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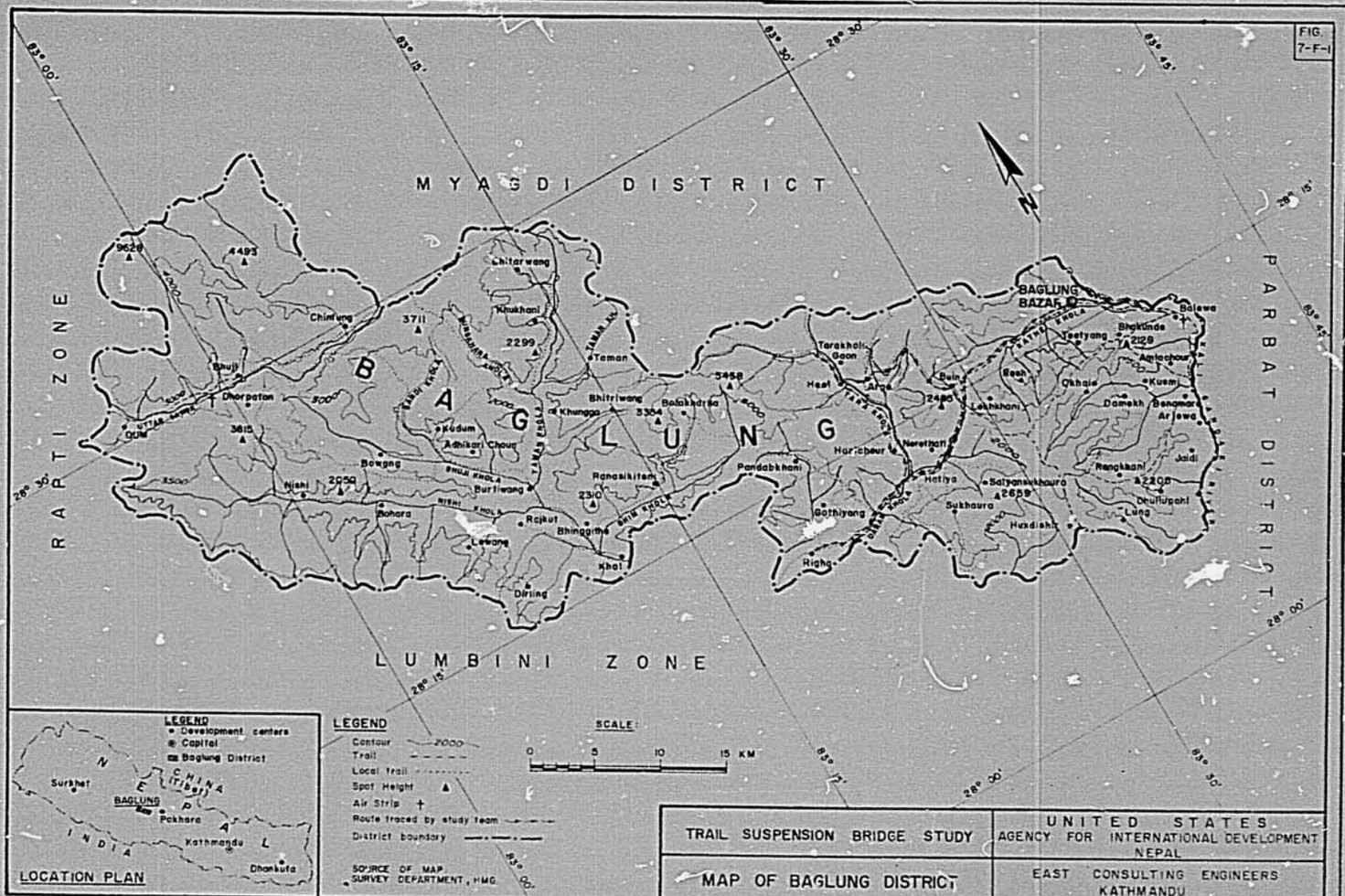


FIG. 7-F-1
MYAGDI DISTRICT
RAPTI ZONE
PARBAT DISTRICT
LUMBINI ZONE
BAGLUNG
BAGLUNG BAZAR
Chimlung
Khukhani
Lahitarwang
Temen
Dhorpatan
Bhuji
Gum
Kudum
Adhikari Chour
Bowang
Burliwang
Nishi
Bohara
Rajkut
Bhinggithe
Khal
Lekwang
Dirling
Khungga
Bhitriwang
Balakhariya
Ranasikiten
Pandabkhani
Harichaur
Nuretari
Hatiya
Sukhaura
Salyanekhaura
Gothiyang
Highs
Hadishi
Heal
Arna
Terakholi Gaon
Buin
Lekhkhani
Bash
Qhaie
Kusum
Damekh
Bangwar
Arjewa
Jaldi
Rangkhani
Dhulupani
Lung
Teetyang
Bhikunde
Aplechour
Balewa
9620
4493
3711
2299
3815
2059
2310
5458
3354
2480
2659
2128
2208
83° 00'
83° 15'
83° 30'
83° 45'
28° 30'
28° 15'
28° 00'
LEGEND
Development centers
Capital
Baglung District
Surkhet
BAGLUNG
Pokhara
Kathmandu
Dhankuta
NEPAL
CHINA (Tibet)
INDIA
LOCATION PLAN
LEGEND
Contour
Trail
Local trail
Spot Height
Air Strip
Route traced by study team
District boundary
SOURCE OF MAP
SURVEY DEPARTMENT, HMG
SCALE
0 5 10 15 KM
TRAIL SUSPENSION BRIDGE STUDY
MAP OF BAGLUNG DISTRICT
UNITED STATES
AGENCY FOR INTERNATIONAL DEVELOPMENT
NEPAL
EAST CONSULTING ENGINEERS
KATHMANDU

TABLE OF CONTENTS

		Page
7.	BAGLUNG TRAIL SUSPENDED BRIDGES	
7.1	INTRODUCTION AND PURPOSE OF THE STUDY	1
7.2	METHODOLOGY	2
7.3	CASE HISTORY IN BRIEF	3
7.4	SOCIO-ECONOMIC BACKGROUND OF BAGLUNG DISTRICT	7
7.4.1	Geographic Setting	7
7.4.2	General Cultural Setting	9
7.4.3	Economic Structure	12
	- Population and Labor Force	14
	- Agriculture	15
	- Rural and Cottage Industries	16
	- Mining Activities	18
	- Trade Patterns	19
7.5	TECHNOLOGY AND PROJECT BACKGROUND	20
7.5.1	Traditional Technology	20
7.5.2	Process of Technological Evolution	21
7.5.3	Project Management	24
7.5.4	Site Selection and Resource Availability	25
7.6	ANALYSIS	27
7.6.1	Socio-Economic Analysis	27
	- Sociological Considerations of Bridge Building Activities in Baglung	27
	- The Role of Bridges in the Economy of Baglung	29
7.6.2	Institutional Analysis	30
	- Local Participation	30
	- Bridge Site Selection	33
	- District Administration and the Pilot Project	33
	- Supervision by District Panchayat Area Member	36
	- The Construction Organization	36

		Page
7.6.3	Technological Evaluation	38
	- Bridge Construction Technology	38
	- Bridge Structure: An Assessment	50
	- Utility, Safety and Expected life	54
	- Transfer of Technology	55
	- Cost Aspect	56
7.7	SUMMARY AND RECOMMENDATIONS	57
	- Summary	57
	- Recommendations	58
LIST OF ABBREVIATION		61
GLOSSARY		62
APPENDICES		
7-A-1	Attachment "B" of Agreement	3 pages
7-A-2	List of Bridges Studied	2 pages
LIST OF TABLES		
7-T-1	Estimated Population and Labor Force Baglung District (1977)	15
7-T-2	Estimated Major Food Crops, Area, Production and Average Yield (FY 1975/76) - Baglung District	17
LIST OF FIGURES		
7-F-1	Map of Baglung District	
7-F-2	Typical General Arrangement: Baglung Suspended Bridges	38A
7-F-3	Type of Anchorages: Baglung Suspended Bridges	44A
7-F-4	Walkway and Suspenders: Baglung Suspended Bridges	53A

LIST OF PHOTOGRAPHS

		Page
7-P-1	Log Bridge in Baglung	22
7-P-2	An act of Charity	39
7-P-3	Use of Imported Ship Anchor Chain	40
7-P-4	Use of $1\frac{1}{4}$ in. Ø old rope way.....	40
7-P-5	Walkway Cable: 3/4 in. Ø old rope way	40
7-P-6	Note the excellent local masonry workmanship	41
7-P-7	Round Anchor Block	42
7-P-8	Straight Face Anchor Block	42
7-P-9	Show of workmanship in a short span bridge	43
7-P-10	The Anchorage is buried underground. Note the.....	45
7-P-11	The hooked anchorage. Also used.....	45
7-P-12	Anchoring the top cables. A different way.....	46
7-P-13	Local way of fixing suspenders, it looks.....	47
7-P-14	Flat Iron Suspenders. Note animals....	47
7-P-15	Walkway with curb and cross beams over the deck	48
7-P-16	A neat walkway	48
7-P-17	Walkway with curb but no beams on top. It looks neat.	49
7-P-18	A mixture of locally-made and imported ship chains	49

7.1 INTRODUCTION AND PURPOSE OF THE STUDY

In the District of Baglung, a campaign to build suspended bridges, in large numbers, under a pilot program, has been going on for the last three years under which they are planning to construct a total of sixty two bridges; fourty one of which have already been completed and commissioned for use, as of May 1978. While people are known to build bridges locally in other parts of the country, this is, so far, the only instance of such a large-scale organized effort undertaken with local initiative and government participation, and it has created widespread interest throughout the country. It has also attracted the attention of foreign agencies like USAID, SATA, UNDP, the US Peace Corps and the German Embassy in Kathmandu. USAID furthered its interest and is trying to know, through this study, the extent to which the measures employed in that area may be applied to a future USAID Trail Suspension Bridge Program.

7.2 METHODOLOGY

The approach followed to study the Baglung Suspended Bridge Program, is a case study approach. The study is primarily based on qualitative aspects and field observations.

The preliminary study included, the review of documents available at the Local Development Department, the government agency which is helping to materialize the Baglung District Suspended Bridge Construction Pilot Program. The background history was collected by interviewing the program's prime mover, the Honourable Member of the National Panchayat from the District of Baglung, Mr. Omkar Prasad Gauchan. The government's district administrative plan was also reviewed in the context of this study along with the socio-economic structure of Baglung District.

The field study included a visit to the District of Baglung where thirty seven traditional bridge locations were inspected. The field team consisted of four senior members of the study team. In the course of the field visit, the government officials, Panchayat workers, school teachers and local people were interviewed. Formal questionnaires were not used.

7.3 CASE HISTORY IN BRIEF

Bridge building is an old technology in Baglung District. Previously people built wooden centilever bridges, many of which can still to be found being used. They also made suspended bridges out of locally mined iron which was made into chains and spanned across rivers. From this a narrow plank walkway was suspended with the help of iron fittings. Technical know-how to do this was and is still locally available. It has been the tradition of the area that if a well-to-do person wanted to undertake a work of charity he would donate his resources for a public utility project such as, a school building, a chautara, a structure of stone built around a tree or two as a resting place for travellers and porters, or a bridge and other people in the locality would contribute their free labour in order to help him materialise his act of charity. Such bridges, some 125 years old, are still standing in the district today.

Leadership: An enlightened local leader, Mr. Omkar Prasad Gauchan, the member of Rastriya Panchayat from the district and also a son of a renowned social worker of the district, saw the possibility of launching a campaign to construct a large number of bridges, and alleviate, once and for all, the problem of fording rivers in the district. He presented a proposal to construct bridges with local technical know-how and labour and with government participation, in the form of materials such as cables, iron fittings, etc.

