they do not study in the school. They study at a school in the nearby village of Genesh. The reason for this is an old standing quarrel over a mosque site. In the village there are about 40 Shia houses.

Stone was brought from a site about one furlong away. The other site used was near a nullah near the KKH. In the first case, it was carried physically to the site. In the second, it was carried to the KKH physically and then to the School site by tractor. Twenty to 25 persons were engaged in doing this job.

Timber was donated by the villagers in the form of Sufaida trees. It was also purchased from Nagar and Hussainabad.

The plinth is an enormous platform of stone pitching to level the ground. At one end it has been filled with about 8 feet of stone. The stone walls are 1'-6" wide and are plastered over with mud. They were put up by local masons free of cost. The masons here had not worked outside this area. It is not clear if they were professionals. They did not use a plumb line or a water or spirit level.

The roof is of Kael and Sufaida rafters and boards, all over-size and not regularly cut due to which the members are wavy. The cutting of the timber was done by "andaza" or intuition. The only saws used were hand operated and no pencil markings were made on the timber to direct the sawing operation. The carpenters were not professionals but volunteers with some experience in timber working.

The school building took three years to build and was completed in 1981. Most of the time was spent in levelling the site. Other delays occurred due to problems in purchasing and transporting timber and cement. No estimates for these items were ever made and they were purchased as and when necessary. This also delayed matters.

The School bow has 70 to 80 students and two teachers. It consists of six classrooms with a seven feet verandah in front. The classrooms are badly lit through small ventilators. "Durris" or rugs are arranged on the floor on which the children sit.

For heating in winter the villagers collected money for the purchase of "bukharis". Some even donated a "bukhari". Children bring timber with them as fuel.

Niat Shah says that lime is half the cost of cement in Gilgit. It comes from the Punjab. It is available in the hills nearby but people are not willing to make the effort to extract it. Timber he says is easily available and can be purchased without difficulty in Nagar. The problem is its transportation and sawing. Due to these problems people are reluctant to use it and sometimes and look for alternatives.

The workmanship in the building is poor. The walls are not in plumb nor the roof or plinth in level. The classrooms are dark and have almost no ventilation. Both the participants to the meeting did not know of any buildings that had been damaged or had fallen due to earthquakes.

BUBAR:

The D.J. School was founded in 1947 near the Jamaat Khana. Subedar (retired) Mirza Din, the most vocal resident present at our meeting, and the Sadar of the Local Ismailia Council, studied at that school. It had three rooms and was only for boys. The people of Grunjar and Bubar constructed it jointly without any outside assistance. It was taken over by the government in 1965 and turned into a primary school. In 1973, the government constructed a middle school and in 1982, it was upgraded to a high school.

In 1971 the present girl's school was formed in the Jamaat Khana. It was only for religious education. As the space was insufficient and as the people wanted to make it more than just a religious school the present building was built. Its construction was undertaken in 1979.

Bubar has 386 households. However, only the 243 Ismaili households participated in the effort. Land was acquired by exchanging "Khalsa" land with land belonging to the "Mukki", Mirza Jan.

Stone gathering and building of the walls and floors was given to a contractor from Bubar. For this work he chanrged Rs 12,000. The walls are 1-1/2 feet wide and plastered with mud. All labour used by the contractor was local and local trained. They did not use spirit or water levels or plumb lines.

Timber work was also given on contract to a local villager Mirza Jan. He employed a village carpenter who had some experience in working for a year in Gilgit. The contract price was also Rs 12,000. Mirza Jan acquired timber by purchasing Sufaida trees from the villagers.

Shah Mirza, Vice Chairman of the Union Council and Khus Rab Khan, Headmaster of the school, both say that earthquakes are common and have caused a lot of damage to buildings in the village. The school building has also developed cracks but they are at wall junctions and at places where stone staggering at joints are insufficient.

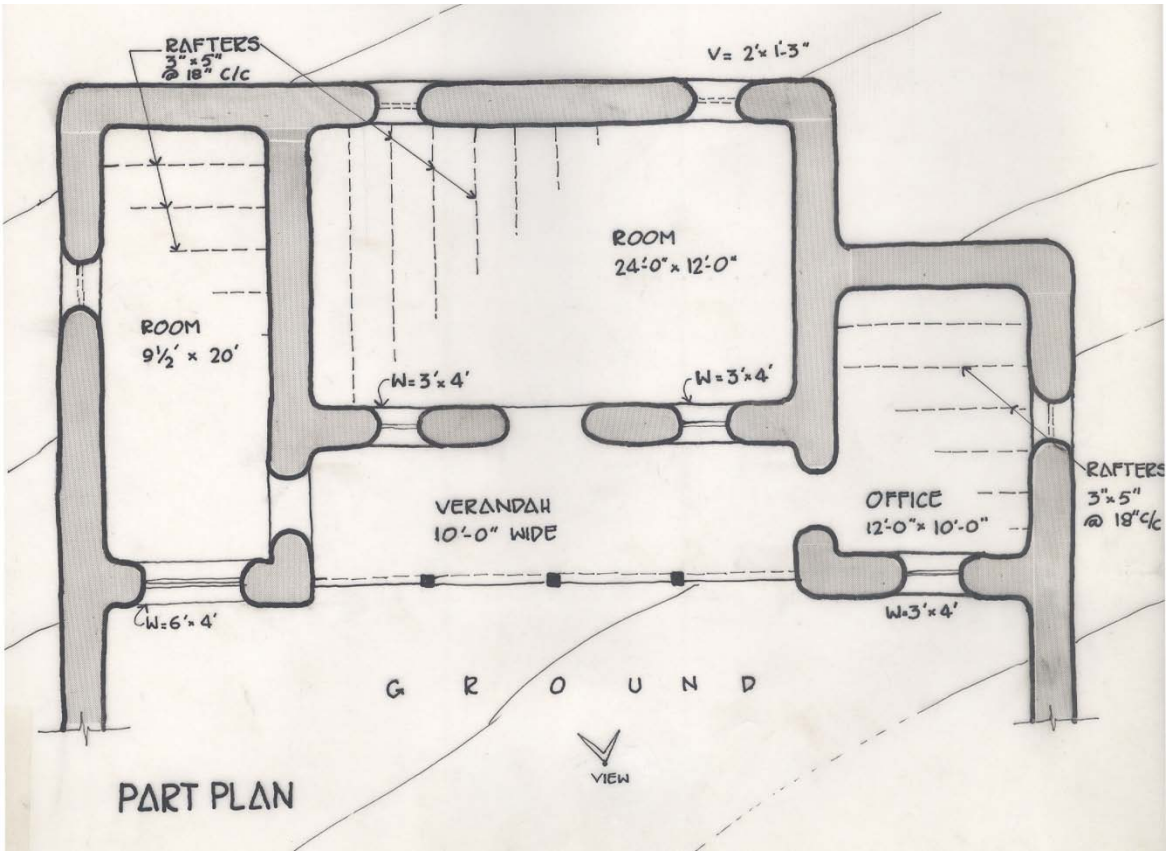
Lime exists at about three kilometres distance and was used for the old Jamaat Khana. The acquiring of it is a problem so cement is preferable. The consensus at the meeting was that if it was available in the market at even 2/3 of the price of cement, it would be used.

The gathering agreed that the school building needed upgrading. For example, they wanted cement for their floors. However, they were unwilling to undertake any further development work on their own. Shah Mirza felt that the Self Help School Construction Programme (SHSCP) of the Aga Khan Foundation should come to their assistance.

At present 179 girls study at this school and the space is insufficient for them. The "motibars" of the village say that they will make a big effort to get a new school from the Imam.

D.J. SCHOOL AT bUBAR

View



Part Plan

The School at Bubar is better than the one at Garlath in workmanship. However, its classrooms are dark and narrow and the floors are of mud.