One basic attribute of this proposal was that it completely did away with the services of trained engineers, and overseers. It is felt that their designs are relatively expensive. Besides, the number of such technicians is still limited and reliance on them would not result in the quantity of bridges that are needed in this district and the country. So, the argument went that if the government was to support the local initiative by a grant of the most needed materials such as, cables and iron fittings, the local people would mobilise indigenous technicians and unskilled labour to undertake the construction of bridges. The large number of bridges built in this manner would be impossible to achieve within the framework of a regular government program.

Constant Persuation: Despite several years of pleading, it was difficult for the Honourable Member to get concerned authorities interested in his proposal. But, he did not give up. He once availed himself of an opportunity to join the then Vice-Chairman of the National Planning Commission, Dr. Harka Gurung, on his trip to Mustang, in 1972, making use of the occasion to convince him of the existence of such a possibility by showing him a few such bridges already in existence. Having won him over, the member then filed a proposal with the Local Development Department (LDD) requesting its assistance in the construction of a total of 50 bridges, thirty of them with a 50 ft. span and the rest of a 100 ft. span, in three phases of ten, twenty and twenty.

The amount of financial involvement estimated, was Rs. 1,400,000/-, out of which only Rs. 400,000/- was expected from the government, in the form of materials.

Result: However, the response of the government was conservative in the beginning and it approved only a total of five projects, but assured to support more, on the basis of their experience with the first five. After further negotiation, in 1974, eleven bridges were approved, and a sum of Rs. 260,000/- was sanctioned. Upon this, the Honourable Member offered to construct twenty of them, instead of eleven, to which three bridges were added at different times by the LDD. as well as by the member himself. These 23 bridges were to be the target number for what was later called the first phase of the project.

In the following year, 1975, the Honourable Member presented a request for an additional allocation of Rs. 400,000/- for twenty eight more bridges. By this time, the construction on the first phase had already gotten under way and was showing successful results. Therefore, the demand for the additional allocation was readily approved by the Government and the construction of the bridges in the second phase, whose number was later increased to 39, was also authorized. In all, a total of 62 bridges have now been authorized to be constructed. At

//

the end of May 1978, the construction of 11 bridges had been completed, and, about 16 others were in different stages of construction. The Honourable Member hopes that all the 62 bridges will be completed by the end of 1978.

The pilot project committee, however, has a roster of a total of 118 bridges, which need to be constructed in the district, and the Baglung District Panchayat has endorsed the project.

P

7.4 SOCIO-ECONOMIC BACKGROUND OF BAGLUNG DISTRICT

7.4.1 Geographic Setting

Baglung District is situated in the Western Development Region and covers a land area of, approximately, 1,345 sq. mi. It is bordered on the east by Parbat District of the Dhaulagiri Zone, in the west by Rukum and Rolpa of the Rapti Zone, in the north by Myagdi of the Dhaulagiri Zone and in the south by Pruthon of the Rapti and Gulmi of the Lumbini Zone (Ref. Figure 7-F-1).

The topography of Baglung is characterized by an unequal surface configurations with an altitudinal variation rising from 2,000 to 3,000 feet to over 10,000 feet above sea level. Because of the wide variations in landscape and elevation, there are distinct climatic and ecological differences present from one end of the district to the other. During the winter season, there is snowfall on the upper slopes of the mountains and hill tops and it is generally colder here, during the rest of the year, than in areas of a lower altitude. The hill tops and steep slopes are covered by forest but these are being thinned out in areas where there are human settlements. The indiscriminate destruction of the forests has brought about serious cases of soil erosion, and this in turn has led to periodic landslides and the destruction of farm land.

Rainfall averages 100 in. annually, but in some areas of the district there is much more, but with the loss of the forests much of the water just runs off thus causing more soil erosion.

Apart from the numerous monsoon streams and rivulets, the geographical terrain of Baglung is drained by the following rivers: Kali Gandaki, Uttar Ganga, Dhor Khola, Taman Khola, Nisee Khola, Bhuji Khola, Bheem Khola, Daram Khola (called Tara Khola on the upper reaches), Gaundi Khola and Ke he Khola.

The Kali Gandaki River, flowing southward along the vertical cliff bordering Parbat District in the east, can be considered as the major river in the area in terms of its width and turbulence. However, other rivers also swell to tremendous proportions during the rainy season. All the rivers listed above, are perennial and most of these rivers are unfordable during most of the year.

7.4.2 General Cultural Setting

Baglung District is not unique in ethnic composition. One notes the same type of ethnic groups as those found in the other western hill regions of Nepal. These ethnic groups are: Upadhaya Brahmin, Jaisi Brahmin, Chhetri, Newar, Magar, Gurung, Tamang, Thakali, Kami, Damai, and Sarki. The 1971 census reports Baglung District of having a 95.5 percent Nepali speaking population (particularly ethnic groups like - Brahmins, Chhetris, Kamis, Damais and Sarkis), 1.6 percent Magar speaking population, a 1.1 percent Newari speaking population, and 1.8 percent population who speak some other languages (representing other ethnic groups like Gurungs, Tamangs, Thakalis). The Newari language, which is virtually non-existent in other hill districts of Nepal, is spoken by a high percentage of Newars in the district. It shows that the Newari culture is still being preserved by the Newars living there. Excluding Gurungs and Tamangs, the Indo-Mongoloid groups, like Magars and Thakalis, are highly Hinduized and their value of life is governed by Hindu beliefs and faiths. However, agricultural and pastoral techniques are a blend of Hindu and Tibetan ways, and to a certain extent, the food items of the Thakalis resemble Tibetan food. The clan names most popularly noted among the Upadhaya Brahmins, Jaisi Brahmins and Chhetris in the district are: Kharel, Gautam, Subodi, Chalise, Sapkota and Bhandari. Though they are Hindus, they fall distinctly into two religious groups: Shaiva (the worshippers of

Lord Shiva) and Vaisnav (the worshippers of Lord Vishnu). Brahmins are orthodox in their Hindu beliefs and have the traditional feelings of caste superiority. They adhere to the concept of caste hierarchy and the status of untouchability for certain castes. A few Brahmins (both Upadhaye and Jaisi) are involved in simple trade and some are also employed in government services. A few of them have also joined in Indian army changing their caste status to that of Chhetris. Military service not only brings cash into the area, but also enhances the social status of the person who has joined the service. In many cases parents encourage their sons to join the military services. There is jealousy and friction among the various group of Brahmins in village panchayat politics and local development. It is, however, observed that in a particular lineage of the Brahmin, there is unity. Brahmins and Chhetris are not considered as the locally skilled groups in the district but they have borrowed the skills of other castes and have managed to do local construction work. Many of the Brahmins and Chhetris have also been involved in the local panchayat and district panchayat politics.

Thakalis are one of the trading groups of Western Nepal. They make their living by trading wool, salt, grain, local herbal medicines. They also run hotels and restaurants. The middle class Thakalis have opened small restaurants or Bhattis at the market centers like Pokhara, Baglung and Bhairawa, or besides the roads, highways, and on the main trails.

A few Thakalis also work as contractors for roads and buildings. Today, almost all Thakalis also do agriculture as well as trade. The success of the Thakalis in the area is partly due to the accumulated cash which they hold as a result of the salt trade in Tibet. After the takeover of Tibet by the Chinese, the open trade in this region was virtually stopped and the Thakalis moved to the south. They had cash and became well established in the area. Their skill as traders and their ability to cope up with the local people and the government, made it possible for them to seize, not only new opportunities, but also better positions in the political power structure of the country. Even in the panchayats like Hatiya and Kadebas, where the numbers of Thakalis is insignificant, they are able to hold positions such as Pradhan Panchas. These Thakalis have played a significant role in the development work of Baglung District.

The Magars of this district are traditionally considered as a skilled group. They work in the mines and are experts in stone and wood work. The different clan groups of Magars present in the district are Chantels, Shrish, Darlami, Laha, Buratheki and Thapa. The technology and work of the Chantel Magars is considered as the best. The local people call them rats or Musa because they make holes in the ground like rats as they mine for copper, iron, lead and slate. They are scattered throughout the district but are common in Wami and Lekhani panchayats. The local people of the district have borrowed the traditional skills of the Magars and are now working in mines, cutting stones and also doing construction work.

The Newars are agriculturists as well as traders, and most of them are distributed in Ba lu Bazar and other market places of the district. Newars of the [illegible] must have also learned the local traditional skills of construction, and have worked in construction.

The Kamis or blacksmiths, the Damais or tailors and the Sarkis or cobblers are untouchables in the Hindu hierarchy and are treated accordingly by the high caste Hindus of the area. Along with their traditional caste occupations of ironworker, tailor and leather worker, they also practice agriculture. These untouchable groups, have played significant roles in the construction work as skilled labourers. The local blacksmiths make the iron chains, anchorage and other iron tools for the erection of bridges and in many cases they are the fitters of the local bridge. Tailors and cobblers do stone work and are considered efficient in making stone walls.

7.4.3 Economic Structure

Like most hill areas of Nepal, the economy of Baglung District is characterised by marginal agriculture. Although the majority of the people are engaged in agriculture, their production is not sufficient to support the district's population of nearly 200,000 persons. This situation is being further aggravated by the ever increasing population. Crude estimates show that agricultural food production of the area, under normal conditions, is only able to meet the food requirements

for 8 to 9 months of the year. The annual food deficit is estimated to be in the tune of 2,000 M.T. Therefore, a good part of the district's food requirements have to be imported from outside the area, and the main source is from the food surplus areas of the Terai. The major export from the area is purified butter or Ghew. Apart from the sale of Ghew, another significant earning of the area is contributed by the remittances and pensions of the Gurkha Soldiers enlisted in the Indian and the British armies. A considerable number of people, mainly belonging to the warrior castes,[1/] enlist in these foreign armies. It is estimated that each household in the district has, on an average, at least one person retired or still serving in one of the armies.

Baglung serves as the regional headquarters for the Dhaulagiri Zone. The regional government offices, banks, college, hospital, etc. are all located in Baglung Bazar, which is also the fastest growing commercial center of the area. Apart from Baglung Bazar, the most important places in the district from a historical as well as a commercial viewpoint is: Galkot, Ghumto, Burtivang, Hatiya Bazar, Rajkut, Bowang, Dhorpatan, Puja Arkha, Hukum Mainkot, Taman, Thantap and Balowa. There are two STOL airstrips at Balowa and Dhorpatan, and RNAC operates schedule flights to Balowa. The trail system that interconnects these important places and localities is well developed. It is estimated that there are 200 suspended bridges, on the major trails, and these have facilitated the mobility of trade and traffic on a perennial basis. The

1/ Mainly people of ethnic origin belonging to the Indo-Mongoloid group, e.g., Magar, Gurung, Thakali etc.

construction of more bridges is still underway and in comparison to other hill district of Nepal, the bridges in Baglung are quite abundant. With the completion of the 118 bridges, of which 62 will be completed by the end of this fiscal year, local leaders express that Baglung will be declared a district where more bridges are no longer needed.

-Population and Labour Force

The total population of the District of Baglung, according to the 1971 CBS census, is recorded to be 172,729. Of this, the males constitute 84,254 and the females 88,475. Assuming a population growth rate of 2 percent per annum, the size of the total population today can be estimated at 194,521. Of this the males are estimated to be 94,884 and the females 99,637. However, following the rearrangement of panchayat boundaries and the addition of a few village panchayats, the total population is now estimated to be 200,000.

Defining the labour force as the number of persons in the age group of 10 years and older who are economically active, the total size of the Baglung labor force is estimated to be 140,475. Of this 48%, or 67,573 are males and 52%, or 72,902 are females. The total activity rate for both sexes is 50%. However, the sex specific activity rates for the males is 57% and for the females it is 43%.