GRUNJAR:

At Grunjar the gathering was small. Only four persons were present. Ishrat Khan, the Mukki of the Jamaat Khana and Chairman of the Union Council did most of the talking.

Number of households in the village are 120. One person from the village has a shop in Gilgit. Thirteen are local shopkeepers and about 30 work in the army. Twelve persons work as “mistris” in the towns of the NA and come home only in winter.

Land was purchased in 1973 for Rs 6,000. Money for this purchase was collected in two years and everyone contributed equally. Didar Jan, a teacher at the school says that everyone is much richer now and twice the amount could be collected in less than six months.

The School is constructed of rubble masonry and is plastered internally with mud. Timber supports have been built into the walls as a precaution against earthquakes. Floors are of mud. However, in one room the floor has been removed and there is a scheme for cementing it provided the SHSCP provides the cement and funds for this purpose.

Before the School was constructed education took place in the Pir Khana. In 1975, the community put us its first classroom. It was completed in two months. Again in 1978 the second classroom and the office were constructed. Costs of construction are not remembered by the people.

Details of construction, etc, were explained to us by the people present.

Ishrat Khan does not want the community to build any more classrooms or improve the old ones. He is sure if the correct “sufarish” or lobbying is carried out then they will be able to get the SHSCP to build them a school.

Lime is available nearby according to Ishrat Khan. It was extracted for the renovation of the Pir Khana and the construction of the Jamaat Khana. Extracting it is too much of a problem therefore it is no longer used.

AT THE SCHOOL SITES AT NAZIMABAD, PASSU AND KHYBER:

NAZIMABAD:

Nazimabad consists of 150 houses and most of its population are land owners. Some are businessmen in Gilgit and three in Karachi Thirty to 35 persons are ex-army men and over 40 are serving.

A small school functioned since 1950 in the village in a Langar Khana. In 1976 the government constructed a primary school in the village. It soon became insufficient as it had only three classrooms and one teacher.

Motivation for the present school was provided by the Chairman of the REB. This was followed by a meeting of all the households were it was decided to construct the school. Land was purchased for Rs 25,000 from Ghulam Kadir and his brother Karimuddin. This land was worth much more but the brothers considered it as their contribution towards the school building effort.

A committee of 12 persons was formed for organising construction. A ketch plan of the school was given to the Committee by the REB. It had been prepared by Amir Ali Mulji, a Karachi architect. The Village Committee then selected master mason Yakook Khan to oversee the school construction. He was helped by 10 to 12 other masons during construction. Yakook has an experience of 20 years working as a mason on government projects in Gilgit, Chilas and Skardu with contractors and engineers. He and some of the 12 masons left their work in the towns and came to Nazimabad at the behest of the Committee. They worked free of cost. During construction they used water levels, plumb line, string for laying horizontal courses and the 3, 4, 5 triangle for laying out of right angles. These techniques Yakook learnt while working in the towns of the NA.

Six carpenters worked on the roof of the building. They were all locals working in the towns of the NA. They also came to Nazimabad at the behest of the Tamirati Committee and no payment was made to them for the work they did. All the carpenters and masons have now gone back to their jobs in the towns.

Stone was brought from the river by contractor. The tractor was rented from Gulmit at Rs 200 for eight hours. It made four to six trips in a day. The “matoris” broke it after it arrived. Each matori can break two tractor loads in a day. The mistris hammer dressed it. Each mistri can make about 40 stones per day and two masons, working together, can put up two tractor loads of masonry. The tractor worked for about 300 days.

Cement was used for the floors and the pointing of stone work. The laying was done in mud mortar. Lime used to be used when there was no road. Now with the KKH cement is easier to obtain than lime although it is twice the cost. About 1,000 bags of cement were used for the School.

Timber came from Nagar, about 70 miles away, by truck. It was purchased in tree form from the government. Village people went to Nagar, chopped up the trees, put the timber on to jeeps till the KKH and from there onto trucks to Nazimabad. The Committee organised this whole effort, including food to the volunteers, who went to Nagar for this mission.