The population is unevenly distributed in the 62 village panchayats of the district. According to the 1971 census the highest

population concentration is registered by Raghut panchayat, with 5,877 persons and the lowest by Karwa with 976 persons. The overall density of population, which works out to be 56 persons per sq. mi., does not suggest a densely populated area. However, in comparison to the arable land area the population density comes to about 949 persons per sq. mi. of cultivated land. While the arable land is limited, the population is growing rapidly, and this is giving rise to adverse economic conditions.

Table 7-T-1: Estimated Population and Labor Force
Baglung District (1977)

Total population	Male	Female	Population 10 yrs & over	Male	Female	Total labour force	Male	Female
191,525	94,804	96,[illegible]	140,475	67,573	72,902	97,548	54,008	43,540

Source: ECE estimate based on 1971 CBS Census.

- Agriculture

Needless to say, agriculture is the main occupation for the majority of the population. Out of the total land area of the district only 12,800 hectares, or approximately 6 percent, is under cultivation. The ownership of this land varies from 0.41 hectares to 1.22 hectares per household. Due to the ruggedness of the terrain, the rest of the land area is either barren, or forested. Of the cultivated land

area only 26% or 3,300 hectares consists of wet lands or Khet, where some irrigation facilities exist. The major proportion of the land area comprises dry land or Bakho, where the agricultural production is dependent on the monsoon rain. The most fertile areas are the narrow strips of land on both sides of the Daram Khola in the Galkot Densi area, and some flat lands of Baglung proper and Balewa.

The major crops grown in the area are maize, millet, barley, paddy, wheat, pulses and mustard. Crops like maize, millet and pulses are grown in the dry lands, and cultivated simultaneously, during the months of May or June. Paddy and wheat are grown in the wet lands where irrigation facilities are available. Paddy is cultivated, mostly, in the months of June or July through October or November, this is then followed by the cultivation of wheat. The total production and average yield rates of the area covered by the major food crops, in the year 1975/76, is presented in Table 7-T-4.

Agricultural technology is basically traditional, although recently, improved agricultural tools are beginning to be used. The use of fertilizers and improved seeds is also increasing with time. Despite the application of modern agricultural inputs the villagers indicate no change in agricultural productivity. This may be associated with the continuous exhaustion of the fertile top soil, and soil erosion. Agricultural production is dependent to the greater extent, on the monsoon rain but, loss of food crops due to occurrances of hail storms during the harvesting season, is also an important feature of the area. In 1977 alone, an estimated 800 M.T. of paddy was destroyed by hail

Table 7-T-2: Estimated Major Food Crops, Area, Production and Average Yield, (FY 1975/76) - Baglung District

Major Crops	Total Areas in Hectare	Total Production in MT	Average Yield in MT/Hectare
Paudy	2600	5580	2.1
Maize	8100	16100	2.0
Wheat	1000	1180	1.2
Barley	200	198	7.0
Millet	2100	2530	7.2

Source: Agricultural Marketing Information, Vol. VII, 1977

storms. Incidents like this aggravate the food situation in an area like Baglung, which is already a food-deficient area.

Animal husbandry is an integral part of farming, and a family unit, on an average, owns 3 to 5 buffaloes, 1 to 2 cows, 1 to 3 goats, and 3 to 5 poultry. A household unit generally consists of 6 to 8 family members. The raising of livestock is for commercial purposes and supplements the major income from the land. However, livestock raising does not hold bright prospects for the future in view of the limited pasture land and declining supply of fodder due to increasing destruction of forests.

The wage rate for labor in the agriculture sector is Rs. 3/- per day exclusive of meals that have to be provided, at least, three

times a day. Thus, with this averaged in, the real wage rate comes to well over Rs. 10/- per day. However, the Parma system is prevalent amongst most of the farming families; and household labor is exchanged on a reciprocal basis, this takes place mostly during the planting and harvesting seasons.

- Rural and Cottage Industries

In the past, the cottage industrial activities were mainly comprised of cotton-weaving, and paper-making. But these activities have, more or less, been abandoned now because of [illegible] pressure to use the land for food production rather than for other cultivation. Today, the cottage industry exists on a limited scale, mainly in the household sector both in terms of production and consumption. The main cottage industrial products are coarse carpets, leather goods, bamboo goods, metal goods, etc. Most of the cottage industries are oriented toward ethnic groups. As far as organized industries are concerned there is one cottage skills center, mainly for textile products, one bakery and four turbine-operated food grain mills present in the district.

- Mining Activities

The mining activities of the district need to be mentioned. Although, large scale commercial ventures have not been undertaken, copper, slate, iron ore, lead and gold deposits exist in the area and

mining explorations are still underway. The Magar ethnic groups are the traditional miners of the area and exhibit remarkable skills in mining. Today a limited scale of operation exists for making cooper utensils; slate is used by most people for their house roof, and in the past, the iron ore was used to make the chains for the bridges. The area is endowed with mineral resources which should be able to contribute to the development of the area, should the exploration be carried out in a scientifically and on a commercial basis.

- Trade Patterns

The major exports from the area, in terms of importance of the commodity, are ghee, dried ginger, livestock and herbs. Ghee is mainly exported to major trading centers in the south such as Tansen, Butwal and Bhairawa. The sale of ghee is a major source of income for the majority of the villagers, but since its production is dependent on the livestock population, which is again dependent on the availability of pasture land and fodder which has been declining over the years, it does not seem to hold good prospects for the future.

The main items being imported into the area, in order of priority, are foodgrains, salt, kerosene and cloth. Since the area is food-deficient, a major portion of its export income is utilized in paying for the import of foodgrains.

7.5 TECHNOLOGY AND PROJECT BACKGROUND

7.5.1 Traditional Technology

In Baglung, iron, copper, lead and slate mining operations seem to have brought about the stone work technology which is one of the predominant construction technologies in this district. The people associated with these operations know, by tradition, how to handle different types of stone. Some slate mining and iron mining is still done in the district.

Because of the local availability of iron, the chain technology has been refined and later applied in the construction of chain bridges. The ironwork done on the bridges, though crude, is quite satisfactory.

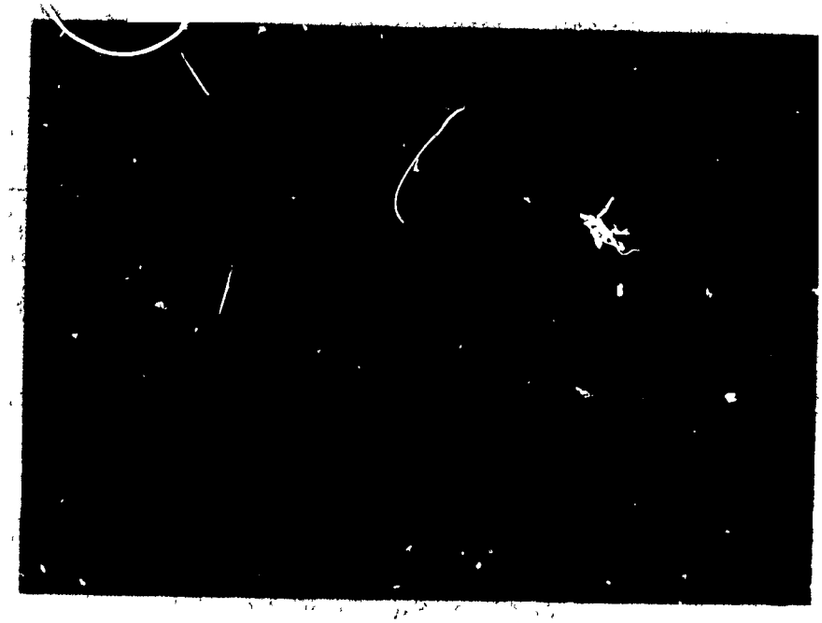
The technology of building trail bridges in Baglung seems to have developed through the ages out of necessity. The technology can be termed an appropriate technology because it suits the socio-economic environment of Baglung. "In general, appropriate technology means a technology which is harnessed for development and which utilizes the available resources and social institutional conditions in a particular developing region."[2/]

2/ Curt, S. Carnemark - The World Bank View on Low Cost roads World Construction, June 1977, Vol. 30, No. 6, p. 78

7.5.2 Process of Technological Evolution

River crossing is an inevitable task for the hill people of Nepal. The local people informed us that in the old days, the people of Baglung used timber from the local forests to built either log bridges, or cant lever bridges for longer span. Small log bridges can still be seen throughout the district. (Photo 7-P-1). The local people have also used rope bridges to cross some rivers. But with the advent of iron mining and the making of chains, chain crossings have replaced many such old bridges, especially on important routes. However, such bridges are used only by humans. In such bridges a pair of chains were used as main cables, they were connected by U-hangers and narrow planks were placed over the betton of these as walkways. Around 1934, the ruler of the then-principality called Galkot (the area is still called Galkot), brought used ship anchor chain from Calcutta and used them instead of local chains. It was assumed that the ship anchor chain was cheaper than the locally-made chain, and quicker to procure and install.

Since the bridges could not be used by animals, the then ruler of the area, Raja Bharat Ban Malla, introduced walkway bars, around 1943, and made the walkway wider. One of the bridges, at Gaighat over the Daram Khola, still has a pair of one-half inch square steel bars used as what we now call, walkway cables. The frequency of bridge construction declined later on, due to the high cost of making or buying chains.



7-P-1. Log Bridge in Baglung.
Date: Oct. 1977

28

The replacement of chains by cables seem to have started around 1953, after the dawn of democracy. The cables were made available by the Government, [illegible] used cable from the old Kathmandu-Dhursing Ropeway. The process of using such used ropeway cables is still prevalent and the pilot program, till now only have used these used cables. The Suspension Bridge Division of the Department of Roads and the Local Development Department, are other sources for cable. The span of the majority of the bridges in the area is less than 150 ft., but some bridges have spans which vary from 15 to 160 ft. Because of the nonavailability of iron rods or iron plates, the villagers have used rope and twine as suspenders in some cases. Other types of suspenders have been used depending on the availability of materials.

Construction of anchor blocks seems to have undergone no major changes and is probably the oldest type of work of all the construction work involved in such bridge building.

Anchorage blocks were made out of one solid stone with a hole drilled through it to hold the chain or cable. The stone was buried well below ground level. If sound rock was found on the site itself, hook anchors were also used. (The details of anchorage construction is explained in detail in chapter 7.6.3.)

Since both cables and chains have been used as the top cables, henceforth we shall be using the word 'cable' for descriptive purposes, though, the word 'chain' may be used in some cases.

7.5.3 Project Management

For the implementation of the pilot project, the Local Development Department itself, probably on the advice of the Honourable Member, created what was called Baglung District Suspended Bridge Construction Pilot Program Committee chaired by the Honourable Mr. Omkar Prasad Gauchan. The president of the District Panchayat of Baglung was appointed as the vice-chairman of the Committee. Other members included a District Panchayat member and a District Assembly member. The Panchayat Development Officer (PDO) of the District was nominated as the member-secretary of the Committee. The Committee was to be directly accountable to the LDD. A separate account, in the name of the Committee, was opened at the Nepal Rastra Bank, and, although the accounts officer of the District Panchayat was to take care of all the monetary transactions of the project, a separate account was opened for the Committee. All expenses were to be authorized by the Chairman of the Committee, or by the vice-chairman in the absence of the former. Although the members of the Committee came from different levels of the Panchayat membership, there is no doubt that this Committee was, for all practical purposes, extraneous to the regular institutional structures provided by the political system of the country.

At the project level, there were also provisions made by the LDD to create what were called subcommittees of the aforementioned main

Committee. Here again the members of the committee did not necessarily have to be members of the local village panchayat. They could be panchayat members, members of the class organizations or social workers. The presidents and members of the subcommittees were picked by the main committee, and Mr. Gauchan seems to have played a very important role in this selection.