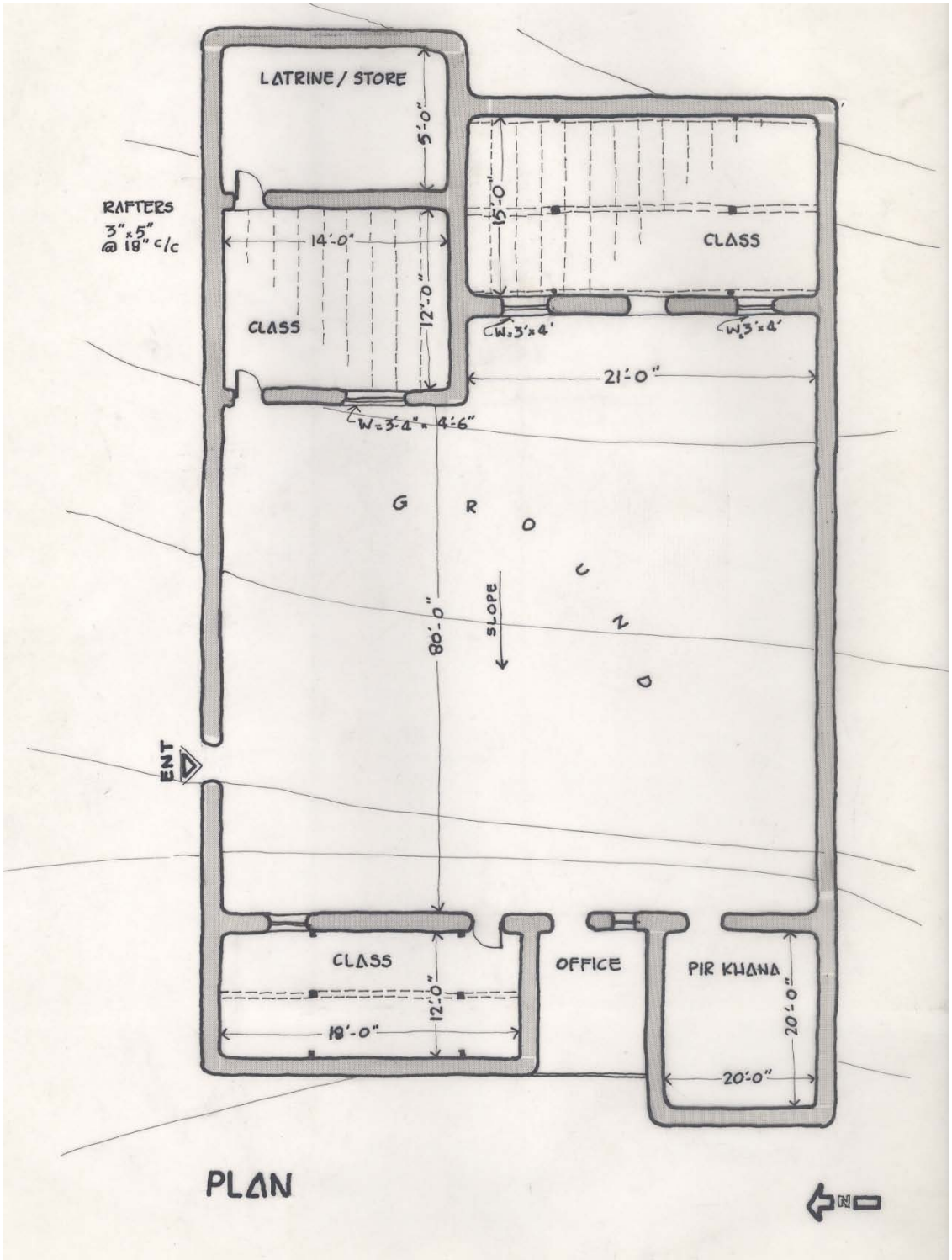
Rs 5,000 were paid to the government for the trees and Rs 20,000 in cutting and transporting it. Yet this timber was not enough and people contributed Sufaida trees as well.