7.5.4 Site Selection and Resource Availability

Three considerations seem to have prevailed in the selection of the bridge sites. Firstly, the applicant village had to put forth a roster of dedicated workers who would undertake the construction of the bridge without delay or hindrance. Secondly, an attempt would be made to ensure that the bridges would be distributed as evenly as possible among all the panchayats. The third consideration is however political, some people have alleged that the bridges which were given priority status, were proposed by the supporters of the Honourable Member Mr. Gauchan.

Altogether, the Local Development Department has made an allocation of Rs. 660,000/- for a total of 62 projects involved in the two phases of the program. The majority of the money was given in the form of materials. Payments were made directly to the Nepal Transport Corporation which dismantled the used cables of its ropelines and transported them to the roadhead at Naudanda in Syangja District, the

closest point available to the people of Baglung for portorage to the bridge sites. Similarly, the iron fittings were made by one of the local steel fabricators in Kathmandu.

Payments for them, too, were made directly by the LDD. Only the balance of this fund was sent to the district in cash. Since the cables, the most expensive part of the whole undertaking, were available at a very cheap price (Rs 33/- for a meter of 1¼ in. diameter cable as against Rs. 90/- per meter if purchased elsewhere), a major saving was made. Even during the allocation of the first phase, there was a cash saving of Rs. 74,000/- which the Committee distributed to the subcommittee at the rate of Rs 1,000/- to 2,000/- per bridge depending upon the cash requirements of the project. The local projects did not require much funding, because much of the work was done on a voluntary basis; this included the carrying of cables, collection of stones, and excavation. Only the skilled work for the project was paid for. In some cases local cash donations were made to help meet those costs. In the case of the 270 ft. long bridge over the Kali Gandaki River at Armadighat, the total cost of which was about 140,000 rupees, Rs. 100,000/- was collected locally and only Rs. 40,000/- came from the Committee, including a cash sum of Rs. 11,000/-. A bridge of this size would have cost much more if the Government were to have undertaken it.

7.6 ANALYSIS

7.6.1 Socio-Economic Analysis

- Sociological Considerations of Bridge Building Activities in Baglung

The erection of private bridges started in Baglung District more than a century ago. It was done primarily as an act of charity to earn spiritual merit. The people of this district felt that one of the easiest ways of earning merit was to construct a bridge for the local people and travellers. Thus the building of private bridges reflected the religious values of the people. During the monsoon, internal communications are hampered and traveling is risky when there are no bridges over rivers and streams, and travellers bless the donor of the bridge while they cross it. Of the 37 bridges we studied in Baglung, we noted that 11 of them were private bridges. The erection of these bridges was done not only by well-to-do people, but also by the poor in the area.

We can cite the case of a Sarki or cobbler who was poor but erected a bridge over the Daram Khola, at a point where the river is unfordable throughout the year. The life of the people in the Baskhola area (Malma panchayat) was made difficult because the river could not be crossed even during the winter. This uneducated Sarki man, by birth an untouchable in the Hindu caste hierarchy, felt that if he built a bridge across the Daram Khola, he would earn enough spiritual merit to go to heaven after his death. As he was poor and had no money to

erect the bridge he went to India to earn money. It is said that he ate only one meal a day for 14 years to save the money. Later, he came back to his home village (Malla panchayat, Baglung) and erected the bridge. He spent about 15 thousand rupees to purchase cables, anchorages, etc. and also to pay the wages of the local skilled workers. He was also given voluntary labour by the village people to erect the bridge. This bridge is called Banskholakopul, the bridge of the Baskhola area. This Sarki man is known all over the area and everybody thinks that he has earned spiritual merit. This bridge was built in 1965.

Similarly, we can cite another case that of a Brahmin family which had constructed a bridge, also for religious reasons in Kadebas Panchayat. In 1940 a Mr. Tikaram Khanal constructed a bridge across the Daram Khola. When the bridge was to be constructed, the Raja Bharat Lom Malla of the Galkot area wanted to help him financially. Although Mr. Tikaram worked under the Raja, and his descendents are still popularly called the people from the palace or Darbariya, he politely refused the Raja's offer and erected the bridge on his own. After nearly 30 years service, the bridge was damaged, but Mr. Tikaram's sons reconstructed it in 1971. Though some members of the District Panchayat were ready to donate money to reconstruct this bridge, Mr. Tikaram's sons, Hiralal, Khimananda and Gopiram wanted to finance the reconstruction of the bridge on their own, because it was a prestige bridge for their family. The chain of the old bridge, which was

originally brought from Calcutta, was not of sufficient length for the reconstruction. The [illegible], therefore, bought 856 lbs. or 162 Dharais of iron and chains made by the local blacksmiths. Twelve blacksmiths worked for nearly three weeks and each of them was paid Rs. 12/- (excluding food) per day. Mason workers were paid Rs. 10/- each per day. In the end nearly Rs. 13,000/- were spent for the reconstruction of the bridge, which is still maintained by the three brothers.

--The Role of Bridges in the Economy of Beglung

Needless to say, the existence of bridges in Beglung has immensely [illegible] the area and allowed for the increased mobility of its people. Local people say that the bridges have facilitated the flow of traffic and trade on a continual basis since the bridges have reduced the risk of accidents, and the flow of people and trade, can be guaranteed. The bridges have contributed to the easier access to agricultural fields, market centers, schools, and Government offices. One of the positive benefits that has come to these areas has been the exchange relationships in the trade sector, though this exchange of goods will, in the future, become [illegible] due to the reduction in fuel export resulting from the depletion of fodder resources in the area.

The bridges, however, have been less instrumental in the opening up of potentially productive areas such as horticulture, which could augment the economic development in the district on a self-sustaining basis.

Bridges are basically an integral part of the hill transport network and, like roads, cannot generate economic development unless accompanied by other, complementary, rural development programs. An integrated strategy promises for better results than an isolated one.

7.6.2 Institutional Analysis

- Local Participation

Local participation in the construction of bridges is remarkable in Baglung District, and comes primarily in the form of the voluntary labor and monetary contribution.

The pilot project generated the feeling among the villagers that the job of the construction of the bridge was theirs. The Pilot Project Committee only provides them with the required amount of cable and iron fittings and some amount of money, depending on the span of the bridge. Usually the money given by the Pilot Project Committee amounted to about Rs. 2,000/- for a bridge of about a 120 ft. in span. The material required for the bridge had to be carried by the people from Naudanda to the bridge site. When asking for the materials to construct the bridge, the subcommittee had to assure the Pilot Project Committee that they would mobilize the local people for the construction of the bridge. If such participation was not assured, the materials were not made available.

The subcommittee made the rule that, one person from each household in the village had to help porter the materials. Those who did not participate in this effort would have to contribute food or money to the people who did participate. Almost all the village panchayat people became involved. In some cases, after carrying the materials to the construction site, the people would also contribute labor or money towards the actual construction of the bridge. All the villagers seem quite enthusiastic about cooperating in such a project.

In Nepal, timing is one of the most important factors for projects like these. The villagers willingly cooperate and participate during the post-harvest period, when they do not have much to do on their farms. The construction of the bridge occurs during two time periods; in March and April the villagers bring materials to the site and later, in December and January, they work on the construction of the bridge. According to the information we gathered in the field, once all the materials were on the site, the bridge could be completed within 25 to 40 days.

Almost everybody contributes voluntary labor for the construction of the bridge. The laborers are put into two groups ; paid skilled labor such as the blacksmiths, carpenters and stone masons, and manual laborers whose work is done on a voluntary basis. The villagers prefer to build their own bridges, and we were told, that when U.S. Peace Corps Volunteers went into the field to help, the villagers sent them back,

telling them that they were capable of building their own bridges by themselves. For these people a bridge is much more than just an easy means of crossing a river, it is a symbol of the capabilities of the villagers.

The uniqueness of this local participation, demonstrated by the quantity of voluntary labor and money contributions in this area, has resulted in such a large number of bridges built in a short period of time. This can be attributed to the following:

- A history of privately-sponsored construction for the common good.
- The happy coincidence, in this district, of material resources and people skilled and willing to exploit them.
- The political and administrative consonance with the modern way of mobilizing local people and resources, and the traditional way in which they mobilize private sponsors whose credibility is not questioned. In other words, private sponsors were not perceived as exploiting people for their own benefit any more than the members of the Pilot Project Bridge Construction Committee. Neither, they needed to coerce the people for voluntary labour, any more. We do not deny that the modern sponsors of bridge building derive political as well as religious merit from their actions, but this does not threaten or exploit the people who cooperate with the project.

- There is no material exploitation perceived, modern bridge building is in accord with the religious values of the area.

- Bridge Site Selection

Baglung District Panchayat has prepared a list of 118 bridges required in different village panchayats. This list comprises the overall assessment of bridge requirement for the district as a whole. From the list, prepared by the District Panchayat and approved by the District Assembly, the Pilot Project Committee selected 62 bridges, to be completed, at the cost of Rs. 660,000/-. These 62 bridges belong to the priority list of the villages. The selection of these 62 bridges also has the indirect endorsement of the District Panchayat, because the chairman of the District Panchayat, is the vice-chairman of the Committee.

- District Administration and the Pilot Project

Some local politicians have reservations about the implementation processes for bridge construction activities. They argue that the District Panchayat, not the Special Committee, should be the legitimate agency for the implementation of this program. However, the District Panchayat members who have voiced this opinion, also do not want the current process stopped. Another reason for not vigorously campaigning against this program, is the notable quantity of local participation and enthusiasm for bridge construction activities. We interviewed people who have had experience with both the District Panchayat subsidized

bridge construction program and Pilot Project Bridge Construction program. These people were of the opinion that the District Panchayat subsidized bridge construction project is too lengthy a process. It involves a request for the bridge construction which has to be made to the District Panchayat, and then the District Panchayat takes time to approve the fund. But, before approving the fund, an overseer has to visit to the site and make the survey, cost estimate and finally, present the report to the District Panchayat. Upon approval of the project by the District Panchayat, a grant will be given, on an installment basis, by the Panchayat Development Officer. The man hired to oversee the construction is held responsible for all activities, and he will have to go to the District Panchayat Office frequently, for the release of the second grant installment and so on. After the completion of the bridge, the overseer again has to examine the bridge and finally approve it. Many difficulties are faced by the local leaders on construction activities organized in this way. On top of all this, when the villagers know that grant funds are made available from the District Panchayat, they will not contribute voluntary labour or participate in construction activities. Such a situation increases the cost of construction. Along with these factors there is a greater chance for corruption and the misappropriation of funds because of the greater amount of money involved.

In the case of a Pilot Project Bridge Construction Program, the bureaucratic procedures are shorter. The Committee is responsible for

providing materials and, once the materials are available, the villagers themselves have to decide how to go about constructing the bridge. They end up putting more effort in the construction, resulting in a better bridge. They also feel that these bridges are theirs. When a panchayat has to make several bridges, we have noticed that they learn from the experience of constructing the first bridge and introduce improvements in the second and third constructions. There is always a collective effort from the villagers to make a better bridge, the second time. In the Pilot Project Program, there has been no corruption, alleged and so the people are very cooperative and willing to participate and contribute voluntary labor.

The Pilot Project Committee, in collaboration with the Local Development Department, procures the ropeway cable and iron rods. The bill is paid directly by the Local Development Department. The Committee's responsibility is to transport the stock to Naudanda. Once it is agreed that a bridge will be built by a certain village, a target is set by that village. The responsibility for material distribution is overseen by the Honourable Member, Mr. Omkar Prasad Gauchan, who issues an authorization letter to the village panchayat. Upon receipt of the letter, the stockkeeper in-charge at Naudanda, will make the necessary materials available to the village panchayat, which is supposed to complete the bridge in the same year.

- Supervision by District Panchayat Area Member

The District Panchayat is composed of 9 members, and every member is the supervisor of the development activities which take place in their specific area in the district. This supervisor checks on the progress that is being made on a project and insures that it goes well. If the village panchayat faces a problem, the District Panchayat supervisor will help. In the area of Pandav Khani [illegible], the villagers did not have the skill needed for the construction of the bridge, and the village panchayat had difficulty in meeting the target date set for the completion of the bridge. The village panchayat approached the supervisor for help, and at their request a group of people with the technical know-how were sent to Pandav Khani and helped in the construction of the bridge. The Pandav Khani villagers learned proper bridge construction techniques on the spot, and [illegible] they no longer require help from the neighboring village panchayat during construction. This is an example of the inter-village transfer of technology, and also of the District Panchayat supervisor's role.

- The Construction Organization

The Village panchayat takes charge of the construction of each of the briage. Each household has to contribute something. In case some household fails to contribute labor, it is fined, but such cases are few.

The skilled laborers are paid and the unskilled laborers are not, though more of this type of labor is usually available in the panchayat itself. If skilled workers are not available, a request is made to a neighboring panchayat to provide them.

After construction, the villagers regard the bridge as a community property, and the maintenance of the bridge is considered as a community responsibility. Deliberate damage to the bridge is a religious taboo and no one would dare to burn the bridge planks or to use them for domestic purposes. This keeps maintenance of the bridge planks down to a minimum.

There are four ways of financing the construction of bridges in Baglung, each way has its own system for maintenance. First; in the case of a bridge whose construction was funded by a [illegible] donor, the repairs are generally looked after by the family of the donor. If the family fails to maintain it, the villagers themselves cooperate to repair the bridge. This is done with the approval of the concerned family. Secondly; in the case of a bridge built with the help of a District Panchayat subsidy, maintenance is taken care of by the District Panchayat itself, through the respective village panchayat. Thirdly; Government-financed bridges are supported and maintained by the SBD. Little interest is shown by the community for the maintenance of the government-financed bridges. Fourthly, in the case of Pilot Project bridges, no machanism for maintenance has yet evolved, though the villagers have already accepted these bridges as community property because they have contributed

so heavily in their construction. Tolls are not collected on bridges in Baglung District, so that the maintenance cannot be paid for in this way.

7.6.3 Technical Evaluation

- Bridge Construction Technology

As mentioned earlier, the technical know-how for the construction of suspended bridges has been locally available for some time. The major work involved is the hoisting of cables or chains, construction of anchor blocks and towers, and the fixing of suspenders and walkway.

Steel /Chains: The set of top cables, which go to the anchor blocks and cross the river, appears to carry the greater portion of the load, and is referred to 'main cables' here. The main cables usually consist of two 1¼ in. dia steel cables or sometimes, one 3/4 in. diameter cables. Both are mostly purchased from the Nepal Transport Corporation/HMG, who operate the Kathmandu-Hetauda ropeway. Chains have also been used alone, or in combination with cables, to form the main cables. The walkway cables usually consist of 3/4 in. diameter cables. It has also been observed, as mentioned earlier, that sometimes steel bars of ½ in. square have been used as walkway cables. The main cables and walkway cables are connected by flat steel or sometimes, round bar suspenders. The hoisting of cables was all done manually except for the cables on the bridge over the Kaligandaki at Armadighat, on which the use of a winch machine was made.

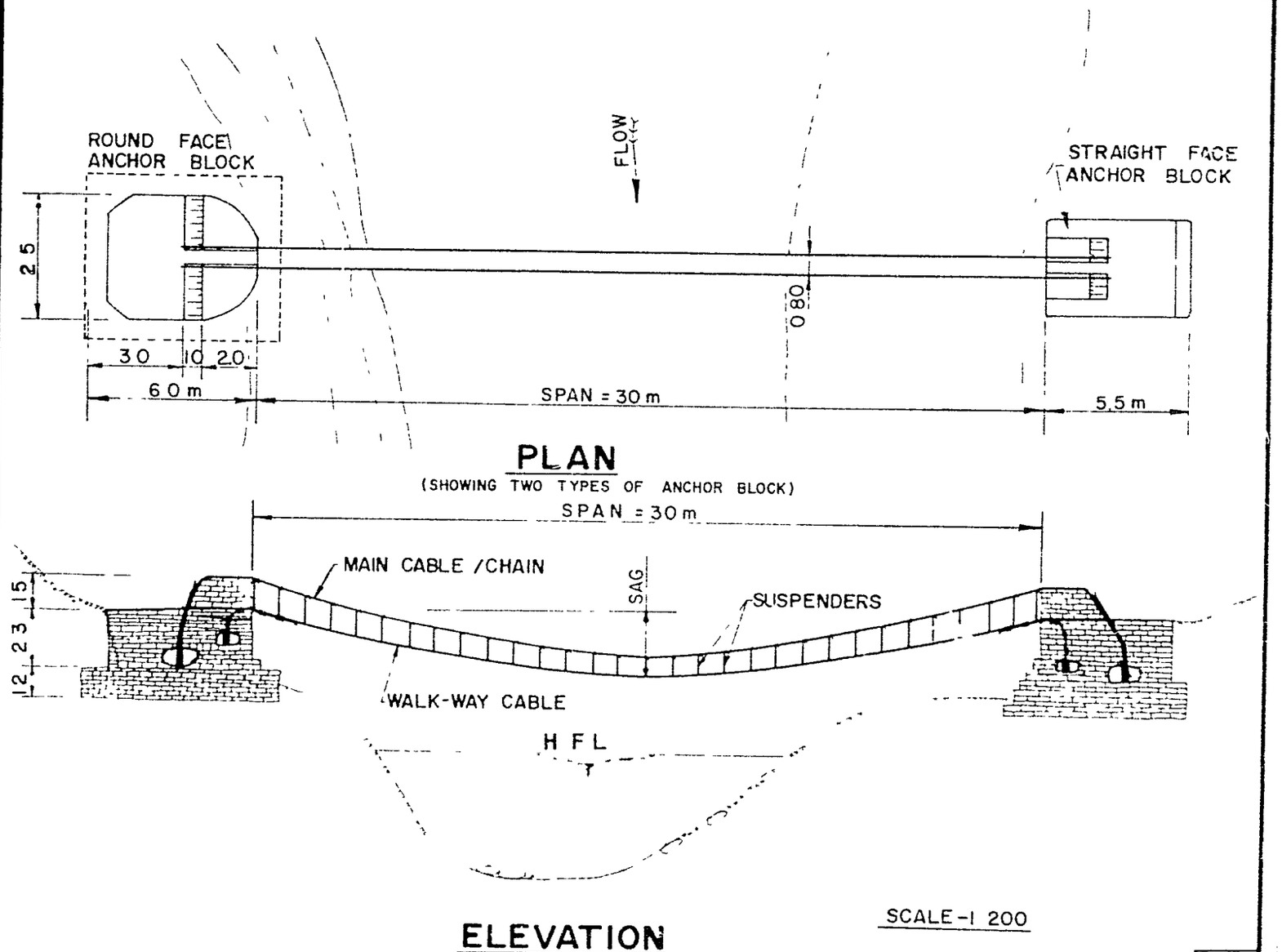


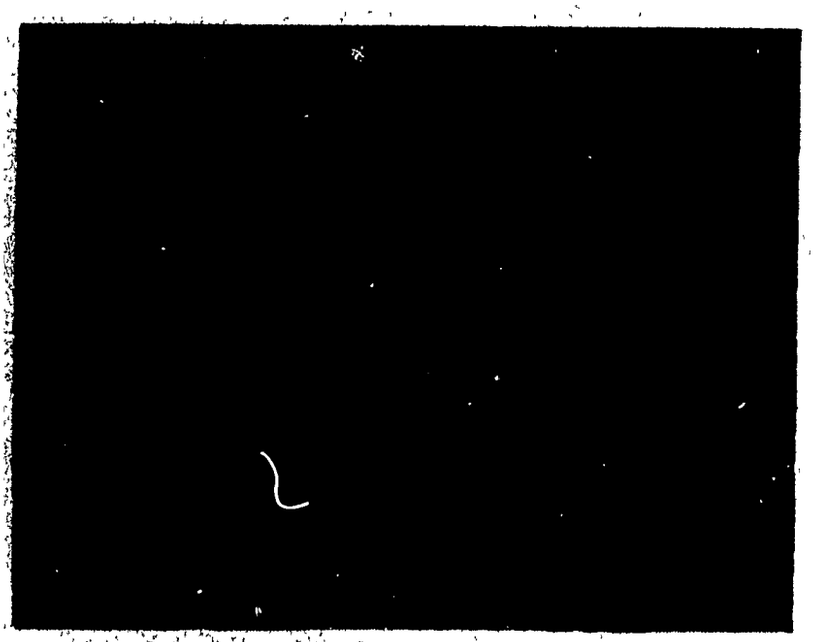
FIG 7-F-2

TRAIL SUSPENSION BRIDGE STUDY

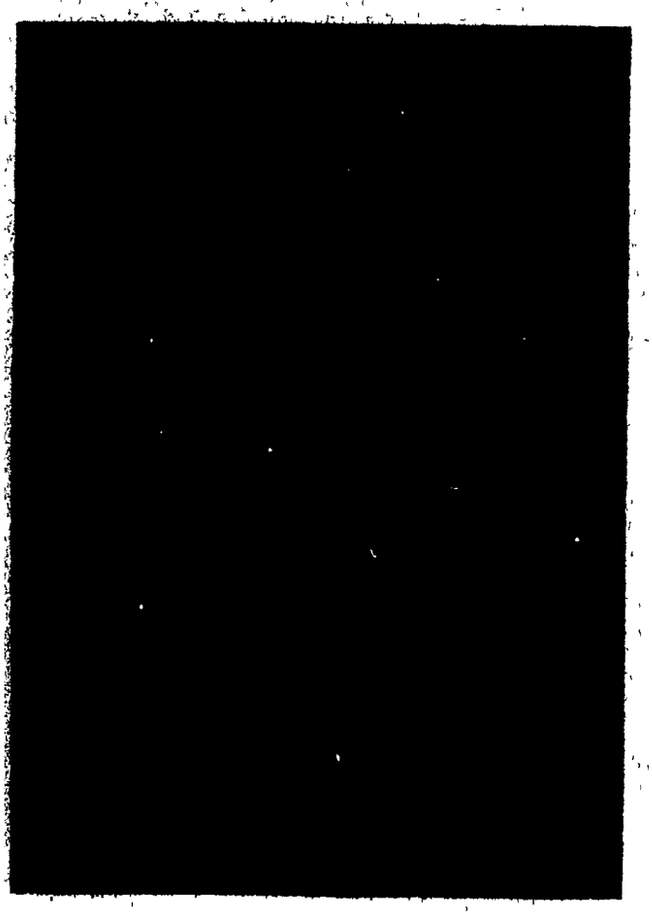
TYPICAL GENERAL ARRANGEMENT BAGLUNG SUSPENDED BRIDGES

UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT NEPAL

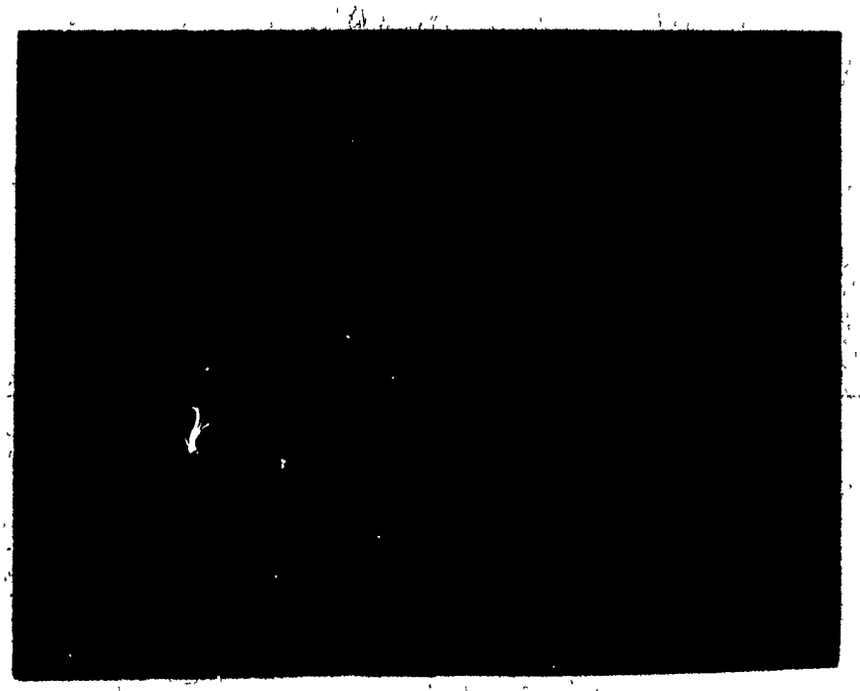
EAST CONSULTING ENGINEERS KATHMANDU



7-P-2. An act of charity.
Date: Oct. 1977



7-P-3. Use of Imported Ship Anchor Chain.
Date: Oct. 1977



7-P-4. Use of 1¼ in. Ø old rope way track cable of spiral construction. Bulldog grips are also used.