The carpenters used the “gunia” or steel right angle, water levels and spirit levels during construction. They also marked out sawing lines on the timber with nails.

The School began in 1979 and was completed in 1984. The problem in completion was due to a lack of funds. On further questioning it became obvious there were other reasons. There was no work plan. No quantities for materials required had been worked out. The Committee depended on estimates for labour and materials worked out by the artisans and these were always grossly under-estimated. This created bad relations between the artisans and the Committee members. The villagers were not given sufficient notice about when funds were needed, etc.

Haji Karim is 65 years and is a mason. He has never heard of a building falling in an earthquake in his area. In the Ghazar Valley, yes, but not here.

D.J. SCHOOL AT GRUNJAR



The Tamirati Committee has kept a register of accounts and has communicated these accounts to the village population.

The ex-army personnel in the village and the nambardar were in the forefront of this effort.

There is no concept of how the school will be maintained or who will do it. So far, no maintenance has been required.

Masons' salaries vary from Rs 30 in Nazimabad to Rs 80 per day in Gilgit. Yakook says he would prefer to work at home for Rs 30 than at Gilgit for Rs 80.

PASSU:

Before the present school was built by the people there was only one school in the village. It had two rooms and one office. It was made of stone and had mud floors. It was constructed in 1978 and is now abandoned.

The old school was too small and to study after primary level one had to go to Gulmit. So people got together and took a decision to build a school. All 62 households assembled and choose a Tamirati Committee. Land was given free by Bande Ali, and some more later, by Gul Ban Mohammad. The plan of the school, a line drawing, was provided by the REB.

Stone was brought as at Nazimabad by tractor and so was sand. All told the village spent about Rs 50,000 on this exercise. They also spent about 1,000 bags of cement at about Rs 85 per bag.

Two-third of timber came from village Sufaida trees. The rest was purchased from Hunza in Log, slipper or board form, and transported to Passu by truck.

Mason Ali Murad was responsible for overseeing construction. He is Gilgit trained. Four to five masons worked with him during the two years the building was under-construction. They all worked almost free of cost. The village gave him an "atia", or token money, of Rs 5,000 on completion of the work.

A purlin roof covers the entrance hall and the main hall of the building. It is a fairly complex affair. Ali Murad learnt how to make it while working on suspension bridges for NAWO.

The Committee was able to arrange food at the cost of the community for the people working on the site. All the households contributed equally towards this effort.

Construction began in May 1980 and was completed in September 1982. Ali Murad gave fairly accurate estimates of quantity and time but the Tamirati Committee did not give people enough notice before asking for money. Thus delays did take place.

Like at Nazimabad, there is no concept of maintenance, as to how it will be done or who will do it. The roof leaked in two places during the rains last year and it was repaired by the school children. However, a school committee has been formulated consisting of three persons. One of them is a member of the REB. This committee has also purchased bukharis for heating the school. 132 children study at the Passu School at present.

Ali Murad is now working at an under-construction hotel building at Passu where he earns Rs 50 per day. He prefers this to earning Rs 70 at Gilgit.

No one in the gathering knew of any building which had fallen in an earthquake in or around Passu. Passu masons and carpenters visited Sherqila and it served as a source of inspiration to them.

KHYBER:

The Khyber School is no different from the Nazimabad and Passu schools. It began construction in 1978 and finished in 1983. This was because Khyber is a small village of 52 houses and there were financial problems. Also there was no work plan and the resultant problems were the same as at Nazimabad.

To overcome these problems some innovations in organisation of construction were also used. For example in the first year, the whole village worked together on the school. Due to differences and problems it was then decided to divide the work between households. So, 11 households were given one room each to build. Thus, the walls were erected without much delay and with almost no financial problems. However, timber was difficult to get hold of and was very expensive. It cost Rs 27,000 and this is where the delay occurred.