Date: Oct. 1977

7-P-5. Walkway Cable: 3/4 in. Ø old rope way haulage cable: 6x7 fibre core construction.

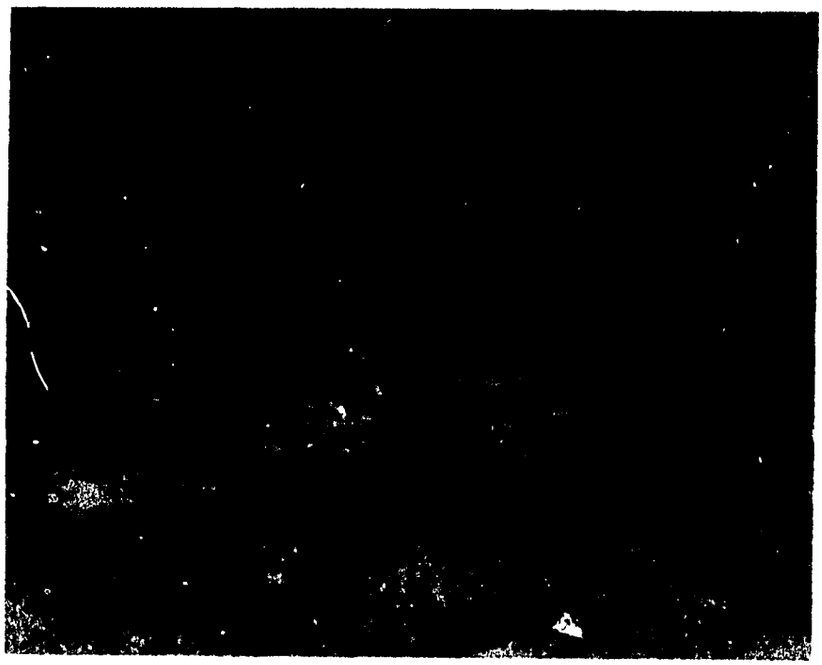
Date: Oct. 1977

<u>The Dry Stone Anchor Blocks</u>: Anchor blocks are usually made of well dressed regular flat stones. No mortar is used and the masonry workmanship is excellent. (Photo 7-P-8). This handed down know-how could have come from, either the Newar craftsmen imported from the Kathmandu valley, (they constitute the majority of the population of Baglung Bazar), from the ex-military men who were exposed to neat construction techniques, or from the local Magars who are the predominant stone masons of the area.

7-P-6. Note the excellent local masonry workmanship.
Date: Oct. 1977

7-P-7. Round Anchor Block
Date: Oct. 1977

7-P-8. Straight Face Anchor Block.
Date: Oct. 1977



7-P-9. Show of workmanship in a short span bridge.
Date: Oct. 1977

The Anchorage: Two types of anchorage system have been found. The first type is, as mentioned in Mr. Groeli's report [2/] where the top cables are taken over the anchor block and the ends are specially fastened through a hole bored into a fairly large stone of about 900 lbs.

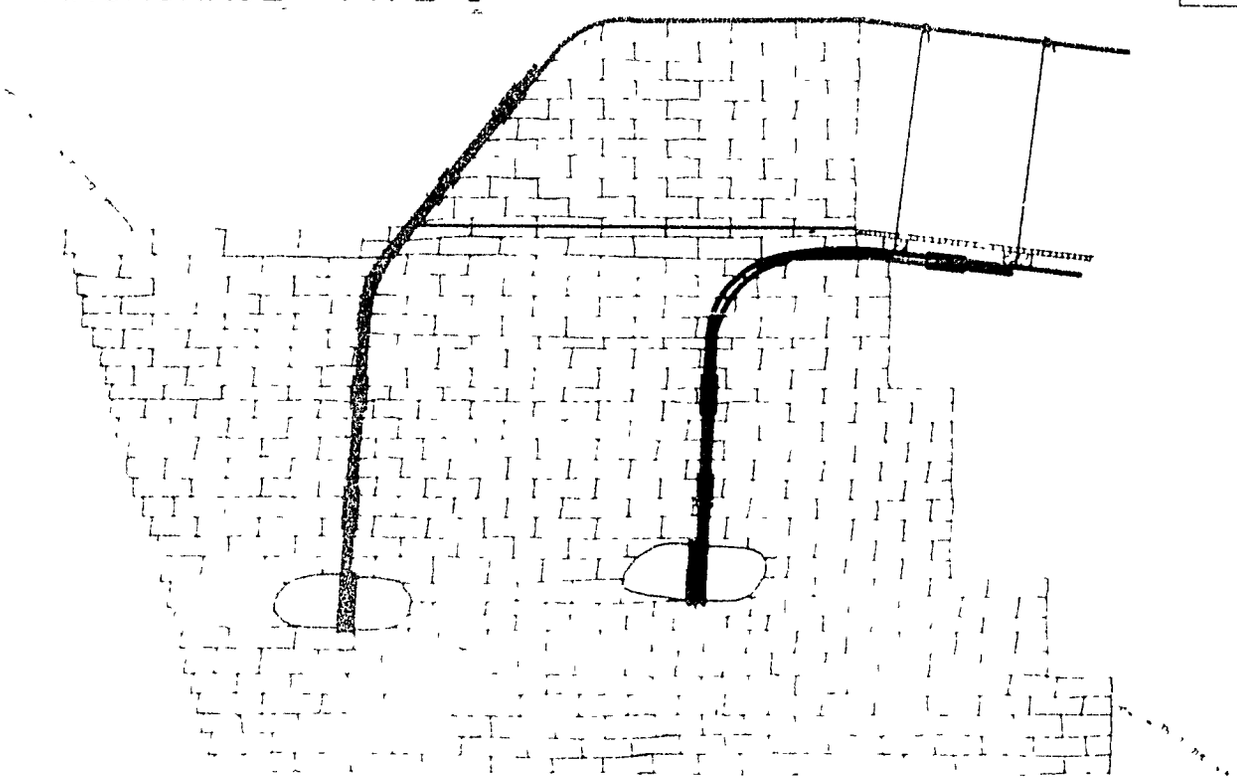
2/ Robert Groeli, Traditional Trail Suspended Bridges in Baglung District, SBD/SATA, HMG-Nepal. 1977, p. 9.

in it and then wound a couple of times in the case of the cables, or hooked to a metal shaft bored into a large stone. (Photo 7-P-10 and 7-P-11). This stone is buried about 9 ft. below the ground, and the free end of the cables are brought above the ground level and fixed to the main cable, by means of locally-made clamps. The same process is also used for the bottom cables (see Fig. 7-F-3). The local people have recently started to use bulldog grips on the advice of Mr. Gauchan and other Kathmandu experts. This anchorage system appears to be fairly popular in the area.

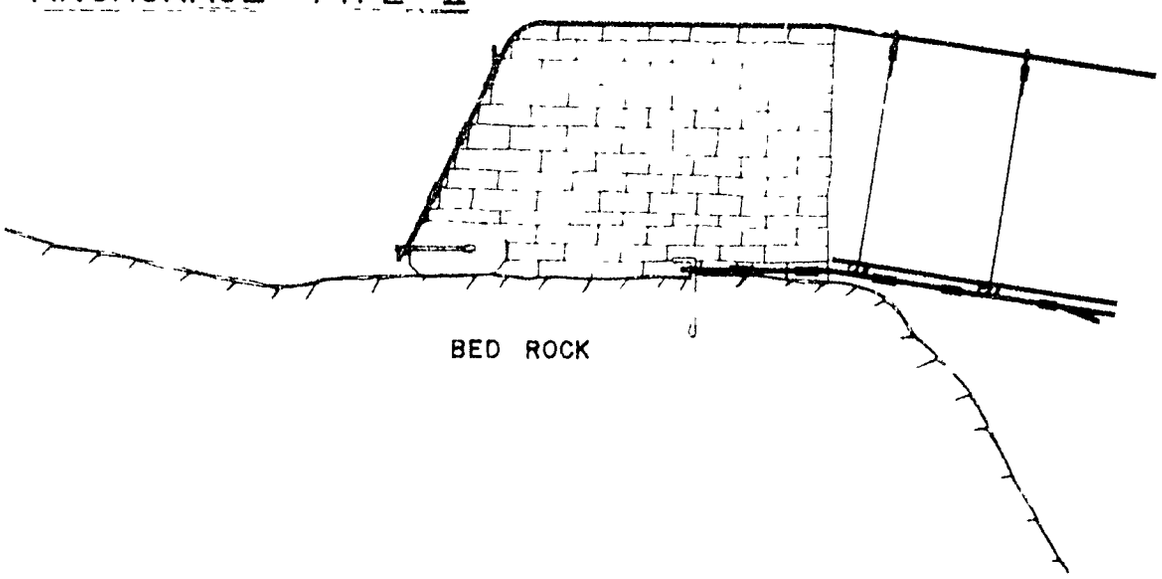
The second type of anchorage system found, was that of the anchor rod type. According to the local people, whenever they come across rock beds which cannot be excavated deeply enough to bury the anchorage stone, if the rock was hard enough, they would bore a hole through it for the anchor rod. The hole is bored to form a bulb-like shape at the close-end. The hole is usually about $1\frac{1}{2}$ ft. deep. A steel rod of $\frac{1}{2}$ in. to $1\frac{1}{2}$ in. in diameter is used and one end of the rod is heated until it's red-hot and hammered into the hole, presumably, while hammering, the red-hot, malleable part of the rod will expand and fill the bulb hole and thus become permanently fixed. Then the outer end is bent into a hook. This system is also used if the cable procured is not of sufficient length for the anchorage described earlier. In such cases, a good hard stone like gneiss or granite is selected and used as the anchoring rock.

FIG 7-F-3

ANCHORAGE TYPE I



ANCHORAGE TYPE II



TRAIL SUSPENSION BRIDGE STUDY	UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT NEPAL
TYPE OF ANCHORAGES BAGLUNG SUSPENDED BRIDGES	EAST CONSULTING ENGINEERS KATHMANDU

7-P-10. The Anchorage is buried underground. Note the use of locally-made grips.

Date: Oct. 1977

7-P-11. The hooked anchorage. Also used for top cables. Locally-made grips work and are easy for local people to handle.

Date: Oct. 1977

7-P-12. Anchoring the top cables.
A different way of anchoring.
Cable bend is sharp, but
it can be improved by the
use of thimbles.

Date: Oct. 1977

7-P-13. Local way or fixing suspenders, it looks crude but it works.

Date: Oct. 1977

7-P-14. Flat Iron Suspenders. Note animals crossing the bridge. Cross beams over the deck are said to keep animals from slipping away.

Date: Oct. 1977

7-P-15. Walkway with curb and cross beams over the deck.
Date: Oct. 1977

7-P-16. A neat Walkway.
Date: Oct. 1977

7-P-17. Walkway with curb but no beams on top. It looks neat.

Date: Oct. 1977

7-P-18. A mixture of locally-made and imported ship chains.

Date: Oct. 1977

The Suspenders: The steel suspenders can be either locally-made or manufactured at the Nepalese fabricator's workshop in Kathmandu. Sometimes, ordinary mild steel rods have also been used. Different types of suspenders like flat iron bars, rods, and even ropes have been used, depending upon their availability and suitability.

The Walkway: The walkway is simple to construct and has been excellently executed in the Nepalese bridges. In the bridges, a pair of cross beams in the top and bottom of the plank have been provided, presumably to hold the planks more firmly. It is claimed that it is better suited to animal traffic because the top cross beams prevent animals from slipping. The linking of cross beams to the walkway cables has been skillfully executed by the local craftsmen. The walkway, with a clear width of 2.5 ft., is wide enough for human as well as animal use.

- Bridge Structure: An Assessment

A full scale engineering assessment cannot be done unless tests are performed on the materials being used for construction. However, a general assessment on the basis of engineering judgement, has been done and presented below.

The Cables: The Pilot Project uses two types of cables. The first type is a $1\frac{1}{4}$ in., used rope way track cable of spiral construction.

It is ungalvanised and has a weight of 3.36 lbs. per ft., and the design breaking strength is 70 tons. The second type consists of a 3/4 in., used rope way haulage cable of fiber core construction. It is ungalvanised and has a weight of 0.87 lb. per ft., and the design breaking strength is 12 tons. The local people tend to make the cable as taut as possible. The choice of sag and the type of cable for different spans, seems to have been done without any reasonable basis. Certain directives could be given to the local people on the choice of sag and arrangement and handling of the cables so that the load carrying capacity of the bridge could be increased. This involves some design consideration. The use of 1¼ in. spiral cable for spans shorter than 45 ft. was observed, which is not economical as well as difficult to handle. The use of used rope way cable is suitable for local suspended bridges, but the exact load carrying capacity is not known. Tests should be done before its use to estimate the safety factor.

In the meantime, the use of chain instead of cables should be looked into in more detail. This has a traditional background, and the chains can be made locally at the site itself or manufactured in the steel fabricating workshops found in many places within Nepal. In such cases, however, the steel has to be imported from India or elsewhere. The chain bridges have stood well and served their intended use. To encourage this local know-how and also to generate employment opportunities, it may be worthwhile to look into this in greater detail.

Anchor Block: Hard stones like granite, gneiss and quartzite are available in most of areas in Baglung. Schist, has also been used as anchor blocks. The stones are in general, well dressed and cut into flat, rectangular blocks. No mortar has been used and the stones hold together because of their own weight and the nature of the bond used, invariably of the English type. These gravity anchor blocks appear more massive than is necessary. The gravity block could have been made less massive by introducing principles of stability.

Their criteria for the dimension of the block is as follows: for a span of about 45 ft., the length of the block is about 12 ft. long along the bridge longitudinally and for a span of about 90 ft. the length of the block is around 18 ft. long. The height of the block rarely exceeds 6 ft. above the walkway entrance level.

Some anchor blocks are round and some are rectangular. According to what the local people told us, round blocks were only made for [illegible] the reasons. But, a round base would be preferable, because in case of high water or flooding, there will be a smoother flow of water past the base of the anchor block.

At all the bridges, the anchor blocks are always above the highest water level ever observed by the oldest men of the locality. Free board clearance does not seem to be enough in all the bridges.

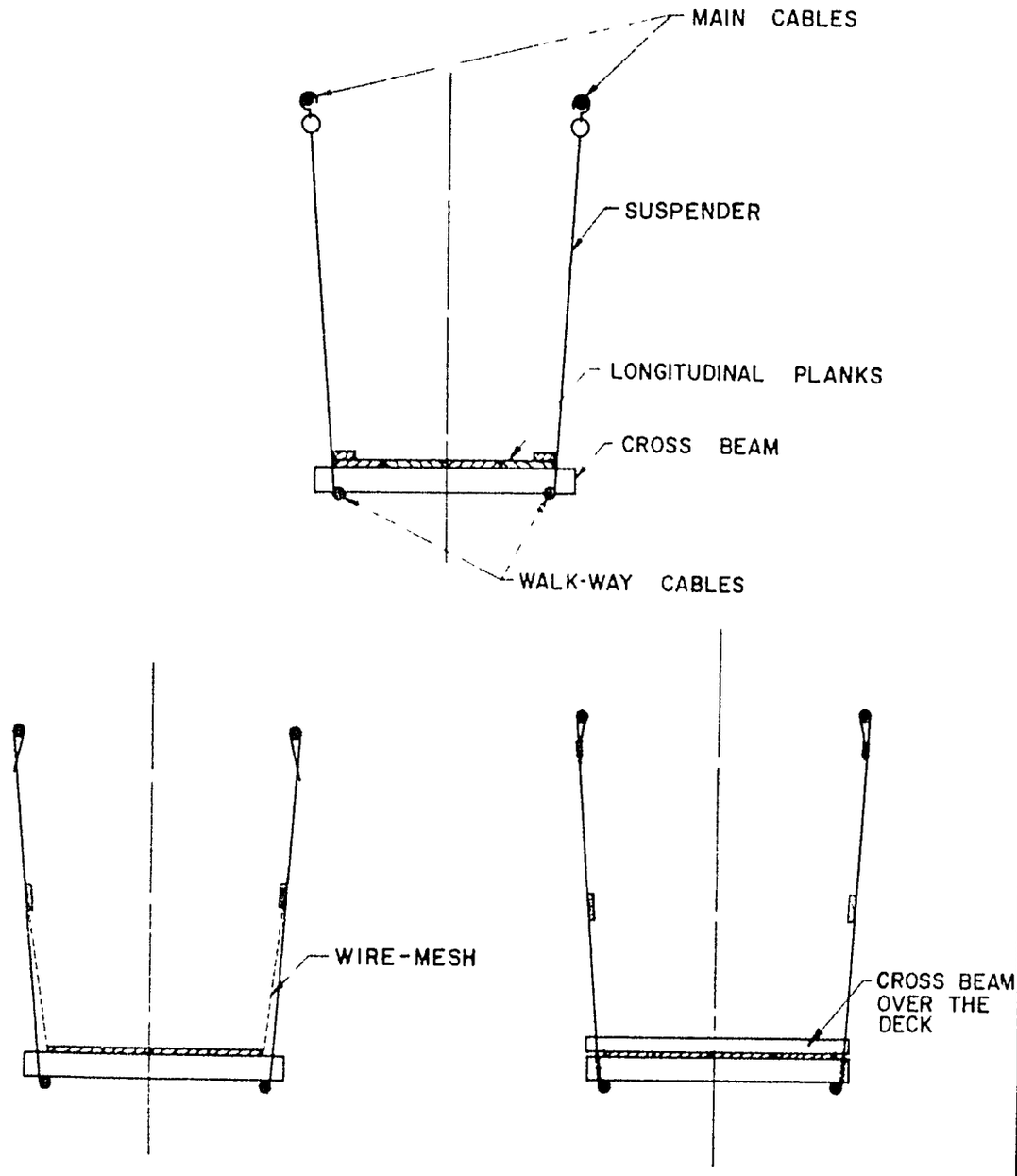
Cable Anchorage: Between the two types of anchorage (explained in an earlier chapter) the second type is more preferable, for the simple reason that the cable is above ground level and can be inspected as and when necessary. For major maintenance, like replacement of the cable, the first type will give problems, because almost the entire structure, including anchor block, would have to be redone. Certain improvements, like injecting mortar into the anchor rod hole could be done with little effort, and would increase the load carrying capacity of the anchor rod for anchorages.

The Suspenders: The suspenders do not have major functions in the bridge structure, except for connecting the main cable with the walkway cables and thus distributing some of the load from the walkway cables to the main cables. The traditional suspenders have served this requirement. Some improvement, like standardization, could be made but this need has not been strongly expressed by the local people.

The Walkway: The cross beams over the planks on the walkway are not necessary on all bridges and should be avoided wherever the animal traffic is negligible.

Instead of putting cross beams over the walkway planks on some bridges, diagonal bracings could be given to the cross beams below the planks, and the performance of the bridge would be improved. For smaller spans (less than 100 ft.), the addition of diagonal bracings would stiffen the deck and enable the bridge to take side movements much better.

FIG
7-F-4



TRAIL SUSPENSION BRIDGE STUDY	UNITED STATES AGENCY FOR INTERNATIONAL DEVELOPMENT NEPAL
WALKWAY AND SUSPENDERS BAGLUNG SUSPENDED BRIDGES	EAST CONSULTING ENGINEERS KATHMANDU

General: Long span bridges like the Arnedi Bridge, have wire mesh netting fixed along either side of the bridge which make travellers feel safer, since there is little danger of falling off the bridge. On short spans (less than 100 ft.), longitudinal bars have been used as railing and these suffice. Wind guys have not been used except on one or two bridges. Even the longest bridge, the Arnedi Bridge does not have a wind guy cable. Proper use of wind guy cables will improve the safety and durability of the bridge.

- Utility, Safety and Expected Life

The utility of the Langlung bridges can be described as general, as is the trend for most of the bridges in the hills of Nepal. For bridges which are situated on more important trails, the utility has been greater than for those falling on the minor trails; which serve only the local populace. The safety factor for travellers, in the case of all the major bridges, is good because the majority of the bridges have been fairly well maintained. Structurally, except for the cables, anchor blocks and anchorage, there seems to be enough safety margin. The anchor block is sufficiently stable, and it functions like a solid block and unlike towers of suspension bridges. The cables, since they are used ones, may have less of a load carrying capacity, than new ones and, thus, need to be tested in the future. The short span bridges (less than 100 ft.) are safer than longer span bridges, using the same type of cable.

An increase in the free board clearance in big rivers, like Kaligandaki, will decrease the risk of the bridge being swept away during very high floods. The factor of safety, as required by the Indian Stardard, may not be achieved by using the second hand cables, but compliance to the Indian Standard should not be the only criterion. The expected life of the bridges without any major maintenance is about ten years. To increase the expected lifespan of some bridges, local people do not use them during the dry season, but do necessary repairs and maintenance during dry season.

- Transfer of Technology

There have already been cases of the transfer of technology from one village to another within the District of Baglung. Our contention is that the transfer can be made to other hill districts of Nepal, especially the neighboring District of Baglung, and should be encouraged. We were informed that the District of Myagdi, the northern neighbor of Baglung, has the know-how to build such bridges. However, selection of areas for the transfer of this technology should be carefully done. The skilled people, when interviewed, were ready to go to other districts of Nepal provided satisfactory remuneration was given. They showed interest in constructing bridges in other districts of a contract basis also. Therefore, transferability of technology has great prospects. But, if technology transfer is sought, certain elementary designs should be introduced and standardisation in design and construction

should be applied for better result. It is known that the traditional technology of building chain bridges has also existed in areas of the District of Ramechhap. However in these areas they do not seem to have developed the use of walkway cables. Therefore the transfer of Baglung bridge building technology to these areas holds good prospects.

- Cost Aspect:

The average span of a Baglung bridge is around 90 ft., and the average cost for its construction is said to be, Rs. 10,000/- excluding the cost of labor in transportation as well as construction. This Rs. 10,000/- did however, also help pay for some skilled workers like masons, blacksmiths and carpenters. The figure looks very impressive in view of the need to construct numerous, relatively short span bridges, for pedestrian and animal traffic in Nepal.

SUMMARY AND RECOMMENDATIONS

-Summary

- Bridge building activity is a traditional technology in Baglung District.

- Many bridges have been built reflecting local religious values.

- Local resources, in terms of hard rock, iron, and skilled workers, are available in the district.

- Local leadership had been crucial in initiating the Pilot Project for the construction of bridges in Baglung.

- The tradition of considering bridge building as charitable act has helped to stimulate local participation in the Pilot Project Program to the fullest extent.

- There is a high degree of local participation in Baglung on projects designed to fulfill the local needs.

- Availability of local skilled workmen strengthens the local enthusiasm for the successful completion of the Pilot Project.

- The special Pilot Project Committee cut through some of the government bureaucracy and thus the people cooperated in the program more willingly.

- The program has, so far, registered spectacular achievements.

- The techniques of bridge construction are acceptable, but can be improved.

- In rural development programs, an integrated strategy holds the potential of better results, than an isolated one.

- Recommendations

- The type of local initiative and participation found in Baglung District should be encouraged and supported by the Government, especially in terms of material assistance. The Local Development Department is the right agency to assist in such projects.

- The Government should immediately initiate this type of program on an experimental basis in other neighboring District of Baglung.

- Such a program appears to be an area where USAID-Nepal could enter into an agreement with HMG (Local Development Department) to foster other such programs in rural areas.

- In order to make such programs more effective at the operational level, a separate Project Committee under the Local Development Department should be established. It is recommended, that at least one person from USAID should work at the project committee head office as an adviser for project design and implementation. Involvement of USAID in the committee might be helpful in cutting short some Central Government bureaucracy.

- Implementation of the project work should be channeled through a special committee at the District level, thus cutting short bureaucratic delays.

- The neighboring districts of Baglung, having certain bridge building experience, should be given priority in the implementation of such projects.

- Certain design improvements should be made before transferring the technology to other districts. This should result in the standardization of parts, economy, safety and quality of work. Therefore, a design and supervision team should be established under the project committee.

- The design team should look into the possibilities of using chains rather than cables in such a suspended bridge program because of the greater potential of increased rural employment. The transportation cost of steel, will also be reduced considerably.

- The committee should also look into the possibilities of launching such programs in the District of Ramechhap, around Those area and in areas where Baglung-type traditions for bridge building activities have existed. There may be other potential areas in other parts of Nepal, where such programs could be launched.

LIST OF ABBREVIATIONS

CBS	Central Bureau of Statistics
D.P.	District Panchayat
ECE or EAST	East Consulting Engineers
HMG	His Majesty's Government
LDD	Local Development Department
M.T.	Metric Ton
PDO	Panchayat Development Officer
RNAC	Royal Nepal Airlines Corporation
SATA	Swiss Association for Technical Assistance
SBD	Suspension Bridge Division
STOL	Short Take Off and Landing
UNDP	United Nations Development Program
USAID or USAID/Nepal	United States, Agency for International Development - Nepal
US	United States

GLOSSARY

Baskhola ko pul	-	bridge of Baskhola area
Bonsi	-	l -lying river valleys
Bhattis	-	small wayside lodge where liquor is served
Chautara	-	a resting place along a hill trail
Darbariye	-	palace people
Dharnis	-	a local weight roughly equal to 5.3 pounds.
Ghew	-	ghee
Khet	-	wet farm land
Khola	-	a stream or a small river
Musa	-	rat
Pakho	-	dry farm land
Parma	-	system of labor exchange
Pradhan Pancha	-	head of the village panchayat
Rastriya Panchayat	-	national legislative body
Sarki	-	An ethnic group engaged in leather works.
Terai	-	the Southerns plains of Nepal; Borders India.
Tho Se	-	name of a place in Ramechhap District in Eastern Nepal

APPENDIX 7-A-1

Attachment "B"
of Agreement

Baglung District Bridge Construction Study

Suspended bridges are being constructed in the Baglung District through [illegible] of local initiative and government resources. A detailed study of the processes and results of this activity is needed.

I. Elements of the Study

1. Brief description of the geographic, social, economic and governmental context of the Baglung District will be developed.

2. The system or processes of planning and selection of bridge sites will be studied, described and analyzed. This would include the planning of bridge sites relative to the flow of traffic, as well as planning to ensure that all elements of bridge construction (personnel and materials) arrive at site in a timely manner.

3. The network of relationships and processes to coordinate the local and government resources necessary to construct the bridges will be studied, described and analyzed.

4. The systems or processes of organizing the local skills necessary for bridge construction will be studied, described and analyzed. This will include the processes of organizing local unskilled village labor as well as the hiring of area craftsmen.

5. The nature and level of local participation in construction and maintenance should be studied, described and analyzed. While this relates to most of the above, how many people are actually involved, and who are they? Are tolls collected to cover maintenance? Are local people involved in all aspect of planning and implementation.

6. A careful evaluation is expected of typical bridge construction as it is related to utility, safety and the expected life of the bridge. This should include a description of construction techniques, probably best supported by photos.

II. Methodology of the Study and Timing of the Report

The methodology will be a qualitative case study approach, a descriptive analysis resulting in generalizations about how the processes might be used in future rural development projects. There are not many case studies of successful local initiative or local participation in development activities.

The Baglung suspended bridge study field activities will require a month to six weeks work during 1977 and be included as part of the interim report.

III. Personnel

The contractor will require one field team of 3 to 4 persons to accomplish the field work in a timely manner. The qualifications for the field and office staff will be the same as that for the USAID Suspension Bridge Study, e.g. one of the field staff must be a trained experienced engineer.

APPENDIX-7-A-2

LIST OF BRIDGES STUDIED

Sl. No.	Name of the Bridge	Name of the River	Year of Construction	Type of Finance	Maintenance Responsibility	Existing Condition	Type of Trial Served	Important Materials: Cable	Chain	Cement	Remarks
1.	Kathe Khola	Kathe Khola	1976	SBD/Pilot Proj.	Government	Bad	Main Trail	x	-	In Anchor	a) Cable supplied by Pilot Project. b) Combination of modern & traditional technology which did not work well. c) Wage Labour
2.	Okhaldhunga	Kathe Khola	1969	* D. P. Subsidy	Local Panchayat	Bad	Village Trail	x	-	-	D. P. Subsidy means Labour is voluntary)
3.	Sili Khet	Kathe Khola	1969	D. P. Subsidy	Local Panchayat	Fair	Village Trail	x	-	-	
4.	Buir Dobhan	Kathe Khola	1966	D. P. Subsidy	Local Panchayat	Fair	Main Trail	x	-	-	a) Double span
5.	Chudi Khola	Chudi Khola	1972	D. P. Subsidy	Local Panchayat	Fair	Main Trail	x	-	-	
6.	Chite Khola	Chite Khola	1967	Personal	Personal	Bad	Village Trail	x	-	-	
7.	Godi Khola	Godi Khola	1967	Personal	Personal	Good	Main Trail	-	x	-	
8.	Eatiya	Godi Khola	1968	D. P. Subsidy	Government	Bad	Main Trail	x	-	-	Major Repair in 1976 on contract
9.	Pipal Ghat	Daram Khola	1923	Personal	District Panchayat	Good	Main Trail	-	x	-	Major Repair in 1976 by D. P.
10.	Masan Ghat	Khahare Khola	1977	Personal		Good	Main Trail	x	-	-	Cable subsidy by D. P.
11.	Masan Ghat (big)	Daram Khola	1950	Personal	District Panchayat	Good	Main Trail	x	x	-	Major Repair 1977 (SBD Fund)
12.	Taremo	Daram Khola	1976	Pilot Project	Local Panchayat	Fair	Village Trail	x	-	-	
13.	Gai Ghat	Daram Khola	1956	Personal	Personal	Good	Main Trail	x	x	-	Major Repair in 1970
14.	Ghusmeli	Daram Khola	1969	D. P. Subsidy	Local Panchayat	Fair	Village Trail	x	-	-	
15.	Chamala	Daram Khola	1974	D. P. Subsidy	Local Panchayat	Fair	Village Trail	x	-	-	
16.	Barakhola	Bara Khola	1968	Personal	Personal	Good	Main Trail	-	x	-	
17.	Sandi Khola	Sandi Khola	1976	Pilot Project	Local Panchayat	Good	Main Trail	x	-	-	

*D.P. Stands for District Panchayat

APPENDIX-7-A-2: List of Bridges Studied (contd.) ... 2

18.	Sandi	Daram Khola	1966	Personal	Personal	Good	Village Trail	-	x	-	
19.	Motu Ghat	Tara Khola	1968	Personal	Personal	Good	Main Trail	-	x	-	
20.	Tara Khola	Tara Khola	1967	Personal	Personal	Good	Main Trail	-	x	-	Major Repair in 1977
21.	Dugari Ghat	Tara Khola	1974	D. P. Subsidy	Local Panchayat	Good	Main Trail	x	-	-	
22.	Bolu Ghat	Tara Khola	1975	D. P. Subsidy	Local Panchayat	Good	Main Trail	x	-	-	
23.	Karmili Ghat	Tara Khola	1976	Pilot Project	Local Panchayat	Good	Main Trail	x	-	-	
24.	Dhapkoth	Tara Khola	1977	Pilot Project	Local Panchayat	Good	Main Trail	x	-	-	
25.	Darkot	Darkot Khola	1976	Pilot Project	Local Panchayat	Excellent	Main Trail	x	-	-	
26.	Chibre Ghat	Bhusakot Khola	1975	Pilot Project	Local Panchayat	Excellent	Main Trail	x	-	-	
27.	Cholunga	Daram Khola	1967	D. P. Subsidy	Local Panchayat	Fair	Village Trail	-	x	-	
28.	Bash Khol	Daram Khola	1967	Personal	Personal	Good	Village Trail	-	x	-	
29.	Galyang	Daram Khola	1965	D. P. Subsidy	Local Panchayat	Good	Main Trail	x	-	-	
30.	Pachima	Khahare Khola	1966	D. P. Subsidy	Local Panchayat	Excellent	Main Trail	x	-	-	
31.	Simal Pokh	Daram Khola	1963	D. P. Subsidy	Local Panchayat	Good	Main Trail	x	-	-	
32.	Kache Bas	Daram Khola	1940	Personal	Personal	Fair	Main Trail	-	x	-	Major Repair in 1970
33.	Righa	Sabani Khola	1976	Pilot Project	Local Panchayat	Good	Main Trail	x	-	-	
34.	Mahila	Khahare Khola	1976	Local Women	Local Panchayat	Excellent	Main Trail	x	-	-	
35.	Parse	Kali Gandaki	N.A.*	D. P. Subsidy	Local Panchayat	Fair	Village Trail	x	-	Some	
36.	Kali	Kali Gandaki	1957	Personal	Personal	Fair	Main Trail	-	x		
37.	Armedi	Kali Gandaki	1977	Pilot Project	Local Panchayat	Good	Main Trail	x	-	-	

* Not Available

TRAIL SUSPENSION BRIDGE STUDY

This report contains seven volumes in three different parts as follows :

PART A Effects of Trail Bridges

Vol 1 Introduction, Summary and Recommendations

Vol 2 Case History, Analysis and Findings (Bridges Studied in CDR)

Vol 3 Case History Analysis and Findings (Bridges Studied in WDR)

Vol 4 Case History Analysis and Findings (Bridges Studied in FWDR)

Vol 5 Case History, Analysis and Findings (Bridges Studied in EDR)

PART B Baglung District Bridge Construction Study

PART C Annotated Bibliography and General Informations on Trails and Trail Bridges in Nepal.

FINAL REPORT 1978

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